

EUROPEAN  
SCHOOL

TIMETABLES  
AND  
HARMONIZED PROGRAMMES

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## NOTE ON THE STRUCTURE AND ORGANIZATION OF STUDIES AT THE EUROPEAN SCHOOL

### *Duration of studies*

After a thorough examination of the educational systems in the nine countries of the Community, the Board of Governors — noting that the normal duration of the primary and secondary studies was together 12 to 13 years and that in schools abroad a reduction of one year was generally allowed on the maximum of 13 years — has fixed the duration of the study cycles at

- 5 years for the primary school,
- 7 years for the secondary school.

### *Organization of studies*

The pupils of each year of study are divided into six sections according to their mother tongue :

- Danish language section (European Schools at Luxembourg and Brussels),
- German language section,
- English language section (European Schools at Luxembourg, Brussels and Varese - primary classes),
- French language section,
- Italian language section,
- Dutch language section.

At secondary school, they receive, accordingly, in their mother tongue, basic instruction : grammar and literature, classical languages, philosophy and mathematics.

The other instruction is given in three languages (German, English, French) in the courses common to the pupils of several linguistic sections.

At primary school, they receive, accordingly, in their mother tongue, basic instruction : reading, spelling and grammar, calculation and arithmetic, exercises in observation, history, geography.

Singing, art, craft and physical education will be taught to them within the framework of the European hours.

The division of the pupils between the courses given in parallel in the common languages is arranged so that all the pupils follow, starting from the 3rd secondary year, a minimum number of hours of instruction in a language other than their mother tongue.

### *Structure of secondary education*

- (a) A common stem of orientation covers the three first years of the secondary education.

The 1st year and the first semester of the 2nd year are considered as periods of observation.

At the beginning of the second semester of the 2nd year, the Class Council, sitting as a directional council, directs the pupils to the Latin section or the modern one. The timetables and programmes of these two sections are the same with the exception of four or five periods (Latin instruction, on the one hand, instruction in scientific education and languages, on the other hand).<sup>1</sup>

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<sup>1</sup> For pupils who do not have an aptitude for abstract studies leading to the baccalaureat and who will normally be directed to the short, terminal cycle at the 4th year stage, complimentary explanations and revision exercises are given in mathematics, the mother tongue and a modern language during these periods.

(b) Four years of specialization in one of five of the following orientations :

- Latin-Greek section,
- Latin-modern languages section,
- Latin-mathematics section,
- Mathematics-modern languages section,
- Economic and social sciences section.

There correspond to these sections at the time of baccalaureat five variants in the series of examinations.

Modern languages : In all the classes and all the sections an important place is given to modern languages.

From the primary school, each pupil studies, at a rate of one period a day, one of the languages (German, English or French) which will be utilized as common languages in the secondary classes. The Dutch pupils study a third modern language in the 3rd year of the secondary school. For the French-speaking Belgian pupils, a timetable of Dutch for three or four periods a week is provided from the beginning to the end of the secondary cycle.

All the pupils study a second modern language starting from the 1st year.

Finally, pupils who have chosen the modern section are obliged to learn, starting from the 4th secondary year, a third Community language.

#### *Structure of the short terminal cycle*

A short terminal cycle has been created on an experimental basis in the European Schools at Mol, Varese and Luxembourg.

At the end of the common stem, the pupils with less aptitude for abstract studies leading to baccalaureat are directed towards this cycle which extends over two years (4th and 5th) and offers the following three orientations :

- technical,
- commercial,
- child welfare and domestic arts.

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Timetables and harmonized programmes  
for the  
secondary classes





# HARMONIZED PROGRAMMES

## Mother tongue

### ENGLISH

#### General considerations

1. The aims of the mother-tongue teaching in secondary classes are not essentially dissimilar from those in primary classes, however vastly different the literature and other material which the adolescent needs to confront. Much of what has been said in the general considerations for the teaching of English in primary classes holds good for secondary classes. The adolescent, like the child, needs increasing linguistic resources to meet the demands made upon him in living and in learning, and it is the teacher's job to provide abundant opportunity for him to use his language in ways which will most conduce to improvement, and to use it under expert guidance so that he is helped to greater precision, sensitivity and effectiveness. Mother-tongue teaching is more process than content, and the main business of the English teacher is not direct instruction in the sense which may be applicable in most other subjects. An awareness of the continuity of teaching and learning in the mother tongue can do something to illuminate some of the problems in secondary classes, when children may show less pleasure in reading and writing. Some similar questions (e.g. 'What is reading for?') may be asked, even if the answers are not the same. An awareness of the unity of English teaching becomes even more important as specialist teaching emerges, and no one teacher sees all the work that a pupil does. The evidence accumulates that language grows, not so much from formal exercises and trial runs, as through an interaction of writing, talk, literature and experience, the body of resulting work forming an organic whole. Again, different demands are made by different subjects across the curriculum, some of them highly specific. For most pupils the motivation for a greater technical control, which will let them move from simple narrative to sustained generalization, is the securing of effective and appropriate communication. This motivation all teachers have to supply, often by indirect approaches. Language development in the secondary school requires the cooperation of all the staff.

The re-definition of the principles behind the aims of all mother-tongue teaching in recent years has been brought about by the realization of the primacy of speech and the importance of talk as a step towards thinking ; the study of the living language ; training in expression as well as communication ; helping children to use language creatively as well as to respond to literature ; inventing learning situations which motivate children to acquire vocabulary, spelling, punctuation, grammar, absorbing the implications for teaching of the new grammar and of linguistic knowledge ; a concept of 'appropriate' rather than 'correct' English, and the linguistic validity for their own purposes of dialect, regional or social ; progress from spontaneous restricted language to more elaborated language. Not all these concepts have been absorbed into teaching, and it has to be recognized that the process is an unsettling one for teachers. In spite of this bewildering situation there are pointers as to the direction to be taken and as to where emphasis should be placed, summed up in a phrase for the overriding aim of the mother tongue as 'The personal development and social competence of the pupil'.

2. As in the primary programme, the English-speaking section has to take account of those for whom English is not a mother tongue, especially the children of Danish families. The problem may be easier in the future when most of such children will come to the secondary classes from the primary school. But at present there is an acute difficulty in equipping the children with enough technical language to manage other subjects in their curriculum.

3. The objectives of the teaching in the secondary classes may be listed in the same order as those of the primary.



(a) *Oral English*

The importance of oral English, of talking and listening, remains fundamental. Indeed, for those for whom English is a second language, even more so. They can improve in oral English, while the more complicated demands suddenly made on their powers in written English may halt their progress. To advance in spoken English builds confidence.

The importance of being able to listen is so closely bound up with the ability to speak that it is perhaps specious even to treat the two separately. It would seem nevertheless that the emphasis in the classroom should be sometimes on exercises which make increasing demands on the children's listening powers, training them in the essential areas of concentration and critical response. From an early stage drama, with the listening demands it makes on those participating, has an important role to play. Class discussion and debate, with the class sometimes dividing into groups and different pupils taking on the roles of chairman and secretary, are practical and interesting ways of sharpening listening skill. The tape-recorder and broadcasting receiver can be used to advantage here too, bringing in different listening situations. At later stages of the secondary school more sophisticated listening situations can be devised, indeed will often arise naturally in the course of language activity — comparisons between 'slanted' material and straight information, for example, work in distinguishing tones, inflections, implications, and critical listening to professional recordings of literature.

The main problem facing the teacher in speech is an organizational one. While children can be listening, reading and writing at the same time in the classroom, it is obviously not possible to have them all speaking together. The problem intensifies as classes get larger. The European School situation creates further problems of organization where many Danish children, for whom English is still a foreign language, cannot be expected to respond in certain categories of conversation where they lack the necessary linguistic experience.

Yet for some pupils in the European Schools the classroom is the only place where they have the opportunity to speak English. Their environment is a non-English one. At home, even for some native speakers, the language spoken is not English. For all the children the lack of exposure to the 'living English' situation of their contemporaries in English-speaking countries must surely result in some kind of a loss in their language experience. They are not experiencing the total *bain linguistique*.

The problem is a formidable and challenging one and the special circumstances prevailing in the European School situation demand special attention to the development of meaningful articulate speech — the more so when the close connection between command of the spoken language and the range of one's written language is remembered.

As the teacher's basic role in creating a situation where discourse will be stimulated is the providing of the stimuli for discussion and ensuring that the discourse continues at the appropriate level, both discussion with the entire class and discussion in carefully constituted groups would seem to be priorities. The general class discussion will, perhaps, exceed the linguistic skills of some children at times, but this very stretching of their powers can be effective teaching, if the teacher is aware of their limitations and of the amount of concentration that can be reasonably demanded of them. It may be wise at times to offer relief and to provide the opportunity for consolidating aspects of the discussion to allow a group to detach themselves from the main discussion and write up, for example, some of the points which have been talked about.

Group discussion would seem to be a most useful way of ensuring maximum participation and at a level as far as possible appropriate to the group. Here teacher intervention is essential to ensure that discussion does not degenerate into gossip.

(b) *Reading*

All pupils in the secondary school can read without difficulty and so their course can concentrate its attention on their understanding of the experiences (literary, para-literary, and non-literary) in which they engage, and on the nature and quality of their responses. Traditionally, their reading matter has been drawn from literature, often in the past from older

classics of literature. Only those books which have been studied in the classroom, or extracts from which have been either read in anthologies of passages or offered as exercises for explication, have been taken into account. The study of literature has had a twofold function — the enrichment of pupils' language through reading and the enrichment of their experience and the consequent development of their personality through the human situations portrayed. A realization of the need to start with books with which pupils are quickly engaged has led to the reading of many more contemporary authors, and the selection of texts less because they illustrate the output of a great writer or are typical of a period or a genre, and more because they touch upon pupils' concerns. To find modern writing which has patently inherent value as well as immediate appeal is not necessarily easy, but for a good many pupils it is the only way in which they may enter into the heritage of literature. But, additionally, the teacher has to take account of leisure reading and of the role of fantasy in such reading. Perhaps one of his most important tasks is to develop the reading habit, to increase the amount and range of pupils' voluntary reading and to look to the growth of discernment outside the classroom as well as in it. He may want to ponder the place of film and broadcasting in the extension of imaginative experience.

But, while few things are more valuable than a reading habit which finds pleasure in a wide range of books, the teacher has to take his pupils beyond browsing or seeking vicarious satisfaction in identifying with fictional characters. He has to cultivate from the beginning appropriate ways of formulating responses to reading, helping pupils to recognize a writer's tone and intentions, and identifying the importance of form as well as content. This objective involves the teacher in a more intensive study of some reading, sharpening to what with older pupils it is not too solemn to call criticism. For the first three years such a process might be termed comprehension, but it is always seeking to go beyond simple literal understanding to an awareness of how the author is using language and shaping his work. Sometimes, for this kind of teaching, collections of extracts are employed. But there are advantages in giving concentrated attention to an important key passage or scene in a novel or play. There are still more advantages in being able to use a whole piece of writing, and the lyric poem, the short story and the short play have much to offer in a classroom setting.

In the sixth and seventh years the balance between intensive study and extensive reading becomes more difficult to maintain. An intensive study, perhaps described as practical criticism and characterized by an *explication de texte* approach, offer pupils tools for critical analysis which help him in his judgment of non-literary as well as literary material. But without wider reading, and without sufficient reading of whole texts, he may find it difficult to reach any adequate standards of criticism. An extensive approach, especially one which seeks to cover a representative collection of national literature, is in danger of providing only superficial information.

There is a difficulty, too, in making sure that literature for the fifth, sixth and seventh years is chosen primarily for its human and humane values rather than its illustration of social, political or moralistic views. The thematic grouping of books, often attractive to pupils, can throw a selection out of balance. One field which has not yet been sufficiently explored, and which seems to have an especial value for the European Schools, is that of literature in translation, world literature as well as European. Its inclusion should not encroach on the responsibility of modern language teachers, for there is a great deal from which to choose. The English-speaking section should additionally take account of the work in English by Irish and American writers.

### (c) *Drama*

Drama is as important to the adolescent as to the child, but it is more difficult to organize. It requires more space and is more likely to need extra material resources. It may have to draw in pupils without experience of educational drama when they were younger. Drama employs non-verbal forms of communication, and, in improvised role-playing, unscripted language; it has wider functions than developing linguistic competence of a formal kind. Indeed, a difficult script may be a handicap. It is an area in which teachers are less likely to

be experienced, and where, with older pupils, it is more likely to approximate to theatre and to be directed to an audience. Nevertheless, its very particular function throughout the secondary school course should be remembered, and it should be part of every pupil's educational experience.

(d) *Writing*

Writing is the linguistic mode which holds most difficulties for the primary child, and these difficulties are intensified for the pupil in the secondary school. Quite suddenly, a new set of demands are made upon him in wider subject fields, where he may not be immediately interested and where a teacher may not easily accept responsibility for any failure in communication. A pupil is quickly bewildered and finally discouraged. It is an especial problem for pupils for whom English is a second language, and it is imperative that the writing tasks asked of them should not be beyond their powers at that moment and so leave them with a sense of defeat. Such a class may have to allow its pupils to work in different ways until they all gain sufficient competence. The third year is a particularly vulnerable point in the course. The nature of the syllabuses in many subjects results in more writing tasks which require exposition, inference, and hypothesis, while the beginning of instruction in history and geography in the foreign working language curtails opportunities for using English. The programme must provide, as pupils grow more competent, regular opportunities for writing at different lengths on a range of topics, and in a variety of styles and manners. Occasions for sustained writing in an ordered sequence, whether as narration, description, exposition or argument, become increasingly necessary. These rhetorical categories are probably inadequate, and newer models of writing, in which a sense of audience is recognized, are nearer the realities of writing problems. A model which seems to have a special relevance to the teaching of English in the European schools has been offered by James Moffet in his book 'Teaching the Universe of Discourse', analysing two ladders of increasing abstraction. The first is the relation of speaker to listener ; the second is the speaker's attitude towards his subject.

The capacity to write is developed by the teacher recognizing the increased demands that can be made, and not by exercises. Language does not develop in a straight line through a succession of points which have been identified and reached. Pupils have to return to similar tasks in greater depth.

If the difficulties are intensified for the pupil, so are the problems of assessment and improvement for the teacher. The question which teachers ask continually of all but the quickest pupils is 'How can I get my pupils to write grammatically ?' ; and, as the pupils get older, they seek short cuts. There are none. At a deeper level, the difficulties of the mazes in sentence structure (and probably of seemingly haphazard punctuation) arise from the continuum of the spoken and written forms of the language. At a more obvious level, an improved understanding of the conventions and niceties of written language, and a greater attention to them, result from the teacher's scrutiny of the pupils' writing. Exercises to establish minor matters following diagnosis may well be beneficial ; but research concludes that exercises *in vacuo*, to establish rules which must be adhered to, have little effect.

In the fifth, sixth and seventh classes it is likely that the writing required from pupils will bear upon literature more precisely, but the need for linguistic resources to comment on ephemeral work and non-literary language in the everyday world has still to be recalled. One of the contributions of the study of literature and its criticism is the building up of these resources.

(e) *Language study*

As anxieties over the ability of pupils to write acceptably standard English increase in the secondary years, so does the concern over the nature and effect of the teaching of language.

The disturbing aspect is, perhaps, twofold. The science of linguistics is still in its infancy, relatively speaking, despite the revolution it has already created in modern language teaching. In the teaching of English as a mother tongue practical application of linguists' findings has been much slower than in the field of foreign languages. Consequently, for the moment, the

problem of how to proceed with the task of developing pupils' linguistic skills defies the possibility of creating a comfortable, graded and self-sufficient programme such as was possible, until very recently, when the English curriculum was structured on what was, indeed, an outmoded model for Latin. With the old curriculum there was a neat, compartmented progression through the 'parts of speech', phrases, clauses, to the main divisions of prose composition. The difficulty was, however, that the kind of analysis and description, possible for a dead language of which ; generally speaking, only one form was known — the written form of the educated classes — was totally inadequate for dealing with the complexity and variety of a 'living' language. The dilemma facing many teachers of English today is whether they should reject the traditional curriculum for language teaching before they have found a substitute with reasonably clearly defined stages of progression or continue with an inadequate syllabus which at least has the advantage of appearing to have progressive stages.

The second disturbing aspect is the number of implications inherent in the findings of linguistic research which are at the root of this present dilemma. The old notion of correctness has, to a great extent, given way to the concept of appropriateness and effectiveness in the use of language. Of course all notion of correctness has not been abandoned — what is implied is that correctness is often not an absolute but that it can vary at different registers of communication. For the teacher used to operating within the simpler framework of 'right' and 'wrong' this is a major change in perspective. The terminology for describing language, long consecrated by traditional teaching, has been rejected by linguists as inadequate, and doubts have been cast on the value of many traditional practical exercises such as clause analysis.

However, while the teacher is still discovering how much of the new grammar he can incorporate into his work and how much of the old is still needed for pedagogical discussion, the pupil is interested in words and their ways. Perplexities over usage, especially social usage, afford a route into grammatical and lexical matters, and eventually, for the sixth and seventh years, into areas of study drawn from the structure of language, the history of language and philology.

#### (f) *Punctuation*

Some punctuation is essential to the quick grasp of meaning, most obviously the period. Such marks, guides to a reader's eye and understanding, call for attention and are an easy matter for direct instruction, and, if necessary, repeated practice. Others, most obviously the comma, can depend upon individual judgment, and are most readily illustrated from children's own writing, or from the variant practices of professional writers. With some children at some ages a 'rule', even if only a part-rule, may be less confusing, particularly if they are also at the same time learning another language where the conventions may be more strictly observed.

But while punctuation should not be ignored, it should not overshadow things of greater importance. There are usually more important things to say of a badly constructed sentence than to point out the absence of a comma or a mis-spelling.

#### (g) *Spelling*

Like punctuation, spelling clearly demands attention, but, again, not so much that it prevents the teacher from considering more fundamental errors. It also lends itself to some direct instruction, although pupils vary a great deal in visual acuity, attention and recall. The habit of consulting a dictionary is clearly a help, but it is not a cure-all and can be time-wasting. This is a field where greater care may be aroused indirectly through an interest in words — the English spelling system is more systematic than is sometimes alleged.

#### (h) *Resources*

Mother-tongue teaching needs the support of facilities much more than has always been allowed. Books must be available in considerable numbers to permit teachers to find those which they can read and study successfully with their classes. There is room for class collections

as well as a school library, and even for a school bookshop. The teacher ought to be able to supply individual copies or small sets of books for group work as well as class readers. Access to duplication assistance so that he can use his own material and not just textbook sources is especially important. English teachers need cassette tape-recorders, and access to recording facilities, to record-players, slide projectors, radio and television.

(i) *The needs of Danish pupils*

Reference has been made on several occasions to the special problems presented by children for whom English is not a mother tongue. These do point especially to the necessity of particular equipment (e.g. tape-recorder and headphones) and materials (e.g. a particular range of books, especially for younger children), and to the advantages of group work within classes, if teachers can continue to organize lessons in this way.

**Scheme of work**

Following the general considerations of the preamble, the pattern of work to be covered in the years of the secondary course is set out below. Books are not prescribed, whether language course books or literature, but close liaison over the selection of books should be maintained between schools to minimize any problems caused by the transfer of pupils between the European Schools.

Two matters of continuing concern from the first year to the seventh are punctuation and spelling. Both of them clearly demand attention in the ways that are elaborated in the general considerations. But in the later years of the course there will be particular pupils who will continue to demonstrate difficulties, which will often have to be dealt with individually rather than by group instruction.

Similarly, throughout the course, the most reliable approach to language study is the observance of language in use, both spoken and written, and in a variety of situations and context. Such an approach begins from interest, and introduces the terminology necessary to illustrate complexities in usage and the differences between idiomatic and standard English. Pupils should not be confused by varying grammatical terms, but it is important that teachers accept that languages do not show structural identity, and that even similarities may be more apparent than real. Emphasis should be given to usage rather than to definition or function. In particular, it is from pupils' own written work that the words or practices which they find difficult will have to be diagnosed and help given. Selective sympathetic assessment of their efforts, and assistance in finding acceptable alternatives to errors, is vital.

**Years 1, 2** — 1st year : 6 hours ; 2nd year, 1st semester : 6 hours, 2nd semester : latin section 5 hours, modern section 6 hours.

The work of these two years has so much in common that taking them together avoids some confusion as well as frequent repetition. It is not easy to delimit practices to one year or the other, especially when pupils may have very different linguistic resources at their command. The years are a bridge between the primary school programme, and the separation of the secondary school curriculum into subject fields, each with its own specialized approach.

(a) *Oral English*

- Opportunities of listening as well as speaking. Listening to sounds as well as voices ; identifying, describing, categorizing ; inventing sounds (in creative, dramatic work).  
Listening to readings, to records, to broadcasts, to programme topics made by older pupils.  
Retelling and summarizing.
- Help in reading aloud to improve clarity, fluency, liveliness, feeling. Practice with tape-recorders, in a mini-lab situation. Choral speaking may be a useful preliminary for the less certain.

- The experience of talking freely and openly with teachers and to each other (in groups). It is important to remember that hesitant, incomplete formulations, all that some pupils can manage, are a necessary step to more confident speech, and patience with this stage is necessary.
- Prepared talks on personal experiences and interests. Talks for different purposes to relate to different audiences (perhaps best attempted after preliminary drama exercises).
- Class or group project in preparing a programme on tape. (Perhaps best attempted in later part of second year — it can lead to a variety of other English work.)

(b) *Reading*

- The capacity to comprehend, both literally and in more subtle ways, taking in an author's tone and intention, is best taught indirectly, however it may be tested or assessed. Use of passages from books that are being read together, from books readily available, and from up-to-date and relevant material prepared by teacher.
- Resources of a library.
- Encouragement of extensive reading by making books available in class collections and school library, talking about them, reading from them, using them as ways into writing or drama. More difficult books offered by teachers' reading. The especial importance of myth and legend.

(c) *Drama*

- Movement and mime.
- Individual, pair and small group work. Improvised scenes.
- Building a dramatic situation.
- Role playing.
- Interpretation of narrative.

(d) *Writing*

- Regular opportunities for writing in as many ways as possible, after appropriate stimulus and careful preparation.
- Description, narrative, report, personal journal, letter writing ; turning a short story into a radio script ; free choice of form (including verse).
- Writing at different lengths, for different purposes, to different audiences ; often by an indirect approach.
- Some copious sustained writing, for those who can attempt it, e.g. a prolonged story.
- Preliminary shorter exercises on especial problems, e.g. writing of dialogue, conventions of correspondence.
- Playing with words, e.g. light verse, for form magazine.
- Keeping of personal dictionaries, reading records, anthologies.
- Exercises on specific linguistic matters from diagnosis of faults in writing.

**Year 3** — Latin section : 4 hours ; modern section : 5 hours.

The language demands made on pupils in this year are not new, but they are intensified. In particular they are asked for more objective forms of writing, both statement and exposition. Demands are also made by teachers with varying expectations, sometimes requiring specific

forms. Thematic approaches are valuable and emphasize the unity of all language work. Pupils of this age should be able to maintain interest in a topic through 4-6 weeks. They might build on the myths and legends read in the first two years, e.g. modern interpretations of the Trojan conflict.

(a) *Oral English*

- In extending the work of the first two years some measure of formality in discussion through debate or committee procedure.
- Listening to dramatic or oratorical nuances in stress and intonation ; variants of English pronunciation.

(b) *Reading*

- Any considerable introduction of project work will mean the discovery, interpretation and selection of printed material of all kinds. But difficult for a project to take account of literature for its own sake, not as an illustration of a theme. Pupils of this age have usually outgrown 'children's fiction' ; there is no 'adolescent fiction' ; and film and television make them familiar with mature subjects and sophisticated treatment. Periodicals and cheap paperbacks supply pulp or ephemeral reading. For adult books within their linguistic competence, but with enough substance for serious consideration, help provided by lists offered in various compilations on teaching pupils of this age.
- An especial place for translations from modern European literature, both short stories and short plays.

(c) *Drama*

- Work from scripts, both writing their own and interpreting the work of dramatists. Important to get beyond playreading, and to remember techniques of casting and rehearsal. Selection of key scenes from longer plays for detailed dramatic consideration. Use of the microphone.
- Background to the theatre ; stage, costume, design, music.

(d) *Writing*

- The projects should provide starting points for oral and written composition of all kinds ; may properly include note-taking, but the prime consideration is occasions for imaginative writing — not, of course, restricted to the projects.
- More elaborate exercises in response to reading, film, radio, etc., calling for more technical vocabulary.

**Year 4 — 4 hours**

In the fourth year the topics should be more demanding, perhaps subsumed under some such title as 'Man in Society'. Work might continue along those lines for a number of the pupils, but for others with more linguistic capacity the programme might turn primarily to the study of literature.

(a) *Oral English*

- By this time much oral work should be part of the preparation for written composition of one sort or another, and of the discussion of literature. Some time given to the art of being interviewed — broadcast models may offer a useful start.

(b) *Literature*

- Pupils' tastes and abilities will vary quite widely and necessary to provide for this difference by group study. But valuable to have literary experience in common, e.g. :

- Careful selection from anthology of modern poetry.
  - Anthology of poetry in translation (not only European).
  - Records of modern poetry, including versions in original languages of translations.
  - A novel of sufficient depth, but not too difficult language (e.g. Huckleberry Finn).
  - A play of wide appeal (e.g. Brecht 'Mother Courage').
  - Short stories (e.g. Joyce) including translations (e.g. Maupassant).
- At the same time, every provision should be made to extend pupils' leisure reading.

(c) *Drama*

- The extension of dramatic methods at this stage may turn upon accommodation and facilities. Some kind of studio and recording facilities make possible more elaborate work.

(d) *Writing*

- A similar balance to that in the third year preserved, but a large proportion of writing generated from the reading of literature.
- More scrupulous attention to accuracy of vocabulary (e.g. prefix, suffix) ; care over structure (e.g. prepositions, complex sentence construction) ; use of dictionary (e.g. derivations).

**Year 5 — 4 hours**

(a) *Language*

- Study of para-literary and non-literary language (e.g. newspaper, magazine, popular reading, poster, broadcast).
- Exercises in writing, calling for definition of attitude to subject and audience.
- Exercises in essay bearing upon examinations.

(b) *Literature*

A selection of 4-6 books from :

- Modern authors of substance, in a variety of genres (e.g. Ibsen, Shaw ; Hardy, Conrad, Lawrence, Bellow ; Yeats, Eliot).
- Contemporary authors (including an anthology of poetry).
- Some literature in translation.
- Authors from heritage of literature (e.g. Shakespeare, Sheridan ; Dickens, George Eliot ; Donne, Byron).

It might be necessary to provide a reading programme of simpler literature for some pupils, probably entirely modern.

**Year 6 — 4 hours**

- (a) Analysis and criticism of unprepared texts, prose and verse.
- (b) An author and his background (e.g. Shakespeare, Wordsworth, Dickens, Eliot, Yeats) — three selected texts for intensive reading.
- (c) A genre (16th-20th centuries) — texts for rapid reading.
- (d) Linguistics and the mother tongue — varieties of English.



**Year 7 — 4 hours**

- (a) Analysis and criticism of unprepared texts, prose and verse.
- (b) Intensive study, one of the following :
  - (i) An author (e.g. Shakespeare — Twelfth Night, Macbeth, Troilus and Cressida).
  - (ii) A period (e.g. 19th century — Wordsworth 'Prelude', Dickens 'Bleak House', Chekhov 'The Seagull').
  - (iii) A genre (e.g. George Eliot — Henry James — Conrad).
  - (iv) A theme (e.g. Ibsen 'The Master Builder', Shakespeare 'King Lear', Sophocles 'Oedipus Rex').
  - (v) Literature across frontiers (Dickens, Balzac, Tolstoy) - (Shakespeare, Molière, Pirandello) - Ronsard, Keats, Heine).
- (c) The historical or critical background to the texts chosen for intensive study.
- (d) A folio of critical writing by pupil.

# Classical languages

## LATIN

**2nd year** — second semester — Latin section : 4 hours

**3rd year** — Latin section : 5 hours

A selection of simple Latin texts (Phaedrus, Nepos).

**4th year** — sections LG-LL-LM : 5 hours

Caesar, Ovidius (Tibullus).

**5th year** — sections LG-LL : 5 hours / LM section : 4 hours

Ciceronis epistulae vel orationes faciliores, Sallustius, Poeta ad libitum (Ovidius, Catullus, Tibullus, Propertius, Livius).

**6th year** — sections LG-LL : 5 hours / LM section : 4 hours

Livius, Vergilius, Horatius (Sallustius, Cicero, Tacitus, Plautus, Juvenalis, Martialis).

**7th year** — sections LG-LL : 5 hours / LM section : 4 hours

Ciceronis opera philosophica, Tacitus, Poeta ad libitum (Lucretius, Vergilius, Horatius, Juvenalis, Martialis, Seneca, Augustinus).

## GREEK

**4th year** — 4 hours

A selection of simple Greek texts (Aesopus).

**5th year** — 5 hours

A selection of simple Greek texts (Xenophon, Herodotus, Lucianus, Homerus).

**6th year** — 5 hours

Plato, Homerus (Oratores Attici, Plutarchus, Poetae lyrici).

**7th year** — 5 hours

Plato, Oratores Attici (Poetae tragici, Homerus, Thucydides, Aristoteles).

The names of authors placed in parentheses are included as suggested reading.

The teaching of classical languages should be orientated towards the comprehension of the language and content of the classical texts. Texts will be selected so as to introduce the pupils to the intellectual life and culture of ancient times. The teacher will take care to give to the pupils those notions of literary history necessary to understand the texts well and place them in the context of their time.

The first school years are devoted to an introduction to the study of the structure of Latin (or Greek) to provide the pupils with an adequate knowledge of the principal grammatical usages and to render them capable of recognizing these usages in a Latin or Greek text. In the following years, this knowledge will be extended and deepened.

# Philosophy

## **Preamble**

- The teaching of philosophy should aim at the development of personal thought.
- The philosophy teacher is free with regard to the choice of method and the order of the contents of the programme. In particular, he can, according to needs, regroup, separate or complete the themes proposed, but he is obliged to deal with all the topics of the programme.
- However considerable this freedom is and however diverse national traditions and methods are, it is important that the pupils be capable of dealing with analogous subjects at the time of the baccalaureat, but only at this time.

## **Sections LG-LL-Ec.**

### **6th year — 2 hours**

#### *Introduction to philosophy*

- The presence of philosophical thought in the activities of man and the historicity of philosophical problems (this is a matter, essentially, of appealing to the personal experiences of the pupils).

#### *Problems of psychology*

- Psychology as a science of man (one would have useful recourse to, amongst other things, notions of the behaviour of self-consciousness, unconsciousness, inter-subjectivity).
- The affective life and its dynamics.

#### *Functions of language*

- Expression and communication (it would be appropriate, in particular, to show the fundamental role of language in philosophical reflection).

### **7th year — 4 hours**

#### *Problems of psychology*

- The constitution of objects through space and time (showing how man constitutes for himself a world of real or imaginary objects).
- The construction of the personality : characteristics and will.

#### *Problems of logic*

- The problem of logic and its historicity (reference could be made to the Aristotelian, Stoic, Cartesian and contemporary systems of logic).
- The logical processes of thought (concerned essentially with the analysis of the notions of concept, judgment, reasoning and with the principal forms of discursive thought).
- Logical discourse and rhetorical discourse.

- The notion of science :
  - The formation of the modern notion of science : method ; science and the transformation of the world.
  - The problematics and methodology of the sciences. (For the different sciences, in particular mathematics, physics, biology, history, one would limit oneself to dealing with problems such as the constitution of the scientific fact, methods of investigation, the principles of explanation.)
  - Dialectics as a principle of logical interpretation.
- The problems of truth.

#### *Problems of ethics*

- The ethical problem ; its historicity.
- From the morals of custom to moral questioning.
- The constitution of the moral act (It is a question of leading the pupil to reflect :
  - on the one hand, on the principles which can provide the basis for the morality of an action,
  - on the other hand, on the incidences of physical, biological, psychological nature and social groups in the constitution of this action. One could usefully make reference to different moral conceptions).
- Values, the individual, freedom : their problematics.

#### **Sections LM-Mod.**

**6th year — 2 hours**

#### *Introduction to philosophy*

- The presence of philosophical reflection in the activities of man and the historicity of philosophical problems (this is a matter, essentially, of appealing to the personal experiences of the pupils).
- Functions of language (one will limit oneself to insisting on the logical functions of language).

#### *Problems of logic*

- The logical processes of thought (attention will be paid essentially to the analysis of the notions of concept, judgment, reasoning and to the principal forms of discursive thought).

#### *Problems of ethics*

- From the morals of custom to moral questioning.

**7th year — 2 hours**

#### *Problems of logic*

- The problem of logic and its historicity (Reference could be made to the Aristotelian, Stoic, Cartesian and contemporary systems of logic).
- Logical discourse and rhetorical discourse.

- The notion of science :
  - The formation of the modern notion of science : method ; science and the transformation of the world.
  - The problematics and methodology of the sciences. (For the different sciences, in particular mathematics, physics, biology, history, one would limit oneself to dealing with problems such as the constitution of the scientific fact, methods of investigation, the principles of explanation.)
  - Dialectics as a principle of logical interpretation.
- The problematics of verity.

*Problems of ethics*

- The ethical problem ; its historicity.
- The constitution of the moral act (It is a question of leading the pupil to reflect :
  - on the one hand, on the principles which can provide the basis for the morality of an action,
  - on the other hand, on the incidences of physical, biological, psychological nature and social groups in the constitution of this action. One could usefully make reference to different moral conceptions).
- Values, the individual, freedom : their problems.

# Modern languages

Aim and limits : In all the classes, the teaching of the second language will be at the same time educative, practical and cultural. It will be, on the whole, practical during the common stem, particularly of a cultural character in the upper classes.

By practical study, one should understand the acquisition of those linguistic elements which allow one to express oneself in the foreign language on general subjects.

The cultural instruction will give notions on the life and civilization of the foreign people, starting from carefully chosen and explained authors' texts, having a formative value for the pupils.

## ENGLISH — FOREIGN LANGUAGE

**Years 1-3** — 1st and 2nd years : 3 hours ; 3rd year : 4 hours

### **General introduction**

In the European Schools the study of English as a foreign language is intended to give the students access to a world-wide medium of communication and to a great heritage of literature. Not only should it develop the pupils' cognitive powers, but at the same time it should allow his personality to evolve and mature. It should contribute to the broadening of the students' perception of the world of reality through the medium of a different linguistic system, taking their individual and national needs into account.

International understanding cannot but be promoted by giving them an insight into other attitudes and ways of life.

Specifically the 7-year course at the European School aims at enabling the student :

- (a) to understand generally accepted forms of spoken English as encountered in everyday circumstances ;
- (b) to speak the language in a readily intelligible manner. This implies an acceptably accurate pronunciation, intonation and usage ;
- (c) to understand modern English writing ;
- (d) to express himself in writing with fair accuracy and in accordance with acceptable usage ;
- (e) to acquire an insight into the social and cultural background of the English-speaking world.

For practical purposes the 7-year course can be divided into an initial period of 3 years, in which the basic structures of the language are assimilated, and a further period of 4 years, in which a knowledge of more complicated structures and idioms, as well as some general notions of the literatures and civilizations of the English-speaking countries are acquired.

For this reason the programme has been broken down into 2 sections : one for the 1st, 2nd and 3rd forms (first stage), and one for the 4th, 5th, 6th and 7th forms (second stage).<sup>1</sup>

No section on methodology has been included in this syllabus. This reflects the existing situation in the European Schools, where no coordinated methodology for English as a foreign language teaching has been developed. This traditional absence is due to a gradual divergence of methods over the years resulting from lack of contact between the schools, the varied approaches of the textbooks used and the different training of teachers of various nationalities.

However, this syllabus is subject to continuous revision and it is hoped that in the near future consultations between teachers from the different schools, bringing together their long-standing and varied experience, will make possible the production of agreed methodological guidelines for English as a foreign language teaching.

### **First stage**

#### **Objectives to be reached at the end of the first three years**

##### *General remarks*

1. It is important to keep in mind that this programme is intended for students beginning to learn English at the age of 11-12, who will be 14-15 at the end of the period.
2. There is always a difference between active and passive command of a language, and between active expression and passive understanding, which needs to be borne in mind

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<sup>1</sup> When more experience has been gained with the new situation created by the extension of the old 5-year course to 7 years, a syllabus for the second stage will have to be drawn up.

consistently in the teaching process. The scope of the student's active skills will be less than his passive knowledge and understanding.

### *Achievements*

The skills mastered after 3 years should include :

- (a) The ability to understand spoken English within the *passive* vocabulary range.  
In practice the student may be expected to show his understanding by responding adequately within his *active* range of vocabulary.
- (b) The ability to speak English without serious mistakes of pronunciation, usage and grammar within an *active* vocabulary of about 1 500 words. (See Appendix II.)  
In practice the student may be expected to carry on a conversation with native speakers and express himself on general subjects within his spheres of interest.
- (c) The ability to read texts suitable to the student's age-group. The *passive* vocabulary should comprise about 2 000 to 3 000 words, depending on the individual child's ability and linguistic background.  
In practice the student may be expected to read intensively within his *active* vocabulary, and extensively within his *passive* vocabulary. He should be able to retell, within his *active* vocabulary, the contents of narrative and descriptive prose within his spheres of interest.
- (d) The ability to write English without serious mistakes of spelling usage and grammar within his active vocabulary.  
In practice the student may be expected to write simple letters and short compositions on subjects within his spheres of interest.

## A p p e n d i x I

### Grammatical notions

At the end of the first 3 years the student should be familiar with the following :

#### *Verbs*

Verb forms : Present simple  
Present continuous  
Past simple  
Past continuous  
Future  
Conditional  
Present perfect simple  
Past perfect simple  
Imperative

Auxiliaries : have, be, can, must, have to, may, do, need, used to, ought to, should, shall, will, would

Patterns : Negative forms  
Interrogative forms

#### *Articles*

#### *Nouns*

Countable — uncountable  
Formation of plural — regular/irregular  
Gender  
Connective particle ('s, s')



### *Adjectives*

Regular degrees of comparison  
Most important irregular degrees of comparison  
Comparison of equality  
Much/many ; little/few ; a little/a few ; a lot/lots  
Interrogative adjectives  
Possessive adjectives (attributive and predicative)  
Indefinite adjectives (some, any, all, every, each, both)  
Demonstrative adjectives

### *Adverbs*

Formation  
Position in sentence  
Interrogative adverbs  
Indicative adverbs

### *Pronouns*

Personal  
Compound personal (myself — etc.)  
Interrogative  
Supportive (one, one's)  
Indefinite  
Relative (who, which, that, zero)

### *Numerals*

Cardinal and ordinal

### *Conjunctions*

(See Appendix IV)

### *Prepositions*

(See Appendix V)

### *Examples of uses of verb forms listed above*

- |                        |   |
|------------------------|---|
| (a) Present simple     | : My father works in London.<br>My father goes to the office every day.<br>My father opens the door and enters. |
| (b) Present continuous | : My father is working in the garden.<br>He is leaving next week.   |
| (c) Past simple        | : His father died yesterday.<br>I saw him two months ago.   |
| (d) Past continuous    | : He was working when I came in.  |
| (e) Present perfect    | : I have lived here for five years now.<br>I have lived here since 1970.  |
| (f) Past perfect       | : He told me that he had bought a new car.  |
| (g) Future             | : I will help you.<br>We shall have to go now.<br>I am going to talk to him tomorrow.                           |

- (h) Ing-forms : Running horses.  
Smoking is bad for one's health.  
I like fishing.  
I'm afraid of going there.  
I want to go shopping.  
She stopped talking for a moment.
- (i) Present simple passive : English is spoken all over the world.
- (j) Past simple passive : He was hit in the face.
- (k) Past participle used as a predicative adjective : This cup is broken.

*Simple sentence structures*

- (a) Subject + verb : He jumps - He doesn't jump - Does he jump ?  
He is singing - He isn't singing - Is he singing ?  
I have slept - I haven't slept - Have I slept ?
- (b) Subject + verb + direct object : You saw him - You didn't see him - Did you see him ?
- (c) Subject + verb + indirect object + direct object : They gave them their books.  
He told me his story.
- (d) Subject + verb + adverb of place : He is there.  
She is in London.
- (e) Subject + verb + adverb of definite time : Tomorrow I shall leave.  
I saw him yesterday.
- (f) Combination of (d) and (e) : I went to the station at 6 o'clock.
- (g) Combination of (c), (d) and (e) : You sent him a letter from London last week.
- (h) Imperative : Listen !  
Don't do that !  
Let's go !
- (i) Structures with adverb of indefinite time and other adverb : He always eats at seven.  
They also wanted to talk about it.
- (j) Question tags : He went home, didn't he ?  
He didn't go home, did he ?
- (k) Object + infinitive : I want him to go.  
We saw him go.
- (l) Impersonal use of 'it' : It's raining.
- (m) Phrasal verbs : I'd like to look into it.

## Appendix II

### Vocabulary

The active vocabulary taught should cover the most frequent words and expressions, always keeping in mind the learner's age-group. It ought to consist of :

- (a) the structural words covered in the 'Grammatical notions' (Appendix I) ;
- (b) the irregular verbs contained in Appendix III and those regular verbs which form part of the centres of interest listed below ;
- (c) the content words related to the 'Centres of interest' (see below).

Adjectives and adverbs may be taught in almost any kind of semantic context and are therefore not listed separately.

### Centres of interest and semantic categories

The list of centres of interest and semantic categories given below is not meant to be exhaustive. It gives the minimum which ought to be covered. The words given are only to be considered as examples. This leaves ample scope for the individual teacher to develop the vocabulary within this framework and to extend it to other centres of interest.

Accidents	: fire, crash, wound / to injure, to run over
Animals	: dog, horse, cat / to feed, to bite, to ride
Body	: arm, head, limbs / to move, to shake, to touch
Business	: company, office, customer / to sell, to buy, to order
Calendar	: Easter, March, holiday, month / to pass, to spend
Clothes	: trousers, skirt, shoe / to put on, to take off, to change
Colours	: red, pink, yellow / to look, to paint
Communications	: radio, letter, telephone / to dial, to ring up, to send
Countryside	: farm, field, tree / to grow, to plant, to feed
Economy	: job, tax, customs / to pay, to borrow
Entertainment	: music, theatre, fun-fair / to amuse, to dance, to have fun
Feelings	: happiness, sadness, quiet / to feel, to laugh, to cry
Food	: bread, cake, tea / to eat, to drink, to cook, to boil
Forms of address	: sir, officer, Mr Brown / to address, to ask, to call
Fruits	: apple, orange, cherry
Garden	: tree, flower, fence / to dig, to cut
Geography	: country, coast, river / to travel, to discover
Government	: king, parliament, law / to govern, to debate
History	: age, antiquity, peace / to invade, to civilize
House	: window, floor, roof / to live, to clean, to build
Human beings	: boy, man, girl, wife / to grow up, to die
Human life	: birth, marriage, death / to die, to fall in love
Human relationships	: friend, enemy, team / to like, to obey
Illness	: disease, prescription, cold / to suffer, to cure
Language	: speech, conversation / to speak, to pronounce
Law	: crime, prison, court / to judge, to arrest
Materials	: iron, wood, paper / to make, to produce
Measures	: mile, kilometre, pound / to measure, to weigh
Military	: army, soldier, gun / to shoot, to attack, to march

Money	: salary, wages, penny / to earn, to spend
Relatives	: father, aunt, niece / to love, to kiss, to inherit
Reading and writing	: book, pen, newspaper / to write, to copy
Religion	: church, prayer / to pray, to kneel
School	: pupil, desk, blackboard / to learn, to listen, to repeat
Senses	: noise, smell, sight / to see, to hear, to notice
Shopping	: department-store, grocery / to wrap up, to buy
Sports	: football, soccer team / to play, to run, to swim
Television and radio	: programme, announcer, news / to broadcast, to watch
Time	: day, 6 o'clock, minute / to tell, to read
Tools	: hammer, scissors, stick / to work, to use, to hit
Town and village	: street, corner, building / to walk, to visit
Toys	: doll, model, ball / to play
Trades and professions	: doctor, plumber, teacher / to work, to repair
Traffic	: policeman, pavement, sign-post / to drive, to cross
Transport	: car, bicycle, railway / to travel, to return
Weather	: snow, cold, cloud / to rain, to snow, to shine

### Appendix III

#### Irregular verbs

to be	to feel	to lie
to bear	to fight	to light
to beat	to find	to lose
to become	to fly	to make
to begin	to forget	to mean
to bend	to freeze	to meet
to bite	to get	to overtake
to blow	to give	to pay
to break	to go	to put
to bring	to grow	to read
to build	to hang	to ride
to burst	to have	to ring
to buy	to hear	to rise
to catch	to hide	to run
to choose	to hit	to say
to come	to hold	to see
to cost	to hurt	to sell
to cut	to keep	to send
to dig	to kneel	to set
to do	to know	to sew
to draw	to lay	to shake
to drink	to lead	to shine
to drive	to learn	to shoot
to eat	to leave	to show
to fall	to lend	to shut
to feed	to let	to sing

to sink  
to sit  
to sleep  
to speak  
to spend  
to stand  
to steal  
to stick

to strike  
to sweep  
to swim  
to swing  
to take  
to teach  
to tear  
to tell

to think  
to throw  
to understand  
to wake  
to wear  
to win  
to write

## Appendix IV

### Conjunctions

if  
whether  
unless  
so that  
so ... that  
after  
before  
when  
until

till  
while  
as  
since  
as soon as  
as long as  
whenever  
because  
for

both ... and  
either ... or  
neither ... nor  
so  
and  
but  
but also  
although  
though

## Appendix V

### Prepositions

above  
about  
across  
after  
against  
along  
among  
at  
because of  
before  
behind  
between  
beyond  
by  
close to

down  
for  
from  
in  
into  
in front of  
inside  
like  
near  
next to  
of  
off  
on  
opposite  
out of

outside  
over  
round  
by the side of  
since  
through  
till  
to  
towards  
under  
until  
up  
up to  
with  
within  
without

## Second stage

### Years 4-7

#### Objectives to be reached at the end of the 7-year course

##### *General remarks*

1. The 4th and 5th years are a period of mainly linguistic consolidation. At this stage the

teaching should concentrate on extending language skills, both in the fields of grammar and vocabulary, resulting in a greater degree of fluency and accuracy in both oral and written usage.

2. In the 6th and 7th years a stage has been reached at which it seems advisable to concentrate less on the linguistic aspect of language teaching. The age of the students makes it possible to deal with more complicated and abstract concepts, which should be gradually incorporated into the teaching.
3. After the 5th year, account should be taken of the fact that the students may choose English as a first, second or third foreign language. The difference lies in the eventual level of achievement, which thus implies different standards of valuation.

### *Achievements*

The skills mastered by the end of the course should include :

- (a) the ability to communicate easily within those forms of spoken English which are generally accepted and on topics which are not too specialized in subject-matter or in language ;
- (b) the ability to read and understand any text which is not too specialized in subject-matter or language ;
- (c) the ability to write in present-day English on subjects that do not involve a use of specialized language.

## Appendix I

### **Grammatical notions**

It seems natural that, as to grammar by far the greater part of the 4th, 5th, 6th and 7th years should be devoted to the repetition, elaboration and extension of the items enumerated for the first 3 years with special attention to the following :

#### *Verbs*

To be added : Present perfect continuous

Past perfect continuous

Auxiliaries : **can**  
**may**  
**must**  
**dare**

will be able to — have been able to  
will be allowed to — have been allowed to  
will have to — had to — have had to

#### *Article*

Uses and omission of the indefinite article : He is a captain.  
He is captain of the Illustrious.  
He acted as a friend.

Uses and omission of the definite article : with abstract and material nouns :

History is bunk.

Butter is expensive.

with names of streets, parks, institutions :

He went to hospital.

He lives near Hyde Park.

with parts of the body :

He took him by the hand.

### *Nouns*

Pair plurals : e.g. trousers, spectacles, scissors, etc.

Post genitive : a friend of my father's  
(a friend of mine)

Genitive with time and distance : yesterday's paper  
a two hours' walk

Partitive preposition : a pound **of** butter, a bottle **of** wine

Appositional preposition : the county of Kent

Some expressions with genitive : to my heart's content  
at his wit's end  
for art's sake, etc.

### *Adjectives*

Conversion : the rich, the blind.

### *Pronouns*

Interrogative : who — which : **Who** did that ? — **Which** of you did that ?  
what — which.

### *Relative clauses*

Position of preposition : I saw the man who (that, zero) you were talking **about**.

Continuative and restrictive clauses :

(a) My father, who is 78, is coming tomorrow.

(b) The man who(m) (that, zero) you see there is my uncle.

'Which' + 'who(m)' not used after :

only, any, all, nothing, something, everything, anything, superlatives.

'What' = all that

'Which' referring to a whole sentence :

I have to go to school, which is rather unpleasant.

### *Examples of uses of verb forms and auxiliaries*

to be added : further functions of 'to be' + ing :

He is always grumbling.

present perfect continuous :

He has been waiting all afternoon.

past perfect continuous :

He had been playing the piano for an hour when I came in.

present perfect passive :

He has been beaten.

past perfect passive :

He had been beaten.

future passive :

He will be beaten.

conditional passive :

He knew that he would be beaten.

present continuous passive :

My car is being repaired.

past continuous passive :

I could not come because my house was being painted.

*Further uses of auxiliaries :*

Can : I **can** see a dog in this picture.

Can v may : We may put out chairs in the garden, and if so we can have tea there.  
If you behave you may (can) go to the cinema tonight.

'Must not' v 'need not/don't have to'

'Must' v 'have to'

All people must die.

You must go now !

You have to leave now, if you want to catch your train.

'Must' v 'should'

You must do your homework.

You should (ought to) do your homework.

'to be to'

I was to meet him at the station, but he wasn't there.

You are to do your homework now !

'Shall'

Shall I tell him ?

'Will'

He will sit there for hours.

'Would'

He used to sit down in that chair, and then he would sleep for the rest of the day.

Emphatic 'to do'

I did tell you !

Do be quiet !

*Gerund v infinitive*

I like to go to school.

I like going to school.

*Passive voice*

Subject corresponding to direct object :

I beat my brother at tennis. / My brother was beaten at tennis.

Subject corresponding to indirect object :

They gave him a medal. / He was given a medal.

Subject corresponding to prepositional object :

We shall look into the matter. / The matter will be looked into.

'Have' + object + passive past participle :

I had the house painted last year.

Special attention should be paid to the frequent application of the passive rather than the impersonal construction :

One should not do that. / It is not done.

Passive gerund :

Your hair needs cutting.

It's not worth repeating.

*Sentence structure*

Reported speech :

He **said** that he **wasn't** hungry.

He **said** that he **hadn't** seen it.

Indirect questions :

He asked us **if** we had been there.

He wondered **who** had done that, etc.

Inversion after initial

Only then did he believe me.

negative sentence qualifier :

Never have I heard anything so ridiculous.

Conditional sentence :

I will tell you if you tell me.

I would tell you if you told me.

I would have told you if you had told me.

N.B. The examples given are not meant to be exhaustive. They only serve to remove any misunderstandings about the terminology.



## Appendix II

### Vocabulary

The student's knowledge of vocabulary at the end of the seven-year course should enable him to understand to a large extent spoken and written English of a non-specialized nature (but on the level of educated people), when used in accepted grammatical structures. He should also be able to use the language actively without seriously offending against accepted usage, so that he can make himself understood.

A distinction must be made between active, passive specialized or professional and sub-standard vocabulary.

*Sub-standard* (unconventional English, slang) is not taught as part of the official course.

*Specialized vocabulary* (both active and passive) cannot be taught in a secondary school except to a very limited extent, e.g. :

some grammatical terminology (present, passive voice, auxiliary, etc.)  
some school terminology (oral exam, test-paper, etc.).

It should be borne in mind that this vocabulary is only used to make teaching in English possible and its use should remain functional. Under this heading also comes some vocabulary in connection with the cultural content of the course (e.g. : Speaker, Public School, Life Peer, etc.) and vocabulary in connection with the European context in which the pupils live.

For both the *active* and the *passive* vocabulary-content of the course it should be borne in mind that for many students the European School is an intermediate step to higher education.

The *passive* vocabulary is increased by hearing and reading English and although it cannot be taught systematically it should be considered as an important element of the course.

It is essential that students should be encouraged to listen to English and read it outside the classroom. Students who take English as their first foreign language are required to submit a list of several articles and books read.

*Active* vocabulary : A definite list of the vocabulary the student is to master cannot be drawn up. It is suggested that a large degree of latitude should be left to the teacher responsible. As a rough guide-line, however, the following points should be observed :

1. Acquisition of vocabulary will progress gradually from the centres of interest (years 1-3 inclusive) to more abstract and semantically more complicated concepts.
2. The vocabulary taught should, in principle be based on frequency of occurrence. Between 2 000 and 3 000 semantic units would cover the general needs of an educated non-native speaker.
3. The structural words (e.g. particles, conjunctions, prepositions) should be known.
4. Special attention should be given to the so called 'faux amis' (e.g. French *actuel* - English *actual*) in order to reduce misunderstanding and interference by the learner's other languages to a minimum.
5. The vocabulary taught should include the most frequent phrasal verbs (e.g. : to look at, to look for, to look into, etc.) and idioms (e.g. : I'm fed up, on the face of it, etc.).
6. Differences between British and, in particular, American English (spelling, usage, meaning) should be pointed out when they occur.

The level required of the students who take English as their first foreign language is higher than for those who take English as their second foreign language.

## Appendix III

### Social, cultural and literary aspects of the course

#### *Social and cultural*

A working knowledge of the more important aspects of the social and cultural life of the English-speaking world contributes to a greater insight into modern life in general and into that of the English-speaking world in particular. Furthermore it provides the foreign learner with necessary background information for the spoken and written language.

It should be borne in mind, however, that a knowledge of the various political, religious, legal educational institutions is to be given as an aid to better understanding and not as an end in itself, so that detailed information on such matters must be considered as being outside the scope of the English courses at the European Schools.

#### *Literature*

Literature is an essential part of Western civilization and uses language as its medium of expression. It must, therefore, form part of the course for more advanced students. As it uses language with aesthetic considerations and is not exclusively concerned with communication in its narrower sense (the exchange of information) students should be given at least some insight into the literatures of the English-speaking world. Studying literature in English will, moreover, enable students to become acquainted with literary values and literary conventions outside the limits of their own literature. A knowledge of literatures other than one's own contributes to a better understanding of *la condition humaine*. It is obviously impossible to treat the whole of literature in the limited time available, whereas detailed literary analysis of even a limited number of works requires a specialized and difficult vocabulary and a profound familiarity with the language that cannot be expected from the foreign language learner before or even at the level of the final examination. Therefore, the student should in practice be made familiar with at least some works of literary merit, especially of the 20th century, without being required to have a detailed knowledge of their possible interpretations and background.

When older works of literary value are discussed in class, care should be taken with the greatly increased linguistic difficulty of most of them.

Some comprehension of the importance of Shakespeare for the English-speaking world and for literature in general must be considered as essential for a course that intends to give its students 'access to a great heritage of literature'.

## Appendix IV

### Note on the frequency lists

Most course books available or suitable for secondary schools are based on the frequency counts for their vocabulary and structures.

The standard lists are :

Michael West : 'General Service List' (Longmans) — about 2 000 word meanings given.

Thorndike-Lorge : 'Teacher's Word Book of 30 000 words' (Columbia University) — meanings not supplied.

(The AA and A words in this list comprise the first 2 000 words. Words marked 49-40 extend this to about 3 000).

Erik Weis : 'Grund- und Aufbau-Wortschatz' (Klett Verlag) — with German translations.

Wein/de Groot : 'Engelse Woordschat' (Wolters-Noordhoff) — with Dutch translations.

Although these lists are useful it should be kept in mind that :

1. they are sometimes based on adult usage (especially Thorndike) ;
2. some were drawn up some time ago so that certain now more frequent words were less current then (e.g. pollution, atomic, nuclear) ;
3. that certain words with a low frequency (e.g. 'oral' in Thorndike between 8 000-10 000) are relatively frequent in the school context ;
4. not all lists distinguish the meanings which are most frequent ;
5. words may gain more frequent currency owing to political, economic or technological developments, etc. (space, devolution, inflation).

This is clearly not an exhaustive list.

# History

## I — First cycle : 1st and 2nd years

### A — General instructions valid for the whole of the first cycle :

1. Limit oneself to the essential facts by strict selection ; no useless nomenclature, no superfluous details.
2. Given an essentially concrete instruction, based on abundant documentation, especially iconographical, drawing, for preference, on the history of the nine countries of the European Community, as a point of departure for the lesson ; have recourse, to the greatest extent possible, to the method of 'discovery'.
3. Accord a place of prime importance to the facts of civilization, centred on some essential events and major figures.
4. Consider this syllabus, above all, as a 'collection of samples' intelligently selected and constantly concerned with the chronological thread.
5. Stress, on every possible occasion, the reciprocal influences of the nine countries of the European Community.
6. Accustom the pupils to make use of the textbooks of other countries in the European Community and the documents placed at their disposal in the school library.

### B — Programme

#### 1st year — 2 hours

##### 1. *The evolution of living conditions of Europeans since 1815* (some thirty lessons)

This study, bearing on some aspects of contemporary history, which least confuses the young pupils, should be particularly lively and concrete. Thus conceived, it will facilitate transition between the methods of the primary school and those of secondary education and will serve as an introduction to the more systematic study of recent history undertaken in the remainder of the first cycle.

- (a) The new sources of energy : steam, electricity, petrol, atomic energy.
- (b) The transport revolution : railways, steamships, automobiles, aeroplanes, the postage stamp, the telegraph, the wireless and television.
- (c) Industrial developments.
- (d) The development of the condition of the town worker from 1830 to the present day.
- (e) The living conditions of the peasant from 1830 to the present day.
- (f) The progress of medicine and social security.
- (g) Educational progress.
- (h) The coming of democracy.
- (i) The conquest of space.
- (j) Contemporary civilization.

## 2. *Elements of modern history*

- (1) Inventions and great discoveries.
- (2) The Empire of Charles V.
- (3) The Renaissance in the West.
- (4) The Reformation and partition of Europe.
- (5) From the religious wars to the Thirty Years War (including the war of independence of the United Provinces).
- (6) The civilization of the 17th and 18th centuries (Baroque and classicism).
- (7) Absolutism, Versailles.
- (8) The great mercantile powers : England, United Provinces.
- (9) The Central and East European powers of the 18th century : Austria, Prussia, Russia.

### **2nd year — 2 hours**

- (1) The society of the Old Régime.
- (2) The move to liberty in the 18th century.
- (3) The French Revolution (limited to essential facts and personages).
- (4) Napoleon.
- (5) The Congress of Vienna.
- (6) The Restoration.
- (7) Belgian independence.
- (8) The 1848 revolutions.
- (9) Italian Unification.
- (10) German Unification.
- (11) The independence of Luxembourg.
- (12) The rise of imperialism.
- (13) The First World War and the peace treaties.
- (14) The dictatorships.
- (15) The Second World War.
- (16) The creation of the European Community.

## **II — Second cycle : 3rd, 4th, 5th, 6th and 7th year**

### **3rd year — 2 hours**

#### *Pre-history and Antiquity*

One will insist particularly on the following themes :

- The contribution of the East.
- The century of Pericles.
- The hellenization of the ancient world.
- Roman civilization from the 2nd century BC to the 2nd century AD.
- Christianity in the Roman world.

**4th year** — 2 hours

*The Middle Ages*

and particularly :

- The heritage of Rome.
- The feudal world.
- The awakening of national cultures.
- Urban civilization in the Middle Ages and its evolution.
- New techniques. The great discoveries.
- Origins and development of mercantilism.

**5th year** — 2 hours

The Renaissance

The Reformation and religious wars.

Absolutism.

European civilization in the 17th century.

**6th year** — 2 hours

The Enlightenment. Its influence : enlightened despotism.

The French Revolution and its achievement.

Europe and the Restoration.

Economic liberalism and the birth of socialism.

Liberal and national movements. The formation of new States.

European expansion before 1870.

The intellectual movement before 1870.

**7th year** — 2 hours

*The world from 1870 to the present time*

One will insist particularly on the following themes :

- The progress of democracy.
- Social issues.
- Imperialisms and the First World War.
- The dictatorships and the Second World War.
- The new aspects of Europe in the 20th century and the major international problems.
- The movement of ideas, the sciences and the arts. The contemporary industrial revolution.

*Observation*

In all the linguistic sections, the teaching of history will be carried out in the mother tongue during the first cycle (1st and 2nd year), and in the common language in the 3rd, 4th, 5th, 6th and 7th year.

Starting from the 3rd year, the history course will not only lean on the notions acquired previously but also on their indispensable, succinct recall. It will consist principally in a study of the evolution of the life of peoples. One will thus study the major movements and aspects of our civilization as well as the successive contributions of peoples and nations. The succinct recall to which allusion is made above, will include necessarily the essential traits of the national history of each of the countries of the Community in the various epochs studied.

# Geography

**1st year** — 1 hour (in mother tongue)

*Basic notions on physical and human geography*

- Relief forms ; the formation of major relief features, erosion.
- Climatic elements : temperature, wind, rain ;  
the various climates and corresponding vegetation zones.
- The oceans.
- The earth's population.
- Man and nature : the kinds of life, land use, the activities of men : agriculture, industry, transport.

The study of these different points will be carried out with the primary concern being an initiation into the vocabulary and working methods of geography and as close a connection as possible with the study of the local environment.

**2nd year** — 1st semester : 2 hours ; 2nd semester : 1 hour (in mother tongue)

*The countries of the European Community*

- Outline study of the physical geography of the European Community : relief, climate, rivers, seas.
- The population of the European Community.
- The economy of the European Community by sectors of activity : agriculture, fishing, industry, transport, commerce.

This study will commence, from preference, from examples taken in the country in which the school is situated.

The pupil will have to familiarize himself with the basic geographical vocabulary with a view to carrying out profitably the study in the common language of the more extensive and demanding programmes for the subsequent classes.

**3rd year** — 1 hour (in the common language)

*Europe*

Study of the major units grouping the countries according to the physical, human, economic conditions, for example : the Mediterranean countries — the Anglo-Saxon countries — the Scandinavian countries — the Alpine countries — the East European countries — comprehensive view of the USSR.

One will insist for each of these units on the essential characteristics, with a more detailed study of one or two States serving as an illustration.

**4th year** — 2 hours

*The world (excluding Europe)*

- (1) Comprehensive view of the different continents ; physical characteristics, demographic characteristics, economy.
- (2) Detailed studies of some countries typical of each continent, preferably other than those which are the subject of a thorough study in the 6th form.

**5th year** — 2 hours

*General, physical and human geography*

Respecting the balance between physical, human and economic geography, the following themes will be thoroughly explored :

(1) *Physical geography*

- Formation and evolution of relief : for example, the formation of mountains, volcanoes, erosion.
- The factors of the climate — the climatic zones.
- The oceans.

(2) *Human and economic geography*

- The population of the globe and its evolution.
- Modes of life ; the major sectors of activity : primary, secondary, tertiary ; land use, urban development.
- The exploitation by man of natural environments and their contribution to the world economy.
- The environment : utilization of space — the protection of nature.

**6th year** — 1½ hours

*The chief world powers (excluding the European Community)*

A study of these powers (USA, USSR, Japan, China) and one or several countries in a process of development will be used to illustrate the essential characteristics of the major economic systems. Emphasis will be placed on the problems of energy, raw materials — the major commercial flows — problems of development and underdevelopment.

**7th year** — 1½ hours

*The European Community*

(1) General study of the countries of the European Community (brief summary) :

- position,
- climate,
- analysis of the population and its activities.

This study will be conducted without consideration of political boundaries.

(2) Some regions typical of the interior of the European Community, for example :

- expanding regions :
  - Rhône-Rhine axis,
  - Parisian region,
  - Plain of the Po,
  - London region,
  - Port zones.
- problem regions :
  - (a) the marginal areas of the Community :
    - Southern Italy,
    - The west of France,
    - Scotland,
    - Ireland,
    - The frontier regions of the east of the Federal Republic of Germany.



- (b) The older industrial regions under going re-development :
- Lorraine - Saar - Luxembourg,
  - North France - Wallonia,
  - British Black Country.
- (3) The general aspects and the problems of the European Community :
- The institutions of the European Community and their functions.
  - The major economic sectors and common policies : agriculture, energy, industry, transport and infrastructure, financial and commercial problems.
  - The special characteristics of the economy of the different Member States of the European Community.
  - The European Community in the world :  
relations with the other European countries :
    - with the Third World,
    - with the other countries : USA, Japan, USSR.
  - The economic and political future of the European Community.

#### OBSERVATIONS ON THE AIM AND METHODS OF THE TEACHING OF GEOGRAPHY

The principal aim of the teaching of geography on the level of the secondary classes is :

- (1) to teach the pupils to reason geographically, that is to say, to perceive the interdependent relationship which exists between man and nature. This makes geography a social science, which makes an essential contribution to civic education ;
- (2) to familiarize the pupils with the working means and methods proper to geography.

To attain this aim, the teacher has freedom to select — within the framework of the programme and by a way based on example — the method, the centres of interest and themes which correspond to the situation in which he finds himself : level of the class, knowledge of the language, location of the school, material available, current situation, etc.

# Economic geography

## *Preliminary remark*

It will be necessary to teach the outlines of capitalist and socialist economics. This should be done in relation to the major products of the world economy and not as specific topics.

## **4th year — 1 hour**

### *I — The major agricultural products (production and trade)*

Cereals : wheat and rice.

Oil seeds.

Beverages : viticulture and wine, coffee, tea, cocoa.

Sugar.

Fruit.

Animal products : meat, milk, wool.

### *II — World population increase and problems of food supply Hunger in the world.*

### *III — World transport and communications*

Roads, railways, waterways.

Sea routes, interoceanic canals.

Great ports, merchant shipping.

Air routes.

Communication media :

- posts, telecommunication cables ;
- radio and television ;
- communication satellites.

## **5th year — 1 hour**

### *I — Sources of energy*

Coal.

Oil and natural gas.

Electricity.

Nuclear energy.

### *II — Major industrial products*

Minerals and metals (iron, aluminium, copper, gold).

Car manufacture.

Ship building.

Aircraft construction.

Electrical and electronic industries.

Chemical products : fertilizers, plastics, synthetic fibres.

III — *The relationships between primary producing regions and the highly industrialized regions*

Problems of under-development.

Problems of the prices of raw materials.

Problems of aid to developing countries.

IV — *Ecological problems: man and the environment*

The threat of destruction of the environment by the exploitation of natural resources, the development of technology, the extension of agriculture and by industry.

Pollutants, transport media.

Methods of protecting the natural environment and planning the human environment.

(All these problems may be covered when dealing with the above-mentioned topics or they may be dealt with separately.)

# Mathematics

**1st year** — 4 hours

## I — *Sets, relations*

Starting from concrete situations, bring out the ideas of : set, element, membership.

Venn diagrams. Equality of sets.

Subset ; inclusion, complement.

Particular sets.

Construction of the subsets of a finite set : enumerability, complements, universal set, and empty set.

Union, intersection, difference ; study of the properties.

Examples of relations. Make clear the ideas of Cartesian product and of one-to-one correspondence.

Equivalence.

## II — *Logic*

In conjunction with the study of the mother tongue and using examples : meaning of the definite article 'the', different meanings of 'a', meaning of 'and', the two meanings of the conjunction 'or', meaning of the word 'or' ; meaning of the word 'all', progressive introduction of quantifiers ; negation.

## III — *The natural numbers*

In connection with sets : the natural numbers (N).

Notation in the denary scale, the binary scale and, if possible, one other scale.

Arrangements of natural numbers.

Operations : addition, multiplication ; inverse operations : subtraction and division. Some examples of addition and multiplication in a non-denary scale.

Properties of addition, multiplication, relative properties, in conjunction with the properties of operations on sets. Zero and singular elements.

Multiples, divisors, LCM, HCF.

Prime numbers.

## IV — *Numerical calculation*

Throughout the course, numerical calculations with natural numbers ; discussion and development of the techniques concerning decimals and fractions acquired during the primary course.

Estimation of the order of magnitude of a result, and determination of upper and lower bounds.

Lengths, areas, volumes (metric system), angles, time.

Simple problems.

## V — *Intuitive geometry*

Study of specific two-dimensional and three-dimensional figures, with the object of familiarizing the pupils with the usual drawing instruments and the terminology. Possible, experimental study and study of displacements. Coordinates of a point on a straight line, in a plane and in space (occasionally on a sphere).

Representation of a figure in a frame of reference.

## 2nd year — 4 hours

### I — *Sets and elements of logic*

Logical connectives. Truth tables. Relation with sets.

### II — *Relations*

Relations from E to F. Representations. Reciprocal. Cartesian product. Function. Application. One-to-one correspondence.

Composition of relations; associativity. Reciprocal of composite relations.

Relations in E. Transformations, permutations.

Properties: reflexivity, symmetry (assymetry and anti-); transitivity.

Relations of equivalence and order.

Partition of a set and the equivalence relation associated with this partition.

### III — *Numbers*

Integers  $\mathbb{Z}$ . Addition, multiplication, subtraction, Euclidean division.

Demonstration of the properties which will lead later to the ideas of group and ring.

Order on  $\mathbb{Z}$ ; order and the operations of addition and multiplication.

Powers to natural number exponents. Monominals and polynominals of one variable in  $\mathbb{Z}$ ; addition, subtraction, multiplication.

Equations and inequations in  $\mathbb{Z}$ , Cartesian product  $\mathbb{Z} \times \mathbb{Z}$ ; some examples of subsets of  $\mathbb{Z} \times \mathbb{Z}$ . Graphical representation.

### IV — *Numerical calculations*

Development of numerical calculations and extension to directed decimal numbers.

Bounds to the result of an approximate calculation.

Mathematization of concrete situation leading to equations and inequations.

Some elements of statistics; statistical series, various graphical representations of series, the idea of frequency, calculation of the arithmetical mean.

### V — *Geometry*

In conjunction with paragraph II and with the aid of examples, familiarize the pupils with transformations in two and three dimensions.

Initial study of mirror symmetry in the plane; composition.

Elements of symmetry of the common shapes.

**3rd year** — 4 hours

*Algebra*

I — *Structures*

- Internal and external laws of composition.
- Definition of a group.
- From the study of finite sets (residue classes on  $\mathbb{Z}$ ), or of infinite sets ( $\mathbb{Z}$ , directed decimals), demonstration of the properties leading to the idea of a ring and a field.

II — *Numbers*

- Approach to the field  $(\mathbb{R}, +, \cdot, \leq)$ ; sub-field  $\mathbb{Q}$ .
- Powers to integer exponents; properties.

III — *Functions of  $\mathbb{R}$  to  $\mathbb{R}$*

- Polynomials in one variable. Degree.
- Addition, subtraction, multiplication.
- Special identities. Factorization.
- Equations and inequations of the first degree in  $\mathbb{R}$ .
- Cartesian product  $\mathbb{R} \times \mathbb{R}$ ; some examples of subsets of  $\mathbb{R} \times \mathbb{R}$ . Graphical representation.

IV — *Numerical calculation*

- Numerical calculations on  $\mathbb{R}$  and  $\mathbb{Q}$ .
- Relative error. Simple flow charts.

*Affine geometry*

Axioms concerning the plane and straight lines.

Parallel axiom.

Group of dilatations.

Sub-group of translations, sub-group of translations in the same direction, sub-group of similarities with the same centre.

Equipollence.

Order. Half line, segment, convex set.

Calibration of a straight line.

**4th year** — **Sections LG - LL - Ec.** — 3 hours

I — *Structures*

Definition of the structure of a field and demonstration of the properties leading to vector space structure over  $\mathbb{R}$ .

II — *Real numbers*

Development of the structure of the totally ordered field of real numbers.

Definition of square root. Calculations with square roots.

### III — Numerical functions

(1) Functions from  $\mathbb{R}$  to  $\mathbb{R}$ . Study of functions from  $\mathbb{R}$  to  $\mathbb{R}$  :

$$x \rightarrow ax, x \rightarrow ax + b, x \rightarrow x^2, x \rightarrow \frac{a}{x}$$

*Increase and decrease*

Examples of step functions and functions affine over intervals.

(2) Calculations on polynomial functions and on rational functions with 1 or 2 variables. Solution of equations of the 1st and 2nd degree in one variable. Inequations of the 1st degree.

Systems of equations and inequations of the 1st degree in 2 variables and with numerical coefficients. Formation of equations and inequations from problems with numerical data.

Examples of linear programming.

### IV — Plane geometry

(1) *Affine geometry*

Demonstration of the vector space structure of an affine plane as defined in the 3rd year (vector space of translations or the isomorphic space obtained by selecting a particular point in the plane).

Projection parallel to a given direction. Unique breakdown of any vector into a linear composition of 2 independent vectors. Coordinates in a plane.

(2) *Euclidean metric geometry*

Orthogonality, distance and angles. Circle, straight line (relative positions). Radius of a circle. Scalar product: definition by orthogonal projection.

Properties: commutativity, distributivity for vector addition and associativity. Orthogonal vectors. Norm of a vector.

Applications to the triangle and, in particular, the theorem of Pythagoras.

Ideas of trigonometry. Trigonometric circle in an orthonormal coordinate system. Definition of cosine, sine and tangent of an angle.

Fundamental relationship:  $\sin^2 x + \cos^2 x = 1$ .

Relation between the cosines and sines of complementary and supplementary angles. Sine formula for a triangle.

### 5th year — Sections LL - LG - Ec. — 3 hours

#### I — Logic

Quantifiers. Propositions obtained from propositional forms by quantification.

Negation of a quantified propositional form.

The teacher is left free to expound the forms of direct reasoning, by *reductio ad absurdum*, or by recurrence.

#### II — Algebra

Numerical functions of a real variable

$$x \rightarrow ax, ax + b, ax^2, ax^2 + bx + c, \frac{a}{x}, \sqrt{x}$$

Domain of definition. Increase and decrease, rate of increase. Graphical representation.

Intuitive idea of the derivative at a point and of the derived function.

Derivation of the function

$$x \rightarrow ax^2 + bx + c$$

Zeros of a polynomial (1st and 2nd degree).

Exercises on equations reducing to the 2nd degree.

Initial study of logarithms, exponentials and powers with rational exponents. Principle and use of the slide rule.

Idea of a function from  $\mathbb{R}^2$  to  $\mathbb{R}$  with the object of studying systems of equations of the 1st degree in 2 variables ; substitution and linear combination.

System of inequations of the 1st degree in one and two variables ; linear programming (simple examples).

Systems of equations in two variables (one of the 1st degree, the other of the 2nd degree).

### III — *Euclidean metric geometry*

Revision of the 4th year metric geometry.

### IV — *Trigonometry*

Circular functions. Addition of arguments. Addition of images.

## 6th year — Sections LG - LL - Ec. — 3 hours

### I — *Sets, relations*

Subsets of a set.

Finite sets : The number of applications of E in F ; special applications, injective, one-to-one correspondence. Counting of the subsets of p elements and calculation of the cardinal number of the set of the subsets of a finite set.

Newton's binomial theorem. Pascal's triangle.

### II — *Analysis*

(1) Numerical functions of a real variable.

Continuity. Limits.

Differentiation : differential coefficient at a point ; tangent. Derived function : rules of differentiation, including differentiation of composite functions and reciprocal functions.

Application to the study of the direction of variation of a differentiable function (give the theorem without proof). Idea of an extremum and a point of inflexion (without theory).

Study of particular functions : linear, affine, quadratic, 3rd degree polynomial, bilinear, square root.

Problems on the intersection of curves.

Primitive.

Intuitive idea of area and signed area.

Integral.

(2) Idea of circular functions ; their differential coefficients (without proof).

(3) Powers, exponential and logarithmic functions and their differential coefficients. Slide rule.



**7th year — Sections LG - LL - Ec. — 3 hours**

**I — Analysis**

(2 hours per week in the first two terms ; 3 hours per week in the 3rd term).

- (1) Revision of the study of the functions included in the 6th year syllabus and the calculation of extrema.
- (2) Logarithmic function and exponential function to base e.  
Study of examples drawn from the sciences (physics, biology, social sciences, etc.).
- (3) Differential equations of the form  $f'(x) = af(x)$ , with a real constant.
- (4) Integral calculus and applications.
  - Integral. Properties : additivity, linearity.
  - Methods of integration : by composition of functions, by parts.
  - Plane area and volume of an axially symmetrical solid as integrals.

II — For one hour per week during the first two terms, the pupils will be introduced to certain more advanced mathematical ideas and to the incidence of these ideas in every day life. The teacher should make a selection amongst the following subjects, in agreement with his class :

- (1) Ideas of probability and statistics.
- (2) Matrices and complex numbers.
- (3) Elements of information theory.
- (4) Algebra of sets, propositional logic, algebra of circuits as a model of Boolean algebra.
- (5) Spatial mechanics.
- (6) Languages.

**4th year — Sections LM - Mod. — 7 hours**

**I — Structures**

Definition of the structures of a commutative ring and of a field.

Calculations in these structures, using concrete examples.

Demonstration of the properties leading to the definition of the structure of a vector space over  $\mathbb{R}$ .

Algebra of sets, propositional logic, algebra of circuits as a model of Boolean algebra.

**II — Real numbers**

Development of the structure of the totally ordered field of real numbers.

Definition of square root.

**III — Numerical functions**

Increase and decrease of a function starting from an isomorphism of strict order.

Application to the study and the graphical representation of functions from  $\mathbb{R}$  to  $\mathbb{R}$  :

$$x \rightarrow ax, x \rightarrow ax + b, x \rightarrow ax^2 + bx + c, x \rightarrow \frac{x}{a}$$

Examples of step functions and functions affine over intervals.

Calculations with polynominal functions and with rational functions with 1 or 2 variables.

Euclidean division of polynominals.

Solution of equations and inequations of the 1st and 2nd degree in 1 variable.

Systems of equations and inequations of the 1st degree in 2 variables.

Formation of equations or inequations from problems with numerical data. Examples of linear programming.

#### IV — *Plane geometry*

Teachers are free to choose the order in which they study the various parts of the syllabus.

##### (1) *Affine geometry*

Demonstration of the properties of the vector space of an affine plane as defined in the 3rd year (vector space of translations or the isomorphic space obtained by selecting a particular point in the plane).

Projection parallel to a given direction. Decomposition of any vector into a linear combination of 2 linearly independent vectors. Coordinates in a plane.

##### (2) *Euclidean metric geometry*

Orthogonality of straight lines and directions : definition and properties of this relationship.

Orthogonal projection. Minor symmetry : definition and properties.

Isometries : Minor symmetries, translations, rotations. Any resultant of a finite number of these isometries is a resultant of not more than 3 mirror symmetries. Reversals. Group of isometries. Determination of an isometry from the images of 3 non-aligned points.

Distance between 2 points. Circle, straight line (relative positions). Distance of a point from a straight line. Radius of a circle.

Angle between a pair of half straight lines from the same origin in an intuitively oriented plane. Oriented measurements of angles (protractor). Degree, grade, radian. Addition of angles. Supplementary, complementary and opposite angles. Angles and the circle : angle at the centre, inscribed angle.

Scalar product : definition by orthogonal projection. Properties : commutativity, distribution of vector addition and associativity.

Orthogonal vectors. Norm of a vector.

Definition of the cosine of an angle.

Application to the triangle and, particularly, the theorem of Pythagoras.

Concepts of trigonometry. Trigonometric circle in orthogonal frame of reference.

Definition of the cosine, sine and tangent of an angle.

Fundamental relationship :  $\sin^2 x + \cos^2 x = 1$ .

Relations between the cosines and sines of complementary and supplementary angles. Sine formula for a triangle.

#### V — *Numerical calculation*

Slide rule techniques, use of numerical tables.

Upper and lower bounds for a real number and a sum and a product of real numbers.

Absolute and relative errors in a sum and a product ; their estimation.

Technique of calculations with radicals.

#### 5th year — Sections LM - Mod. — 7 hours

##### I — *Logic*

Quantifiers. Propositions obtained from propositional forms by quantification. Negation of a quantified propositional form.

The teacher is left free to expound the form of direct reasoning, by *reductio ad absurdum* or by recurrence.

## II — Structures

Abstract structures of group, ring, commutative field and real vector space. Morphism and isomorphism.

Transfer of a structure by morphism.

## III — Algebra

(a) Ring and vector space of polynomial functions of one variable on  $\mathbb{R}$ .

Divisibility by  $x - a$  of a polynomial in  $x$ .

Factorization.

(b) Numerical function of a real variable

$$x \rightarrow ax, ax + b, ax^2 + bx + c, \frac{a}{x}, |x|, \sin x, \cos x,$$

$$\sin(ax + b), \cos(ax + b), \text{ and } \sqrt{x}.$$

Domain of definition, increase and decrease, rate of increase, graphical representation.

Intuitive idea of a derivative at a point and a derived function.

Derivatives of the above functions.

Exercises on equations reducible to the 2nd degree: biquadratic equation and irrational equations solvable by squaring (once or twice).

Sign of a trinomial of the 2nd degree.

Optionally: position of a number in relation to the roots of an equation of 2nd degree.

Initial study of logarithms, exponentials and powers with real exponents.

Principle and use of the slide-rule.

The habit should be formed of presenting certain sequences of calculations and reasoning by means of flow-charts.

As examples: functions defined in terms of  $\mathbb{N}$ , arithmetical and geometrical progressions.

(c) Idea of a function from  $\mathbb{R}^2$  to  $\mathbb{R}$ .

Systems of equations of the 1st degree in 2 variables.

Systems of inequalities. Substitution and linear combination.

Systems of inequations of the 1st degree in 1 or 2 variables.

Systems of equations in 2 variables, of which one is of the 1st degree and the other of the 2nd degree.

(d) Calculation with matrices in  $\mathbb{R}^{n \times p}$  with  $n \leq 2$  and  $p \leq 2$ .

In the set of real matrices  $\mathbb{R}^{2 \times 2}$ : structure of vector space and ring: inverse matrix, transposed matrix, determinant.

## IV — Geometry

1. *Review and further properties of metrical plane geometry*

Sub-groups of the group of isometries (displacements, rotations of the same centre, etc.).

Similarities.

## 2. *Real vector spaces*

### 1. *General matters*

Axioms. Calculations. Linear combination. Linear dependence and independence.

### 2. *Real vector spaces of dimension $n \leq 2$*

(a) Base. Change of base.

(b) Linear applications (in particular : transformations and forms).

(c) Euclidean vector spaces :

— Scalar product and concept of bilinear forms : from a bilinear form it is possible to define a scalar product, or bring out the idea of a symmetrical bilinear form from the scalar product defined in the 4th-year class. The idea of an alternate bilinear form could be derived from determinants,

— Norm of a vector,

— Isometries in vector spaces.

### 3. *Trigonometry*

Circular functions. Addition of arguments. Addition of images.

## 6th year — Sections LM - Mod. — $6\frac{1}{2}$ hours

### *Logic - Concepts of sets - Structures*

— The concepts occurring under these headings in the transitional syllabus for the 5th year will continue to be brought out and used during the 6th year.

— Enumeration of the applications of E in F (finite sets).

Arbitrary applications, injectives, bijectives (one-to-one correspondence).

Enumeration of the subsets of a set of p elements and calculation of the cardinal number of the set of subsets of a finite set.

Newton's binominal theorem ; Pascal's triangle.

### *Vector spaces on IR*

#### (1) Vector spaces of 1, 2 and 3 dimensions

— Base ; changes of base ; linear transformations.

— Vector sub-spaces : straight line and plane as sub-spaces.

— Vector equations ; vector interpretation of a system of equations of the 1st degree in 2 and 3 unknowns.

#### (2) Affine point space related to a vector space of 2 and 3 dimensions

— Space of 2 dimensions. Vector equation, parametric Cartesian equations, Cartesian equation of a straight line.

— Space in 3 dimensions. Plane and straight line : vector equations, parametric Cartesian equations, Cartesian equation of a plane and the equations of a straight line.

— Conditions for incidence, parallelism. Section ratio. Barycentre.

— Affine transformations.

#### (3) Introduction to matrix calculations

Row matrix, column matrix, square matrix of order  $n \leq 3$  : multiplication of matrices, inverse matrix, determinant associated with a square matrix, product of a matrix and a number.

### *Complex numbers*

- The field of complex numbers ( $\mathbb{C}$ ). Conjugated complex number.
- Representation in the Gauss plane. Modulus and argument.
- De Moivre's formula. Binominal equations.

### *Analysis*

#### (1) Elements of topology

- Open and closed sets ; neighbourhood.
- Fundamental properties of the real line, including the principle of boxed intervals and the theorem of the existence of an upper (or lower) limit for any non-empty increasing (or decreasing) subset of a line.

#### (2) Numerical functions

- (a) Numerical functions on any set.
- (b) Numerical functions of a real variable as an application of  $\mathbb{R}$  to  $\mathbb{R}$ 
  - Continuity and limit.
  - Limits of indeterminate forms.
  - Derivative at a point ; tangent, linear approximation. Derived function.
  - Rules for differentiation, including composite and inverse functions.
  - Successive derivatives.
  - Application of derivatives :
    - Rolle's theorem : theorem of finite increments, geometrical interpretation. Leading to the theorem of the variation of a function by means of the sign of the derived function, concavity, inflexion.
    - The following functions should be studied : linear, affine, quadratic, polynomial, homographic, trigonometric and their reciprocals.
  - Primitives. Calculation of elementary primitives.

#### (3) Calculation of errors

Absolute and relative errors in a sum, difference, product, quotient.

7th year — Sections LM - Mod. — 7 hours

### *Structures*

Definition of the abstract structures of a group, ring, field, vector space.

Calculations in these structures.

Real numbers as a commutative field ; ordered, Archimedean, complete.

### *Algebra*

- (1) Ring of the polynomial functions on a ring : divisibility by  $x - a$  ; a polynomial function of degree  $n$  on a field admits of no more than  $n$  zeros.
- (2) Structure of the ring of real square matrices.
  - The body of real matrices of the form  $\begin{pmatrix} a & -b \\ b & a \end{pmatrix}$  is isomorphic to  $\mathbb{C}$ .
  - Homomorphism  $h$  of the group  $(\mathbb{R}, +)$  on the group  $(\mathbb{V}, \cdot)$  of complex numbers of modulus 1 :
  - $h : \mathbb{R} \rightarrow \mathbb{U} : x \rightarrow \cos x + i \sin x$ .

(3) Zeros of a binomial  $az^n + b$  and of a trinomial  $az^2 + bz + c$ ,  $(a,b,c) \in \mathbb{C}^3$  and their geometrical representation.

(4) Plane similitudes, defined by the formulae

$$z' = az + b \text{ or } z' = a\bar{z} + b, (a,b) \in \mathbb{C}^2$$

after identification of  $\mathbb{C}$  with the point plane provided with an orthonormal reference frame.

Constants.

Group similitudes and sub-groups : isometries, displacement, rotations with the same centre.

### *Integral calculus*

Intuitive concept of area and directed area.

Integral of a continuous numerical function of one real variable, over the interval  $[a, b]$  : definition.

Properties : theorem of the mean, additivity, linearity, positivity of the integral.

Methods of integration : by composition of functions, by parts.

Plane area and volume of an axially symmetrical body as integrals

$$D \int_a^x \varphi \chi = \varphi \chi \quad (D \text{ differential})$$

### *Numerical functions of a real variable*

Napierian logarithmic function and exponential function to base e.

Extension to logarithmic functions and exponentials to any base.

Powers.

Derivatives of these functions and primitives.

Simple logarithmic and exponential equations and inequations.

### *Geometry*

(1) Vector spaces of 1, 2 or 3 dimensions

Bilinear applications of  $U \times V$  to  $W$ .

Symmetrical bilinear forms and associated quadratic forms.

Scalar product as a positively defined symmetrical bilinear form.

Euclidean vector space.

Linear applications in Euclidean vector spaces.

Linear groups and orthogonal groups.

(2) Point space associated with a Euclidean vector space

Application of the above concepts :

— distance, angle, perpendicularity ;

— straight line, circle : relative positions ;

— conic sections : focal definitions ;

— plane, sphere : relative positions.

(3) Conic sections

Definition by quadratic form.

— Intersection with a straight line.

Conjugate points.

Poles and polars.

— Centre, Diameters, Asymptotes.

— Axes.

Classification of conic sections.

Reduction to canonical form ; graphical representation of conic sections.

# Applied mathematics

**4th year** — 1 hour

1. Ratio and proportion. Proportional mean.
2. Rates, percentage (per thousand).
3. Applications (bonds, VAT, etc.).
4. Proportional sharing.
5. Simple interest. Commercial methods of calculation.
6. Discount :
  - (a) Operations on negotiable instruments ;
  - (b) Equivalence ;
  - (c) Common maturity and mean maturity.

**5th year** — 1 hour

I — *Current accounts* (Hamburg method)

II — *Statistics*

1. Generalities. Definitions (population, qualitative and quantitative character, continuous and discontinuous (discrete) character).  
Descriptive and mathematical statistics. Rounded numbers.
2. Observation of facts and evaluation of observations.
3. Presentation of the results of the evaluation of observations in classes (range, limits, absolute and relative frequency, increasing and decreasing cumulative frequencies).
4. Graphical representation of statistical series (bar charts, histograms, etc.).
5. Characteristic elements of a statistical series :
  - (a) Measures of position :
    - arithmetic, geometric and harmonic means ;
    - median (by calculation and graphically) ;
    - mode.
  - (b) Measures of dispersion :
    - range ;
    - quartiles and deciles ;
    - mean deviation ;
    - variance and standard deviation.
6. Analytical properties of the arithmetic mean and standard deviation in a combination of sets.

**6th year** — 1 hour

I — *Linear programming*

II — *Probabilities*

1. Revision of combinatorial analysis (permutation, arrangement, combination) without repetition. Combinatorial analysis (permutation, arrangement, combination) with repetition.

2. Algebra of events.
3. Finite probability spaces :
  - (a) Probability over a universal set.
  - (b) Probability spaces.
  - (c) Fundamental properties :
    - complement rule,
    - total probabilities,
    - compound probabilities.

**7th year — 2 hours**

*I — Probability*

1. Revision of total and combined probabilities.
2. Conditional probability.
3. Mathematical expectation.
4. Binomial distribution (Poisson distribution).
5. Normal distribution (Gaussian - arithmetical paper).

*II — Concepts of sampling and estimates*

*III — Financial mathematics*

1. Compound interest.
  - Graph of the function  $y = (1 + i)^x$ .
  - Semi-logarithmic graph paper.
  - Graph of the function  $Y = x \log (1 + i)$ .
2. Constant annuities.
  - Calculation of the amount of the annual payment.
  - Calculation of the number of annual payments.
  - Calculation of the rate of interest.
  - Calculation of the capital.
3. Loans repayable by constant annual instalments.
  - Calculation of the value of the loan.
  - Calculation of the annual instalment for amortization.
  - Calculation of the interest rate on the loan.
  - Calculation of the number of annual instalments.
4. Loans in the form of bonds.
5. Insurance.
  - Mortality tables.
  - Deferred capital.
  - Life annuity (on one life).
  - Present value of a life annuity.



# Economics

4th year — 3 hours

## *Business economics*

### 1. *Goods and needs*

Consumer goods and production goods.

Importance of the life-span of goods : fixed assets.

The production of goods : production factors, production sectors.

### 2. *Business enterprise*

Different types of enterprises and exploitations :

- private enterprise,
- the company,
- the cooperative,
- the nationalized enterprise.

### 3. *Information within the enterprise*

The accounting documents.

Studies of the principal documents : invoice, cheque, bill of exchange.

Analysis of the operations of the enterprise :

- acquisition of the means of production,
- realization of the aim of the enterprise : production,
- different types of payments : the special role of credit (credit obtained, credit granted),
- claims, debts.

The balance sheet.

The accounts of the enterprise. Set of accounts.

The balancing of the accounts.

5th year — 3 hours

## A — *Business economics* (continued)

### I — *Information within the enterprise* (revision and complementary study)

#### 1. Study of the determination of the result.

Equalizations, redemptions, provisions for depreciation.

Structure of trading and profit and loss accounts.

Concept of value added tax.

#### 2. Study of production costs.

Their dimensions, factors, calculation, supervision.

#### 3. The critical threshold of the enterprise.

### II — *The financing of the enterprise*

#### 1. Origin of the capital.

Money market, financial market.

Suppliers' credits.

#### 2. Earmarking of capital : investments and liquid assets.

B — *Macro-economics*

1. Introduction to economic theory : definitions and methods.
2. Investment, economy, consumption.  
National product and national income.
3. The circulation of goods and money.
4. The concept of economic models.
5. Money (concepts in summary).  
Role, functions, historical evolution.

6th year — 3 hours

(a) *The theory of demand*

- Factors in demand.
- Price demand.
- Representation of the functions.
- Elasticity of demand.
- Determination of the elasticity of demand.
- Receipts and marginal receipts for a product.
- Geometric study of the revenue curves and indifference curves.

(b) *Supply and the supply curve*

- Costs curve relative to production.
- Short run.
- Total costs.
- Average costs.
- Marginal costs.
- Long run.

(c) *Markets and the formation of prices*

- Perfect competition.
- Notion.
- Formation of price (geometric representation).
- Criticism.
- Simple monopoly (curve).
- Discriminating monopoly (curves).
- Monopson (curves).
- Imperfect competition.
- Oligopolistic competition.
- Oligopoly.
- Classification of the oligopoly.
- Evolution of the theory.
- Types of oligopolistic situations (cartel, collusion, price leadership).
- Price theory and reality.
- The fixing of prices in public enterprises.

(d) *The prices of the factors of production*

General notions on production.  
Pay.  
Nature and character.  
Economic aspect.  
Social aspect.  
Determination of pay, at the present time.  
Interest.  
Definition, justification and explanation of interest.  
Evolution of the rate of interest.  
Profit.  
Concept, sources and justification of profit.  
Intervention of the State.  
Ground rent.  
Ricardo's theory.  
Evolution of rent.

**7th year — 3 hours**

(e) *Monetary theory*

Revision and complementary study (inflation and deflation).

(f) *Cyclical fluctuations*

Definition and object of the economic cycle.  
Principle and methods in the economic cycle.  
Materials employed.  
The method of the models in causal investigations.  
General diagnosis.  
Bottle-necks.  
Economic forecasting.  
The economic cycle in practice.  
Future perspectives of the economic cycle.

(g) *Economic growth*

Economic growth and progress in the developed countries.  
Under-development.  
The factors of development.  
Demographic dynamism.  
The dynamism of innovation.  
The dynamism of social groups.  
Concept of productivity.

(h) *International economic relations*

The international movement of goods.  
The movement of capital.  
Balances of accounts and payments.  
Exchange.  
Concept of devaluation and revaluation.

(i) *Economic systems*

From the closed economy to the exchange economy.

The domestic, agricultural and urban economies.

The economy of the capitalist market.

Formation of capitalism.

Liberal capitalism.

Regulated capitalism.

The planned economy and its operation.

(j) *Economic policy*

Introduction.

Evolution of the role of the State in the direction of the economy.

Effect on the structures.

The State and the structure of the market.

Effect of the State on the sectors of economic activity.

Effect on overall quantities and the economic cycle.

Policies of expansion.

Planned utilization of resources.

The State and the problems of harmonized growth.

Role of international organizations.

# Sociology

## General teaching directives

- (1) This course should preserve a very wide cultural character.
- (2) The intellectual level of the pupils does not allow their being given the development or pace of a university education.
- (3) This instruction should be essentially active :
  - (a) to involve the pupils in observing the social facts and describing them objectively,
  - (b) analysing and interpreting the facts gathered with the prudence required when dealing with human phenomena,
  - (c) deducing the laws from this when the situation so permits.
- (4) The major present-day problems will always be dealt with as a priority.

## Methods of procedure

Analysis of and comments on :

- statistics, graphics, reports on work, demographic investigations, budgets, legislative texts ;
- documents which report facts, opinions, of various pieces of evidence from different perspectives.

## 6th year — 2 hours

### I — *Introduction to sociology*

- What is a social phenomenon ?
- Relationship of sociology with the other sciences (history, geography, biology, psychology, philosophy).
- Methods in sociology.

### II — *Man in society*

- Evolution from childhood to old age.
- Participation in social and ethnic groups.
- Transition from primary groups to complex groups.
- Relationship between the generations.
- Ethnic problems.
- Problems of minorities.

## 7th year — 2 hours

### I — *Evolution of societies*

- Demographic problems.
- Interpretation of demographic variations.
- Evolution of the population and economic equilibrium.
- Position of the individual (Universal Declaration of the Rights of Man — Declaration of the Rights of the Child).

Sociology of the family.

Sociological problems at the level of the teaching of vocational formation.

Urban and rural environments.

Social structures (social aspect of liberalism and collectivism).

Social institutions and organizations.

Man at work.

Leisure — Psycho-sociology of leisure.

Deterioration of social life (juvenile delinquency — crime - mental disorders, etc.).

## II — *Civilization*

Constants and variables (demography, technical progress).

Resultants: equilibrium and the social hierarchy.

The idea of progress.

## III — *Notions of political science*

### (1) The political process

- Rights and duties of the citizens.
- Public opinion.
- Freedom of expression.
- Freedom of association.
- Information media and techniques.
- Role of the parties.

### (2) International institutions

International affairs — UNO and the specialized world institutions.

European institutions — European Communities.

Several major international political problems (under-development, cooperation between East and West, disarmament, etc.).

# Law

6th year — 2 hours

(1) *Introduction*

Society and social order.

Different systems of social norms : morals, religion, custom and law.

Law and the State.

Law and the individual.

Objective and subjective law.

The different traditional branches of law :

Private national law,

Public national law,

Private international law,

Public international law : time of peace and time of war.

(2) *Private law*

A — *The sources of law :*

Custom.

Written law.

Jurisprudence.

Sources : European juridical patrimony.

B — *Persons :*

Natural persons, bodies corporate :

name, domicile, nationality.

Legal competency :

protection, those under a disability.

C — *Notions on property :*

Personal property and real estate.

Property and its dismemberment.

D — *Obligations and contracts :*

Sources of obligations.

Conditions of existence and of validity of agreement, instruments.

Proof and termination of obligations.

Guarantees of obligations.

(3) *International law*

A — *Public law*

Elements.

International organizations.

B — *Private international law*

Elements.

Field of application, Essential principles.

# Biology

**1st year** — 2 hours

*Zoology*

Man, the mammals.

*Botany*

Phanerogams (simple types).  
(Practical exercises).

**2nd year** — 2 hours

*Zoology*

Birds, reptiles, batrachians, fish, arthropods.

*Botany*

Phanerogams (complex types), gymnosperms.  
(Practical exercises).

**3rd year** — 2 hours

1 hour Biology ; Zoology.

Other invertebrates, classification.

*Botany*

Cryptogams, plant life, classification.  
(Practical exercises).

1 hour Geology.

Principal minerals and rocks. Present-day geological phenomena. Geological ages.

**6th and 7th year**

**A - LM and Mod. Sections**

Within the consideration of harmonizing the material taught in the seven schools, at the same time leaving a certain latitude to the teachers and introducing some modern aspects, it is suggested that it be divided, in the 6th, into 40 programmed lessons and 10 lessons reserved for subjects proposed at the choice of the teacher.

This programme is based, in the 6th, on the separation of the sections (on the one hand, the LM and Mod., and, on the other hand, the LG, LL and Ec.) and continuity in the teaching of the subject in the 2 weekly lessons, be they consecutive or not (see the decision of the Board of Governors, annexed to the report of the meeting of 12 and 13 May 1969, p. 41).

It should further aim at giving the pupils an overall view of the material taught in the 6th and 7th year.



6th year — 2 hours

— Morphological study of the cell, as revealed under the optical microscope	}	practical work
— Cellular division	}	microscopy
— Tissues	}	
— General structure of living beings Animals : 1 example Plants : 1 example	}	dissection preferably done by the pupils
— The functions of nutrition in animals : <ul style="list-style-type: none"><li>• digestion</li><li>• respiration</li><li>• circulation</li><li>• excretion</li></ul>	}	with practical work as far as possible
— The functions of nutrition in green plants <ul style="list-style-type: none"><li>• minerals</li><li>• chlorophyllian synthesis</li><li>• respiration</li><li>• circulation of the sap</li></ul>	}	

One or another of these functions can be treated, at the choice of the teacher, in a more or less comprehensive manner, or quite simply left out.

The physiological and physico-chemical aspects at the cell level will be studied to the extent that the pupils have sufficient knowledge of organic chemistry.

*Themes for optional subjects*

1. Movement in nature.
2. Ecological study of an environment.
3. Nervous and humoral correlations in human beings.
4. Energy : production and utilization in human beings.
5. Bacteriology : practical observations, contagious diseases leading to the notion of vaccines, serums, anatoxins.
6. Ethology.
7. Protection of nature : balance of nature.
8. Present-day problems.

7th year — 1½ hours

- The cell :  
Revision and extension to the cellular structure, as revealed under the electronic microscope, a deepening of the physico-chemical notions (DNA, RNA).
- Reproduction :
  1. Sexual reproduction :  
Gametes - gametogenesis.  
Fertilization.  
Sexual characteristics.
  2. Notions of asexual reproduction.
  3. Notions of embryology.

— Heredity :

1. Attempt at a modern definition of the notion of species, stock and variation.
2. Classical genetics :  
Mendel and the laws of hybridization.  
Morgan and the theory of chromosomes.  
Genetic determination of the sex.  
Heredity linked to the sexual chromosomes.  
Linkage.  
Crossing-over.  
Mutations.  
Human heredity.
3. Modern genetics :  
Genes and their mode of action.  
Chemical nature of genes.  
Relations between genes and characters.  
Mode of action of genes.

— Evolution (some notions).

**B - Sections LG-LL-Ec.**

Programme made out for the present framework of 2 weekly lessons.

The separation of the Sections (LG-LL-Ec., on the one hand, and LM-Mod., on the other) was allowed by the Board of Governors at the meeting of 12 and 13 May 1969.

In these sections, an overall view of biology should be given, but in a less detailed manner and in a different spirit for the LM-Mod. Sections, for we are dealing with persons of a literary disposition.

**6th year — 2 hours<sup>1</sup>**

(a) The cell :

- Production and microscopic examination of preparations of living cells.
- Unity of the organizational plan of the cell.
- The different types of cells and their functions.
- Studies of some cellular changes.
- Examination of preparations demonstrating the stages of mitosis. Importance of mitosis.

(b) Anatomy and human physiology :

- Summary anatomy of the principal organs.
- More intensive study of physiology.

(c) Reproduction :

- Asexual reproduction.
- Sexual reproduction :  
Examination of preparations and micro-photographs showing the sexual cells (animal and plant).  
Spermatogenesis.  
Ovogenesis.  
Maturation of the ovule as an example of a process due to hormonal regulation.  
The phases of a fertilization.  
General observations on fertilization.

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<sup>1</sup> As a consequence of a modification of the timetables starting from September 1972, this programme is provisionally in the 7th.

(d) Heredity :

- The statistical laws on the transmission of hereditary characters.
- Determination of sex.
- Heredity of blood groups.

(e) An aspect of the problem of evolution — Origin and evolution of man :

- Analysis of paleositological documents and documents of prehistoric archaeology.
- Outline of the history of man and his origin.

*Observation* : It is evident that this programme, which must be compressed within the framework of the restricted timetable of these sections, can be treated only in a fragmentary fashion. The teacher has the choice of which subjects to go into at depth.

**7th year** — 2½ hours

The various manifestations of life starting from the observation of man, animals and plant-life.

I — *The cell*

- (1) Practical study of living cells.
- (2) Structure and ultra-structure of the cell, as they reveal themselves under the optic and electron microscope.
- (3) Notions on the physico-chemical constituents of living matter (including DNA and RNA).
- (4) Mitosis and meiosis.
- (5) Notions on cellular changes.

II — *The living being in his environment*

- (1) Food chains.
- (2) Biological equilibriums.
- (3) Adaptations (starting from simple examples).

III — *Essential functions of living beings*

- (1) Functions of relationship : neuro-humoral co-relationships, illustrated by one or two examples.
- (2) Nutritional functions : material and energy balance.
  - (a) Autotrophy for carbon, photosynthesis.
  - (b) Notions of heterotrophy, foods, digestion, circulation, respiration, excretion.
- (3) Functions of reproduction.  
Show the general facts of the phenomenon and lay stress on reproduction in the human species.

*N.B.* The different systems responsible for these functions will be studied very briefly, starting from dissections and dismantling of plastic models.

IV — *Genetics*

- (1) Statistic laws : an example of monohybridism and an example of dihybridism.
- (2) Chromosomatic theory of heredity ; determinism of sex ; example of transmissions of hereditary characters in the human species ; mutations and somatic mutations.
- (3) Notions of modern genetics.

V — *Evolution*

An aspect of the problem of evolution : origin and evolution of man.

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A certain number of practical sessions has been fixed :

17 sessions of two hours each, for which classes of more than twenty pupils should clearly be divided into two.

Item I of the programme : 5 sessions

Item II of the programme : 1 session

Item III of the programme : (1) 2 sessions

(2) 4 sessions

(3) 2 sessions

Item IV of the programme : 2 sessions

Item V of the programme : 1 session

Total : 17 sessions of two hours.

What is involved is an incompressible minimum number.

# Chemistry

## LM and Mod. Sections

### 5th year — 2 hours

Nature and properties of matter. Chemical phenomena.

Atoms, molecules, ions.

Periodic system of the elements.

Fundamental laws of chemistry.

Oxydation and reduction.

Symbols, formulae, chemical equations, stoichiometric calculation.

Chemical bonds.

Acids, bases, salts.

— The chemical reactions are to be considered as far as possible from the energy point of view in the 5th and 6th LM - Mod.

— Examples from organic chemistry will be used to illustrate the different points in the programme.

### 6th year — 2 hours

Acid — Base titration.

Chemical equilibrium.

Catalysis.

Acid/base theory.

pH.

Redox and electrochemical phenomena.

Methods of determining molecular masses.

### 7th year — 1½ hours

*Structure of the atom :*

Kimbal's model.

Orbitals.

Periodic system.

It would be desirable, in physics, for the notion of levels of energy starting from spectroscopy to be reached.

*Chemical bonds :*

Covalent bond.

Ionic bond.

Coordinate bond.

Intermolecular bond.

Special character of the carbon atom.

Isotopes are dealt with rapidly in the 5th year. Isotopes and nuclear reactions should be dealt with fairly soon and in a more detailed way in physics.

*Functional groups, their reactions and reactional mechanisms :*

Alkanes, alkenes, alkynes.

Homologous series.

The benzene nucleus.

Functions of alcohol, phenol, ether, aldehyde, ketone, acid, ester, amine.

Molecules having different functional groups.

The mechanisms of the reactions of replacement, addition, polymerization and condensation are to be dealt with when studying the corresponding functional groups.

### **LG - LL and Ec. Sections**

**6th year** — 2½ hours

Nature and properties of matter. Chemical phenomena.

Mixtures, pure substances, compounds, elements.

Atoms, molecules, ions.

Oxidation and reduction.

Fundamental laws of chemistry.

Chemical symbols, formulae, equations.

Acids, bases, salts.

Chemical equilibrium.

Study of the groups of the periodic system (general outline).

Special character of the carbon atom.

Alkanes, alkenes, alkynes, benzene.

Functional groups : alcohol, aldehyde, ketone, acid, ester, amine.

Carbohydrates, fats, proteins.

# Physics

4th year — LM - Mod. : 3 hours

LG - LL - Ec. : 2 hours

Section I : Introduction, object of physics. States of matter. Notions of measurement. Units.

Section II : Forces.

1. Concept of force. Vectorial force quantities. Representation. The newton.
2. Composition of converging forces.
3. Composition of parallel forces in the same direction and in opposite directions.
4. The moment of a force. Couple.
5. Notion of weight. The kilogram weight. Standardization of a spring. Measuring weights. Dynamometers. Variation of weight with place.
6. Notions of mass. Mass scalar quantity. Invariance of mass. The kilogram standard.
7. Relation between weight and mass.
8. Mass by volume, weight by volume, density.
9. Equilibrium of bodies resting on a horizontal plane, of bodies rotating about a horizontal axis. Principle of the equality of the action and reaction.
10. Frictional force, sliding.
11. Work done by a force. Work done by gravity. The joule. Energy.
12. Power. The watt.
13. Simple machines : levers, inclined plane, pulleys. Principle of the conservation of energy in simple machines.
14. Pressure. The newton per metre squared (Pascal).

Section III : Hydrostatics

1. Hydrostatic pressure.
2. Pascal's principle.
3. Fundamental account of hydrostatics.
4. Archimedes' Theorem. Applications.

Section IV : Aerostatics

1. Pressure in gases. Principle of Archimedes (analogy with hydrostatics). Applications.
2. Atmospheric pressure. Torricelli's experiment. Normal atmospheric pressure.
3. Barometer. Manometer.

Section V : Optics

1. Sources of light, transparent, translucent, opaque, bodies.
2. Rectilinear propagation of light. Pencil of rays. Applications.
3. Study of the phenomenon of reflection. Plane mirror. Laws of reflection.
4. Principle of inverse return of light (object distance = image distance for a plane mirror).
5. Real and virtual objects and lenses.
6. Rotation of a mirror.
7. Study of the phenomenon of refraction. Laws of refraction.
8. Refractive index. Physical interpretation of the refractive index.

9. Passage of light from a less refractive medium to a more refractive medium. Refraction limit.
10. Passage of light from a more refractive medium to a less refractive medium. Total internal reflection.
11. Applications :
  - (a) Parallel-sided block.
  - (b) Prism. Dispersion of white light. Experimental study of deviation.
  - (c) Thin lenses. Generalities.
12. Converging and diverging lenses. Principal and secondary foci. Focal planes. Focal distance. Path of light rays. Construction of images. Formulae for lenses. Measurement of the power of a lense.
13. Application of lenses.

**5th year** — LM - Mod. : 3 hours

LG - LL - Ec. : 2 hours

#### Section I : Thermometry

1. Concept of temperature.
2. Celsius scale.
3. Expansion of solids, liquids. Applications.
4. Study of gas : Variation of pressure and volume at constant temperature.  
Boyle-Mariotte's Law. Variation of volume in relation to temperature at constant pressure. Variation of pressure in relation to the temperature at constant volume. Perfect gases. Definition. Equality of the coefficients of expansion at constant pressure and constant volume. Absolute scale of the temperatures. Perfect gases equation. Applications. Density and volumic mass of perfect gases.

#### Section II : Transference of heat

1. Concept of heat capacity.
2. Measurable heat quantity. The kilocalorie. Heat per unit mass of solids and liquids.
3. Calorimetry. Calorimeters. Principle of the measurement of heat capacities by method of mixtures.
4. Concept of changes of state.
5. Conversion of work energy into heat energy. Experimental measurement of the mechanical equivalent of the calorie.

#### Section III : Magnetism and electricity

1. Natural and artificial magnets. Magnetic field. Action of a uniform magnetic field on a magnet (quantitative study). Magnetic field of the earth. Declination and angle of dip.
2. Electric field. Qualitative notions of field lines and electric spectrum. Force exercised by a field on a point charge. Coulomb's Law.
3. The electric current and its three magnetic, chemical and heating effects.

#### Section IV : Electrodynamics

1. Chemical effect of electric current (quantitative study). Electrolysis. Ionic theory. Faraday's Laws. The coulomb. Current intensity. Ammeter (graduated galvanometer).



2. Heating effect of electric current (quantitative study). Energy converted and corresponding power. Joule effect. The ohm.
3. Resistances in parallel. The volt. Ohm's Law for a simple resistance. The voltmeter (graduated galvanometer). Resistances in series. Specific resistance.
4. Brief study of accumulators and batteries. Electromotive force and voltage at the terminals of a generator. Ohm's Law for a generator. Association of generators.

The teacher will have the option of dealing with Section IV. by a method which changes the order in which the effects are introduced and the fundamental quantities defined.

6th year — Sections LM - Mod. : 3 hours

#### Section I : Electrostatics

Capacitance. The farad. Capacitator. Charge and discharge. Capacitance of a capacitor. Dielectric constant. Energy of a charged capacitor. Association of capacitors.

#### Section II : Electromagnetism

1. Magnetic field of a rectilinear current. Uniform magnetic field within a solenoid. Intensity of the magnetic field. Magnetic permeability.
2. Force exercised by a magnetic field on an element of current. Definition of the tesla. Mutual action of the magnetic fields of two parallel rectilinear currents. Legal definition of the ampere. Magnetic flux. Moving coil galvanometer and magneto-electric instruments.
3. Phenomenon of electromagnetic induction. Lenz's Law. Induced voltage. The weber. Induction coil.
4. Self-induction. The henry. Energy from self-induction.

#### Section III : Alternating current

1. Characteristic quantities.
2. Alternator.
3. Impedance of an R-L-C circuit in series. Fresnel's diagram.
4. Power of an alternating current. Transformer. Transport. Transport of energy.
5. Three-phase current. Rotating magnetic field.

#### Section IV : Mechanics

1. Length, time, force and their measurement.
2. Kinematics. Uniform rectilinear motion. Mean velocity. Uniformly varied rectilinear motion. Instantaneous velocity. Acceleration. Free fall. Measurement of acceleration due to gravity.
3. Fundamental relation of dynamics. Application to free fall. Principle of inertia. The newton. International system. Universal gravitation.
4. Principle of the independence of motion. Composition of two rectilinear motions.
5. Quantity of momentum and impulse. Equality of impulse and variation of the quantity of momentum. Conservation of the quantity of momentum. Rockets. Central elastic and inelastic collisions (simple examples).
6. Energy. Potential and kinetic energy. Mechanical energy. Transformations of the different forms of energy.

7th year — Sections LM - Mod. :  $3\frac{1}{2}$  hours

Section I: Periodic motion

1. Uniform circular motion.
2. Centripetal acceleration. Centripetal force. Centrifugal force as a force of inertia (moving observer).
3. Harmonic motion. Sinusoidal rectilinear motion. Simple pendulum. Elastic pendulum.
4. Coupled oscillators. Resonance.

Section II: Waves

1. Propagation of a wave. Propagation of a transverse wave. Propagation of a longitudinal wave. Speed.
2. Propagation of a sinusoidal motion. Length of wave. Expression of attenuation.
3. Reflection — interference — stationary waves.
4. Gravity surface waves — qualitative study of reflection, refraction and diffraction — Interference.
5. Sound-waves in gases. Reflection. Interference (Koenig's Trombone : Quincke). Stationary waves (Kundi's Tube).

Section III: Electric oscillations and electro-magnetic waves

1. Oscillating discharge of capacitor. Damped electric oscillations. Undamped electric oscillations. Thomson's formula.
2. Inductive coupling. Transmitting dipole. Propagation of electromagnetic waves in space. Lecher wires. Receiving dipole.

Section IV: Physical optics

1. Speed of light. Foucault's experiment.
2. Light interference in monochromatic light. Young's slits. Fresnel's mirrors. (Fresnel's bi-prism, Billet's bi-lens).
3. Rectilinear polarization of light by reflection. Brewster's Law. Malus' Law.

Section V: Notions of atomic and nuclear physics

1. Elementary electric charge. Electron gun. Action of an electric field and a magnetic field on an electronic beam.
2. Qualitative study of the electric discharge in rarified gases. The Geiger-Muller Counter.
3. Photo-electric emission. Duality of waves and particles.
4. Qualitative introduction to nuclear physics : Bohr-Sommerfeld Model. Atomic mass. Atomic number. Proton. Neutron. Electron. Isotopes. Transmutations. Radioactivity. Mass-energy equivalence. Einstein's relativity.
5. Group of electro-magnetic radiations.

6th year — Sections LG - LL - Ec. : 1 hour

A — *Energy*

Mechanical energy :

Fall of bodies in a vacuum.

Notions of dynamics.

Kinetic energy.

Potential energy.

Their mutual transformations.

Calorific energy.

Principle of the initial state and the final state.

First principle of thermodynamics (principle of equivalence).

Second principle of thermodynamics (Carnot's Principle).

#### B — *Vibratory phenomena*

Simple oscillatory motion.

Propagation of a wave.

Propagation of a sinusoidal motion.

Interference.

Experiment of Fresnel's mirrors.

Theory of light vibrations.

#### C — *Some aspects of atomic and nuclear physics*

Particulate nature of electricity.

Thermo-electric effect.

Beam of electric particles in the electric field and magnetic field.

Quantum theory of light.

Photo-electric effect.

Photon.

Atomic nucleus, radioactivity, transmutations.

# Music

## 1st year — 1 hour

(1) *Singing*

Folk and national songs from the countries of the Community.

(2) *Theory*

Rudiments, including perfect harmony ; the major scale ; note values ; simple time signatures.

Aural training : simple intervals.

Solfeggio.

(3) *Listening*

Either classical music or simple descriptive (after solfeggio of the musical themes if possible), or study of the instruments of the orchestra.

## 2nd year — 1 hour

(1) *Singing*

Folk and national songs, songs of the Middle Ages, of the Renaissance and of the XVIIth century.

(2) *Theory*

Sol-fa.

Intervals, major and minor scales, simple and compound time.

Simple musical dictation.

(3) *Listening*

Simple works of classical music (after solfeggio or singing of the principal themes).

Musical illustrations of the history of music.

## 3rd year — 1 hour

(1) *Singing*

Folk and national songs, songs of the XVIIIth and XIXth centuries.

(2) *Listening*

Musical illustrations of the history of music.

(3) *Theory*

Music dictation ; tonic sol-fa (further study of major scales, minor scales and modulation).

4th year — 1 hour

(1) *Singing*

Songs of different countries, songs illustrating the course of the history of music.

(2) *History*

Characteristics of national music in the XIXth and XXth centuries.

Furthering of knowledge of the history of music, including music of the XXth century.

Music in Greece — Rome (general history programme).

(3) *Listening*

Musical illustrations of the history of music.

(4) *Theory*

Musical dictation; further to solfeggio and study of harmony.

# Non-denominational moral education

The course in non-denominational moral education is directed at children whose conduct in life is not determined by belonging to a specific religion.

It has as its object the preparation of pupils for life in the present-day world as free, honourable and balanced beings, schooled in tolerance, not led by any exclusive doctrine nor fanatically attached to any cause. The task of the teacher is to guide the children who are entrusted to him, examining with them the problems of life as an individual and life in society. He must give evidence of the most conscientious objectivity in examining these problems and assist the development of these individuals, allowing them freely to build the structure of their convictions.

The programme of the course in moral education should not be conceived in a rigid manner. On the one hand, the teacher will make use of the events of day-to-day life and of the present day to stimulate thought about them and, on the other hand, as far as possible, he will take his inspiration from the interest displayed by his pupils and deal by means of topics with any subject which seems to him to possess formative value.

## **1st year — 2 hours**

Family relationships.  
Good habits for the school pupil.  
Preservation and improvement of health.  
Friendship.  
Responsibility.  
Respect for the well-being of other people.  
Our attitude towards animals.  
Qualities and defects.  
The need to work.

## **2nd year — 2 hours**

The dignity of work.  
The great inventions and the progress of humanity.  
Moral values arising from human activity.  
Honesty and candour.  
Courage - heroism.  
Value of leisure and hygiene.

## **3rd year — 2 hours**

Moral reflection and the formation of character.  
The conscience.  
Justice.  
The respect for others.  
Self-denial and self-sacrifice.  
Sacrifice.  
Love of one's neighbour.

**4th year — 1 hour**

Moral reflection and the need for a social organization.

Good citizenship.

Efforts to achieve a high level of humanity.

Patriotism.

Basis of law : natural law or convention.

**5th year — 1 hour**

The attitude of men to the unknown and the known :

(a) The religious attitude : religions and religiosity :

(1) History of the major religions,

(2) Moral precepts of the religions.

(b) The humanist attitude :

(1) The major humanist conceptions of the universe,

(2) Humanist ethics.

**6th and 7th year — 1 hour**

The personality.

Elements of the formation of the personality (heredity, needs, frustrations, conditioned reflex, automatisms, the psychology of the mob).

Contribution of the findings of psychology and psychoanalysis.

Obligation and responsibility :

— The attitude of some thinkers to obligation,

— The great lovers of moral thought of our time,

— The moral person : the awakening to autonomy,

— Toleration — interest in human beings — the major problems of our time.

# Social studies

(Draft)

## I — The individual and society

Section 1 — *Every man has need of other men*

Robinson.

Protection.

Interdependence (need of others).

Section 2 — *Family*

Section 3 — *School*

Section 4 — *Occupation*

Forms of manual, intellectual work (all should be respected).

Social role of work : duties, rights, respect for the work of others.

Protection of work (trade unions).

Rules of work : probity, professional conscience.

Training and competence.

Section 5 — *Society*

Forms of society.

Brief look at the evolution of modern society (for the freedom of the individual), from the subject to the citizen.

Structure of society : district, region, nation.

Interdependence of nations.

Human solidarity.

## II — The citizen and the State

Section 1 — *The district*

The cradle of citizenship (civil status and protection of the individual).

Structure of local life (evolution of the public services).

Local representation, local powers (typical examples of communal organization in various countries).

The locality, first cell of democratic life.

The elector in different countries.

Section 2 — *The province or department*

Comparison of organization and intermediary powers in different countries.

Section 3 — *The State and the nation*

Organization of the State.

The three powers : executive, legislative, judicial.

Comparison of different constitutional systems, including the various kinds of State.

Section 4 — *Modern evolution of society and the responsibility of the State*

In cultural life : education and the arts.

In economic life : the economic systems — capitalism, socialism, Marxism ; different sectors of economic activity — industry, agriculture, commerce, transport.

In social life : social security.



Section 5 — *The citizen and the State*

Rights and duties.

Political activity : party, trade unionism, trusts.

Public opinion and the problems of information.

The mass media of information : press, radio, cinema, television.

Section 6 — *Patriotism and nationalism*

III — **Europe**

Section 1 — *Links between nations and, initially, between European nations*

Summary of a few historical facts with regard to European unity, separating the various nations from each other.

Section 2 — *The evolution of the world makes cooperation between European nations necessary*

Facts and statistics.

Section 3 — *Attempts at European unification*

Section 4 — *First manifestations in the political and economic domain*

OECD.

The European movement.

Council of Europe.

The European Communities.

European integration.

Necessity for cooperation between European nations.

IV — **The world**

Section 1 — *World organization up to the Second World War*

The League of Nations.

The International Court of Justice.

International cooperation (International Institute of Agriculture, etc.).

Section 2 — *The revival of nations after 1945 and the differing pace of development in different parts of the world, the major problems of the present-day world.*

The demographic problem.

Hunger in the world.

The developing countries.

The refugees.

The minorities, etc.

Section 3 — *The United Nations and specialized organizations*

## II

Timetables and harmonized programmes  
for the  
short terminal cycle  
4th and 5th years

# HARMONIZED TIMETABLES

## 4th and 5th year

	Courses common to the pupils of the long and short cycles	Courses intended specially for the pupils of the short cycle
Mother tongue	4 hours	1 hour
1st modern language	3 hours	
2nd modern language (English)	3 hours	
History		2 hours
Geography (in common language)	1½ hours	
Economic geography (in common language)		1 hour
Mathematics		3 hours
Science		2 hours
Physical education	2 hours	
Music	1 hour	
Optional subjects †		6 or 7½ hours
Religion or morals	1 hour	
	15½ hours	15 or 16½ hours
	30½ or 32 hours	

† The pupils have a choice between the following subject groups :

Group 1 : Geometrical drawing	2 hours
Technology	2 hours
Arts and crafts	2 hours
	6 hours
Group 2 : Bookkeeping, commercial arithmetic	2½ hours
Typing	2 hours
Shorthand	2 hours
Commercial correspondence	1 hour
	7½ hours
Group 3 : Child welfare	2 hours
Domestic arts	2 hours
Artistic education	2 hours
	6 hours

The pupils are not allowed to choose subjects belonging to different groups. The choice made at the beginning of the fourth year commits the pupils, in principle, for the last two years.

To the extent that the organization of the courses permits, pupils can choose as a supplementary option a subject belonging to another group.

# HARMONIZED PROGRAMMES

## History

4th year — 2 hours

### I — *Political History circa 1713 to the present day*

1. *Evolution towards democracy in Europe starting from the 18th century :*  
Origin and development of the basic institutions of the states of West Europe (the major stages will be emphasized : French Revolution, England as a liberal State in the 19th century, present democracies).
2. *The United States of America :*  
Brief outline of the birth of the USA ; the formation of their economic strength ; their present social and political problems.
3. *The USSR :*  
Brief outline of the old Russian régime ; the 1917 Revolution ; the Stalin era ; the USSR of today.
4. *The totalitarian régimes :*  
Fascist Italy ; National-Socialist Germany.
5. *The Far East :*  
From imperial China to the China of Mao Tse-Tung ; modern Japan.

### II — *Technical and economic evolution*

1. *The industrial revolutions :*  
The triumph of mechanism and the computer revolution.
2. *Modern means of transport and the expansion of commerce :*  
The conquest of terrestrial (continents and oceans) and extra-terrestrial (space exploration) space.
3. *The population explosion and its causes (the progress of hygiene and medicine) ; the problems of the feeding of mankind.*
4. *The problem of under-development :*  
Economic, human and political aspects (third world and under-developed regions in the industrial countries).

5th year — 2 hours

### I — *Social evolution in the Western world*

1. *The evolution of the living conditions of peasants and workers from the 18th century to the present day.*
2. *Socialism and the workers' movement :*  
Trade unionism and social legislation ;  
Various examples of socialist régimes ;  
Present-day tendencies of Marxist ideology.
3. *The development of mass communication media (post, telephone, radio, television, cinema), of education, of a popular culture. The problem of leisure in the modern world.*

## II — *International manifestations in the contemporary epoch*

1. Imperialism, colonialism, nationalism, antagonism between nations and the two world wars.
2. Attempts at peace organizations : League of Nations, UNO, movements for world peace.
3. The cold war, peaceful coexistence.
4. Decolonization and neo-imperialism.
5. Efforts towards European unification.

## III — *Scale and risks of scientific research and technical progress*

1. Atomic energy.
2. Biological research.
3. Ecological problems.

### *Recommendations concerning the application of this history programme for the classes of 4th and 5th of the short, terminal cycle*

The teaching of history is not intended to primarily give information, but rather to help the pupils to understand and face the realities and problems of the contemporary world.

The teaching of history in the short cycle will be given in the mother tongue, the only one capable of allowing the pupils of a weaker intellectual ability to acquire the formation aimed at. The proposed programme is divided into four major study themes spread over two school years with two hours of teaching a week.

The programme for the 4th year is intended for pupils of 13 to 15 years of age. It comprises a study of the political, technical and economic evolution of the world in the last two centuries. This theme produces a better link-up with the conception of the programme studied in the 3rd year.

The programme for the 5th year deals with the social evolution of the Western world and with contemporary international relations. It is directed at pupils of 15 to 17 years of age, whose emotional ages are better suited to a study requiring greater maturity. It represents, moreover, a more direct preparation for active life and comprehension of the problems encountered in professional life.

Within this general aim fixed for the teaching of history in the short cycle, it is right to invite teachers to place emphasis on contemporary periods and on those questions which are more essential for the understanding of our age, without, however, neglecting the origins and evolution in times past of the issues studied.

This teaching will be essentially concrete and based on the greatest possible utilization of iconographic documents (photographs, transparencies, films, if possible, television transmissions) and written documents (historical texts, diaries).

Freedom should be given to the teacher to deal with the various issues in the order he considers the most suited to his own teaching aims and the interests of his pupils. For the same reasons and to be able to carry out a deeper study of certain themes judged more essential, he can limit himself to a more rapid presentation of all or a part of other sections. However, it is indispensable that all the items figuring on the programme form the subject of study and, in any case, the item entitled 'Efforts towards European unification' must give rise to a serious study.

# Economic geography

## I — Preliminary observations

The teaching of economic geography in the 4th and 5th years is intended to complete the geography instruction followed in common with the corresponding classes of the long cycle. This latter, given in the common language and by way of two hours weekly, deals with the following programmes, as they are drawn up in the proposals made by the meeting of teachers of geography on 26 January 1971, in Brussels :

### 4th year — The world (excluding Europe)

- (1) Overall view of the continents, physical characteristics, human and economic evolution.
- (2) Made more precise by detailed study of a few typical countries from each continent, other than those which are the subject of comprehensive study in the 6th.

### 5th year — General, physical and human geography, particularly the following themes :

#### (a) Physical geography :

- morphology,
- geology,
- hydrography,
- climatology,
- oceanography.

#### (b) Human geography :

- demography,
- type of life,
- the major sections of activity : primary, secondary, tertiary,
- disposition of space : urban development, conurbations, protection and exploitation of nature.

The programme below takes into account those programmes common to the classes of the long cycle and those of the short cycle ; it also takes into account the history programme proposed for the short cycle, some items of which study problems which also involve economic geography.

Although the use of the mother tongue may appear the most suited for an education intended for pupils one may consider as being endowed with a form of intelligence more orientated towards the concrete and the practical, it is proposed that the teaching of economic geography be given in the common language to ensure as close a coordination as possible with the teaching of geography in common with the long cycle ; the use of the common language, knowledge of which is more and more indispensable in administrative or commercial employment.

Intended for those pupils who will enter active professional life when or shortly after they conclude this cycle of study, the teaching of economic geography should aim, by using as concrete methods as possible, at supplying those elements which will permit the understanding of the world at present at the same time as opening out a perspective into the future. Therefore, it is necessary to recommend the greatest possible use of photographs, transparencies, films, television transmissions, graphics, statistics, newspaper articles.

## II — Programme

### 4th year — 1 hour

Study of some major products and factors in the world economy :

- agricultural products : corn and rice ; vegetable oils ;
- stock farming products : meat, milk, wool.

Problems of feeding the world — Hunger in the world :

- industrial products : minerals and metals :
  - motor-car industry ;
  - ship building ;
  - aircraft industry ;
  - electrical and electronic equipment ;
- chemical products : fertilizers ; plastics ; synthetic fibres, etc.

Relationship between regions producing raw materials and highly industrialized regions :

- world transport : terrestrial, maritime, air.

This list is neither restrictive nor prescriptive. The teacher can lay stress on certain of the items in the light of centres of interest, current events and educational aims and he may well neglect others, but he should make every effort to give as complete a view as possible of the importance and complexity of economic relations in the world. He will emphasize the inter-dependences and the problems and conflicts inherent in these relations. Freedom should be allowed him to deal with the various issues in the order of his choice.

### 5th year — 1 hour

Study of some major economic powers :

- the EEC and its place in the world economy ;
- Great Britain ;
- two major free economy powers :
  - the USA,
  - Japan,
  - the characteristics of the free economy ;
- two major socialist economy powers :
  - the USSR,
  - China,
  - the characteristics of the socialist economy ;
- two countries in the process of development :
  - Brazil,
  - India,
  - the characteristics of countries in the process of development.

Observations made on the subject of the programme of the 4th have equal validity for the study of the programme for the 5th.

# Mathematics

## 4th year — 3 hours

Set of the points in a plane.

Relations : graphical representation of an affine relation in 2 variables ; system of 2 equations of the 1st degree in 2 variables.

Irrational numbers.

Lengths, areas, volumes ; theorem of Pythagoras.

Introduction to descriptive statistics.

## 5th year — 3 hours

Functions ; graph of a function ; affine functions and simple quadratic functions ; simple quadratic equations.

Use of the slide-rule.

Similarity ; similarity of figures.

Geometric ratios ; cosine, sine, tangent ; use of tables ; simple calculations of angles and distances in a plane and in space.

Extension of the concepts of descriptive statistics.



# Science

## I — Preliminary observations

Science in the classes of the 4th and 5th of the short cycle comprise 2 hours over 2 years. This instruction should comprise the following subjects : physics, chemistry and biology. Teaching in this section should be carried out on the basis of concrete examples and experiments.

The programmes proposed form a coherent whole which has not been sequentially arranged in order to leave the teachers with every latitude on the order in which they wish to deal with the different items of the programme.

The following division of the hours of the course is recommended :

4th and 5th year : 1 hour of biology — chemistry,  
1 hour of physics.

The programme of the technology course for option group 1 should integrate harmoniously with that of the practical work.

## II — Programme

### 1. *Biology — Chemistry*

Biology.

Man in his environment (air, water, earth, conditions for life).

Human biology : physiology and hygiene.

*Chemistry*

Mixtures and compounds.

Elements, molecules, atoms, ions.

Oxidation and reduction.

Solution, bases, acids, salts.

Air, water, metals.

Carbohydrates, fats, proteins.

Catalysts.

Alcohols, hydrocarbons.

### 2. *Physics*

— States of matter, units of measurement ;

— Mechanics :

- Force, Hooke's Law, composition of forces,
- Weight, mass,
- Moment,
- Work and energy ;

— Statics of fluids :

- Density,
- Pressure,
- Atmospheric pressure ;

- Optics :
  - Rectilinear propagation,
  - Reflection in a plane mirror,
  - Refraction (qualitative),
  - Thin lenses ;
- Kinematics :
  - Qualitative study of the modes of motion ;
- Heat :
  - Temperature,
  - Expansion,
  - Heat quantity, method of mixtures ;
- Magnetism : magnets, magnetic field ;
- Electricity :
  - Quantity of electricity,
  - Current intensity, voltage, resistance,
  - Ohm's law,
  - Energy and power,
  - Notion of alternating current.

## OPTIONAL SUBJECTS

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### *Group 1*

Technical drawing	2 hours
Technology	2 hours
Arts and crafts	2 hours
	<hr/>
	6 hours

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# Geometrical drawing

## 4th and 5th year

With this optional subject, one will not aim to initiate the pupils in all the subtleties of geometrical and technical drawing. As the short cycle prepares the pupils subsequently to enter the various institutes of professional and technical instruction, so the optional subject : 'Geometrical Drawing' should rather arouse in the pupil the joy of working with ruler and pencil (pen and indian ink). But, above all, there should be developed an extreme sense of cleanness and neatness in execution and, therefore, a work discipline to which pupils of this level are not accustomed.

### *I — Management of the instruments, knowledge of the standards and standardized lettering*

Geometrical drawing : various constructions.

Perpendicular bisector of a segment.

Perpendiculars, mid-point, ends.

Parallel straight lines.

Bisector of an angle.

Construction of an angle equal to a given angle.

Division of a segment.

Centre of the circle.

Construction of triangles.

Regular polygons inscribed in a circle.

Linking circles.

Ellipses.

Revision exercises.

Basic rules of dimensioning.

Forms regarded from a single (viewed from a given position).

### *II — Representation of prismatic forms*

— The prism, perspective,

3 views,

Section, cut,

Perforation,

Groove,

Cross-section.

- Developments.
- Cylindrical pieces (see prism).
- Pyramid and cone (see prism).
- Representation in sections.
- Dimensioned sketch.

## Technology

### 4th and 5th year

- The technical object, the machine unit.
- The movement of the part, translation and rotation.
- The technological chain : motor, receiver.
- Technological representation : projection, views.
- Measurements of lengths, vernier, slide square (reminder of science).
- Precision of measurements and tolerance : the shutting of a door.
- Measurement of angles (reminder of science).
- Forces : rotating handle of a motorized cycle.
- Composition of forces : study of a pair of shears.
- Couples : study of a vice and the screw-nut system.
- Work : study of a jig-saw.
- Simple machines : pulleys, inclined plane, winch, lever, screw with nut, gears, belts.
- Velocity and acceleration, a simplified tachometer.
- Power : change of gear of bicycle, free wheel.
- Weight : Standardization of a dynamometer, weighing machine for persons, balance, bascule.
- Friction : disc brake.
- Rotation and rolling : roller skates.
- Micrometer, plumb-line, level, balance.
- Electric circuit : the pocket lamp.
- Mains current : office light.
- Direction and intensity of the current : ammeter.
- Calorific energy : electric ring.
- Power : immersion heater.
- Tension : incandescent lamp.
- Resistance : fused circuit breaker.
- Equipment : electric soldering iron, domestic iron, bimetallic cut-out switch, electricity meter.
- Assembly of simple technical equipment and detection of simple faults.

## Arts and crafts

### 4th and 5th year

Starting from practical work, arts and crafts studies should lead the pupils to become people working joyfully, whose sensibility and sense of judgment are developed by making objects which they will have devised themselves.

In the studio the pupil learns to respect a set of rules laid down after mature consideration ; he must take tools and materials into consideration, handle them with care, look after them and give them due respect.

Work in teams makes pupils assume common responsibilities and initiates them into the principles of the division of labour.

Through individual work, the pupil discovers the originality of the skilled crafts. By making several similar objects he asks himself how one might find methods which would tend to simplify the work. Handicraft may lead to the awakening of a vocation.

(a) *Free arts and crafts*

These are assemblages, constructions of objects made freely from selected materials. The properties of the different materials will lead to the creation of specific objects. It is not necessary for these objects to be made to last. It is necessary to leave complete freedom in the choice of materials.

(b) *Experimental arts and crafts*

The handling of various materials and tools will bring to the pupil a certain individual experience. As well as the old materials such as paper, cardboard, wood, metal, clay, he should use new materials like plastic, synthetic fibres etc. The free use of these new materials will allow the creation of new forms. The transformation of these materials can be made by mechanical means as well as by chemical means and will thus help to resolve certain modelling problems.

(c) *Directed arts and crafts*

When the pupil is capable of mastering the materials, he can make objects for everyday use, using plans, respecting the methods of employment of the materials and the tools. It is understood, of course, that the making of such objects will not lead to apprenticeship or pre-apprenticeship for a trade. By way of exception, pupils having reached the age 16 years or who are older can, on occasions, and on condition they are supervised, work on the lathe, the band-saw, the planing-machine.

The choice of work to be carried out will stimulate the pupils to invent decorative forms and make useful objects for themselves, while, at the same time, leaving them their creative initiative.

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*Group 2*

Book-keeping, commercial arithmetic	2½ hours
Typing	2 hours
Shorthand	2 hours
Commercial correspondence	1 hour
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	7½ hours

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## Book-keeping

### 4th year

The entering of the usual transactions.

1. Study of the principal commercial documents : invoice, draft, cheque.
2. The balance sheet.
3. The ledger :  
The balance sheet accounts,  
Management and profit and loss accounts,  
The set of accounts.

4. Auditing.
5. The journal.
6. Study of some special accounts :
  - Goods account. Permanence and intermittency of stock-taking ;
  - Purchases and sales accounts. The stock card. Weighted average prices ;
  - Wages and salaries account. Deductions on pay. The pay slip.

### 5th year

#### I — *Inventory entries*

1. Principle of the determination of the result.
2. Redemption.
3. Regularizations.
4. Trading and profit and loss accounts.
5. Closing and reopening of accounts.

#### II — *Presentation of some accounting systems*

1. Principle of the American journal.
2. Principle of the centralizing system,  
Study of bank journals.
3. Principle of the transfer system.

## Commercial arithmetic

### 4th year

Proportional values.  
 Exchange of money.  
 Averages (simple and weighted).  
 Mixtures.  
 Alligations.  
 Professional divisions.  
 Calculating ‰, ‰.  
 Simple interest — usual formulae.  
 Methods of rapid calculation of interest.  
 VAT.

### 5th year

Commercial discount.  
 List of bills for discount.  
 Average due date.  
 Common due date.  
 Current account (direct method and balance method).  
 Calculation of cost price and sales margins.  
 Customary operations of the stock exchange.

# Typing

*Aim to attain* : correctness of touch and not speed (which can only be acquired by intensive training on solid bases).

## 4th year

Touch method obligatory ; study of the keyboard.  
Arrangement of a continuous text (short, heading along the margin).  
Maintenance of the typewriter ; management of work folder.

## 5th year

Exercises for suppleness and practice (work with the little finger, words with accent(s), orthographical and punctuation signs, etc.).  
Centring of the title, accompanied by a short text.  
Arrangement of the letter (commercial and administrative).  
Layout of the envelope (professional).  
Use of the tabulator.  
Use of the carbon, stencil, possibly spirit duplicator.

# Shorthand

*Aim to attain* : knowledge of the method and correction of the transcription ; reading.

## 4th year

General theory of the system adopted : only aim at accuracy in transcription and in calligraphy.

## 5th year

Revision and further study of the system.  
Practice in numerous and varied exercises, but orientated towards commercial correspondence.

# Commercial correspondence

## 4th year

General principles (rapidity, precision, discretion).  
The general lay-out (or standard).  
Application for employment (reply to a newspaper advertisement ; spontaneous offer).  
Exercises.  
Curriculum vitae.  
Application for scholarships.  
Requests for information and reply to requests for information.

### 5th year

Revision of the programme of the 4th year.  
The order and its execution.  
The claim.  
Bank correspondence.  
Letters in duplicate.  
Letters typed as soon as the pupils are able.  
Different presentations.

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#### *Group 3*

1. Child care	2 hours
2. Home economics	2 hours
3. Art	2 hours
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	6 hours

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## Child care and development

### 4th and 5th year

#### *The mother and the new baby*

Mothercare.  
The nursery.  
The baby's first weeks.  
The care of the baby — physical care and feeding.  
Physical and mental development during the first year.  
Compulsory inoculations and medical examinations.  
Premature babies and their care.  
The sick baby.

#### *Early years*

Physical development.  
Mental development.  
Feeding and nutrition.  
Care and safety.  
Cleanliness and hygiene.  
Child's play.  
Children's activities.  
The sick child.



# Home economics

## 4th and 5th year

The following syllabus is designed to give pupils essentially practical rather than theoretical education. All work should be planned to give young people the training and experience they need to develop their home-making skills. Stress must be placed on the planning, organization and hygienic methods of work.

### (a) *Food and Nutrition*

Food for health.  
Composition of foods and their nutritional value.  
The most important foods.  
Planning balanced menus.

### (b) *Cookery*

Preparation of simple menus.  
hors-d'œuvre and entrées.  
flour-based dishes.  
different varieties of pastry.  
cakes and pastries.  
national cookery.  
seasonal foods.  
dishes for special occasions.  
'bachelor' cooking (quick but good).  
invalid cookery and diets.  
preparation of a variety of dishes from a basic group of foods, e.g. vegetables or meat ;  
use of seasoning and spices.

### (c) *Needlecraft, dress and textiles*

The aim of the 4th- and 5th-year course is the development of knowledge and skills gained in previous years. By division of labour and by making a variety of articles pupils will be taught gradually to make garments. Finally they will have enough skill in cutting and dressmaking to produce clothes for themselves. This is the principal aim of the course.

In the following scheme the teaching points are listed separately although in practice they will be completely integrated.

1. Understanding and use of sewing-machines ; operation of treadle and electric machines, their use, care and maintenance.
2. Knowledge of textiles : modern fabrics and sensible choice and use of materials.
3. Cutting-out : taking measurements, commercial patterns, Use of patterns and adaptations to individual measurements.
4. Dressmaking : hand and machine sewing, trying on, fitting and finishing of a selection of garments in the following order : children's clothes, skirts, trousers and dresses.
5. Decoration and accessories : finishing of work with machine or hand embroidery, collars, belts, buttons, etc.

# Art education

## 4th and 5th year

### I — *Considerations and proposals*

To the same extent as during this period of adolescence direct expression of the imagination diminishes, objective representation progresses. Thanks to this growing faculty of awareness, the analysis of objectivity becomes more intensive and objective. This stage is characterized by a tendency to technico-constructive and abstract thought. The faculty of self-identification with the objects grows and, with this, also the possibility of reliving works of art. The specific interests of representation by the image, be it creative or meditative, should be explored in this sense.

### II — *Teaching aims*

To bring the pupil to make completely free use of materials.

- (a) Differentiated representations of the imaginary, the object, the observed.
- (b) Experimentation with materials of natural form or devised form.

### III — *Means to be used*

- (a) Formal pictorial media : gradations, colour mixtures, colour relationships, differentiated colours, intensity, relationships, values of greys, light-dark, graduated colours, colour harmonies, colour contrasts, tint upon tint, representation of space.
- (b) Materials :  
paper, cardboard, adhesive paper, gouache, watercolour, indian ink, clay, plaster, wax, glass, plastic, textile fibres.

### IV — *Themes*

- (a) Invention : representation of forms devised.
- (b) Representation : painting the external world and the events which are enacted in it, principally, slices of life.
- (c) Observation : drawing of objects, analysis of paintings, drawing from nature.

### V — *Study of painting*

- The periods of painting ;
- Visits to museums, to art galleries, to artists while at work ;
- Collections of good reproductions, transparencies.

### III

Timetables and harmonized programmes  
for the  
primary classes

# General introduction to the programmes of the primary school

The primary school carries on and amplifies the educational work of the infant school. It supplies the fundamental formation and prepares the child to pass smoothly into secondary education. It develops the personality of the pupils and initiates them in their social life of the present and tomorrow. It adjusts its influence to ensure for all, in relation to aptitudes and potentialities, equal opportunities for maximal development.

The primary school no longer has any finality in itself, as was still the case a few decades ago, which produced encyclopaedic programmes and preoccupations concerned exclusively with the transmission of a diversified and abstruse knowledge. Under the combined influence of various factors it must now reconsider its objectives in order to meet the requirements of the present time and the possible contingencies of the future.

What use is this knowledge, even though extensive, if it is not functional, that is to say, able to be placed at the service of practical know-how and the solving of new problems. What is the issue, then, is not so much informing the pupils as forming them. They should not so much learn but, before everything, learn to learn. The material acquired is not the essential thing. What is the essential thing is the way in which the acquisition is carried out.

This finding puts an end to encyclopaedism and the premature compartmentalizing of the disciplines. It leads to the logical conclusion that if a reforming of primary education necessarily postulates a revision of its content, it especially postulates, above all, a profound revision of its pedagogy and its didactics.

If, on the one hand, it is necessary to offer equal opportunities to all and, on the other hand, to allow for recent work in scientific psychology, the pedagogy of the primary school has no other alternative than to start from the child — this being which it should mould to the best of his possibilities as a child — from the child with his interests, needs, potentialities, his affective and emotional life. Starting from his deep motivations it should give to the child the maximum he is capable of acquiring just as it should provide special additional care to help him surmount those difficulties at which he could stumble.

A pedagogy of interest demands that one starts with the interests of the child himself, and uses them as levers in his formation. What interests the pupil of the primary school is his environment, close at first and then progressively more distant. At present, this environment is also everything that is offered by the modern broadcasting media : the printed word, radio, television. It is in this environment that questions are posed to him to which he seeks an answer, problems which he wishes to solve. It is necessary to profit from this intellectual appetite, to encourage it and to make fundamental use of it to reveal the answers requested and the solution of the problems raised. But, also, making use of the same occasion, to develop the function of the mother tongue ; to set in motion the mental functions ; to create the motivation for new problems ; to learn to handle the sources of documentation which allow a widening of knowledge through the effort of personal research.

The utilization of the environment cannot, therefore, constitute an aim in itself. It remains an instrument in the service of knowledge of apprenticeships and of formation. It allows the education of the child in an atmosphere of real life, *joie de vivre* and joy in discovery.

This method of work excludes encyclopaedism and the compartmentalizing into different sections which know nothing about each other. The primary school pupil does not, moreover, understand this adult logic. For him, knowledge is a whole of which secondary education reveals the particular divisions. One can allow that the mother tongue, mathematical operations

and the second language, although preserving ties with other activities, may occupy a separate place on the timetable. But it is appropriate to regroup other activities under a single name : prospectional activities and artistic activities.

At the primary school the activities will be grouped, therefore, into :

- (a) mother tongue, mathematics, second language ;
- (b) prospectional activities : observation, expression, history, geography, science ;
- (c) artistic activities : arts, arts and crafts, music, etc. ;
- (d) physical education.

One should not, however, misjudge the meaning of a pedagogy in which 'everything is in every other thing'. In relation to the age and degree of advancement of the pupils, it is the duty of the teacher to lead the children to give order to this 'everything', in their own way and according to the criteria which are present at their level. Thus, there will be the progressive constitution of syntheses, simple and modest in the lower classes, more and more rigorously based in accordance with the pupils' advancement ; syntheses which, in every case, should initiate scientific thought because they will have been elaborated by a scientific process, indeed, still elementary, but, none the less, scientifically based.

To offer equal opportunity to all, to allow each to progress according to his own pace and ability (taking into account the requirements of the programme), to prepare for social life, so many objectives which exclude permanent collective teaching. As often as possible and certainly with regard to the projectional activities, the teacher will split up his class into work groups, according to the level, aptitudes and interests of the pupils. Frequently, also, he will set them investigatory work individually or in groups. In such cases, he temporarily ceases being the play-leader to become the councillor and guide.

This manner of conceiving the pedagogic organization of the work and the class requires a modification of the relationships which have existed traditionally between teacher and pupils. Subjection should give place to understanding and cooperation.

Finally, we would recall that the European schools have, among other objectives, that of forming their pupils in the European spirit. Consequently, favourable conditions should be created and every occasion should be seized to attain this.

# HARMONIZED TIMETABLES

(a) 1st and 2nd year	Periods	
Mother tongue	8 hours	$16 \times 30$ minutes
Mathematics	4 hours	$8 \times 30$ minutes
2nd language	2 hours 30 minutes	$5 \times 30$ minutes or $6 \times 25$ minutes for the six-day week
Irish	(3 hours 45 minutes)	( $5 \times 45$ minutes)
Musical education	1 hour 30 minutes	$3 \times 30$ minutes
Artistic education	2 hours	$4 \times 30$ minutes
Physical education	2 hours	$4 \times 30$ minutes
Complementary activities	1 hour	$2 \times 30$ minutes
Religion - Morals	1 hour	$2 \times 30$ minutes
Recreation	3 hours 30 minutes	$7 \times 30$ minutes
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	25 hours 30 minutes	$51 \times 30$ minutes

(b) 3rd, 4th and 5th year	Periods	
Mother tongue	6 hours 45 minutes	$9 \times 45$ minutes
Mathematics	5 hours 15 minutes	$7 \times 45$ minutes
2nd language	3 hours 45 minutes	$5 \times 45$ minutes
Irish	(3 hours 45 minutes)	( $5 \times 45$ minutes)
Sciences	45 minutes	$1 \times 45$ minutes
Geography	45 minutes	$1 \times 45$ minutes
History	45 minutes	$1 \times 45$ minutes
'Awakening' activity	1 hour 30 minutes	$2 \times 45$ minutes
Artistic education	1 hour 30 minutes	$2 \times 45$ minutes
Musical education	45 minutes	$1 \times 45$ minutes
Physical education	1 hour 30 minutes	$2 \times 45$ minutes
Religion - Morals	1 hour 30 minutes	$2 \times 45$ minutes
Recreation	2 hours 30 minutes	
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	27 hours 15 minutes	

In addition to these  $27\frac{1}{4}$  hours each school has the opportunity of organizing up to three periods of recreational activities (expressionary disciplines) according to the needs and the local infrastructure. This elasticity of timetable, a corollary of the diversity of the local situations, does not introduce appreciable differences between the schools: in effect, these activities (artistic, musical, physical education) are not capable of altering the standard of the pupils.

In this domain, the decisions will be taken by the directors after consultation with the plenary meetings. If such activities are organized, the pupils are obliged to take part.

# HARMONIZED PROGRAMMES

## Mother tongue

### ENGLISH

#### General considerations

1. The aims of mother tongue teaching in primary classes have always included the acquiring and improvement of skills in reading and writing. Because of the difficulties these skills present for many pupils, they have been given a great deal of attention and practised through a wide variety of exercises. But increasingly they are now seen, not as isolated activities, but in a context of language growth and development.

As the complexity of language has been realized, and the way in which children acquire it better understood, it has become apparent that the problems of the teacher of the mother tongue are not those of the teacher of a foreign language. The six-year-old child comes to school already able to understand and employ most of the common structures of his native language, and already possessing a considerable vocabulary. During all his school years the lessons concerned with his reading, writing and speaking are only part of his total awareness of language. His more confident grasp of more complicated structures continues to be gained intuitively, as he needs to interpret more complex experiences. The teacher, of course, seeks opportunities for intervention and knows the occasions for direct instruction. But the major part of his skill lies in extending the range of that experience, both at first hand and through literature, in such ways that new demands are made upon the child's language, in listening, talking, reading and writing. The teacher's skill will order his material and his lessons to secure progress in all these modes of language, but his first task is to make certain that the child senses the pleasures and profits of learning to read and write, and of talking with and listening to people, whether teacher or other children.

There will be times when one or other of these four modes will be given immediate priority, but, if they are to be meaningful to the child in school as in everyday life they must be seen to be interdependent and to lead into each other. Every lesson is a language lesson in the sense that the mother tongue is being taught continually — or, perhaps more accurately in the European Schools context, most lessons are.

2. This last qualification is important since there is in any case a significant proportion of children from families where English is literally not the mother tongue, which may militate against the growth of its usage in the home. In addition, the local reinforcement of English, through television, cinema, or libraries is not extensive.

3. Another feature which may be specific to the English-speaking section is that a number of young children may have had fairly considerable time in a nursery or an infants school before they join the European Schools. Such a school will have provided the child with a range of books and a wide experience of stories and poems, beyond those even of a good home. It may also have organized its teaching and learning in an elastic way, which will have allowed children to progress at their own rates. Thus some of these children at the age of five or six will already be reading or on the point of reading.

4. In aiming at a growing control of oral and written language, enabling children to express themselves and to communicate with others, the following objectives can be listed.

#### (a) *Oral English*

The prime mode of expression and communication is speech, and Piaget's work has demonstrated the close link between speech and play in very young children. Almost half of

their speech is in the category of monologue or soliloquy (egocentric speech) with the child speaking to himself, even in the immediate presence of other children.

The conclusion to be drawn is that teachers of young children need to make provision for this type of language within the class. Opportunities need to be provided for children to play, in the presence of but not necessarily with other children, in situations which they are creating for themselves. Play situations will stimulate this egocentric speech, and classroom equipment which includes, for example, a home corner, dolls and dolls' clothes, improvised roadways and airports, constructional toys, water, sand and clay will allow these situations to be created. The purpose of affording opportunities for children to play, and to talk while they play, is to provide for a specific type of speech development, requiring encouragement, or perhaps intervention, by the teacher from time to time. Thus enter incidental conversation, between child and teacher or between child and child; topics of interest to the child from home or his surroundings; topics from his occupations in school or outside response to story, poem or song; the telling of stories whether reproduction or invention. With older children the work grows increasingly sophisticated, and such resources as a tape recorder or slide projector are valuable.

It is with older children, also, that too great a concentration on individual work cards, employed to allow children to get on for themselves, may stifle talk, and inhibit the learning which can only come from attempting to formulate ideas in speech.

#### (b) *Reading*

(i) Possibly the most important help and stimulus to reading is a plentiful supply of books which are suitable for the children in each class; the opportunity to display them and make them available to look at, leaf through, read and perhaps borrow; and occasions when the teacher reads from them. It is in such a climate that the teachers' materials and instruction are most successful.

All children do not learn to read at the same age any more than they learn to talk or walk at the same age. There is need for understanding and tolerance and an avoidance of stress, from both teacher and parent, for the late starter. By and large, boys do not come to reading as easily as girls. Conversation, play, story, respect for questions, are all helpful, probably essential.

The consensus of research findings indicates that there is no single method of teaching reading that is best for all children all the time. In consequence, teachers tend to use modes of instructions, activities and materials drawn from a variety of sources. There are dangers in this situation. For instance, the freedom of teachers to select their own combination of methods can lead to such differences between the work carried out within classrooms in a single school, that some children may become bewildered and confused. The lack of ordered continuity in the teaching of reading could become grave without regular consultation, and it is imperative that teachers keep themselves informed of new interpretations of this difficult process.

Each school needs for the teachers at least a nuclear collection of books on literacy, and the forthcoming publication of the report of the Committee of Inquiry into Reading and the Use of English will be a major reevaluation. In any research on the teaching of reading the single indisputable fact is that the teacher variable is more important than the method or approach.

The most useful line of approach seems to be to regard the acquisition of reading as a process in which a number of interrelated skills and competencies are brought together to discover meaning in print. From this point of view, a 'method' of teaching reading would be an organized attempt to structure a programme that enables a child to master those skills or behaviours (e.g. grapheme - phoneme relationships) which are essential to translate the written code, and at the same time a programme that provides for a developing competency in language (e.g. the command of information and reasoning). A constant review of such a programme is more valuable than the composition of a rigid programme for all to follow.



(ii) The fundamental importance of learning to decode print and manuscript can overshadow the need to develop intermediate and higher skills, and to move towards adult reading. The final objective of fluent, silent reading must be remembered, and here there is no substitute for a considerable supply of books both fiction and non-fiction.

The further skills are probably most easily categorized as understanding or comprehension, although they can only roughly be regarded as successive. The reader must first literally comprehend in order to identify and recall material, and it is this literal comprehension only which many books and reading laboratory materials exercise. They have one grave defect, that they do not satisfy the prime reason for reading, which should be that it is undertaken to satisfy some previous purpose. In addition, since they are convenient classroom exercises and over-used, they may stand in the way of developing skills of reorganization, inference, evaluation and appreciation which any reading programme should bear in mind.

(c) *Literature*

The role of literature is to bring the child into an encounter with language in its most complex, varied and rewarding forms, so providing him with a personal resource in coming to terms with his experience and his fantasies, and giving him an imaginative insight into other people and their lives.

The teacher needs to be able to present literature which is more mature than the child would seek out for himself or take in by himself. Most commonly it would be presented by reading, but record, tape and radio broadcasts can all assist.

Poetry has a special claim to inclusion in children's education. Carefully chosen poetry will not only throw light on life but will foster sentiments and nourish the imagination. Poetry, therefore, should not be lightly chosen or read to children without preparation. Children enjoy colour and texture of language and sound, unexpected and exciting words and clear images, which help them to see clearly. These are the poetic qualities which appeal to children, and they will gain from stories, poems of action, poems of humour, poems which describe both the world they know and the world they dream about. Even difficult poems sometimes have passages in them which children can appreciate.

(d) *Writing*

A child learns to speak naturally, but he must learn to write consciously. Writing is in part an unnatural activity, and one of the central purposes of a school is to teach the child to write. Writing begins most readily from talk, and the first motivation is provided for a child when a teacher gives shape and some permanence to his stories and news by putting them on paper for him. Children begin to write at ages and stages which vary even more than those at which they start to read. The child who has been exposed to storytelling and children's books, and to parents and friends who write freely, is more likely to begin earlier and to be successful. He learns to copy and then to write independently for himself.

As children gain in proficiency it becomes clear that the essential requirements in free written work are to have a reason for writing, to have plenty of time to write, and time to finish. The retelling of stories will help good sequence because this will be controlled by the action of the story. Descriptions of visits and experiences will offer occasion for writing, preceded by discussion which will help in the choice of vocabulary. Time must be found for personal and imaginative writing. As he gets older he reaches towards more impersonal objective writing, which can sustain a degree of exposition. The teacher's influence is greatest when discussion and correction take place between him and the individual. From the study of each child's work, he will know what teaching to give in spelling, grammatical accuracy and punctuation.

(e) *Language study*

Children acquire most of the grammar of their mother tongue intuitively and before ever they start school. There may still be a case for making explicit a form of linguistic behaviour which they have implicitly assumed, although research does not support the argument. There may be

a special case in the European schools, with their considerable emphasis on the teaching of modern languages, so that some pedagogical exchange is possible between teachers of English as a native language and English as a second or foreign language, and teachers of other languages also. If such discussion requires the continuance of traditional grammatical categories, it is imperative that teachers inform themselves of more recent and more carefully refined descriptive grammars, and of their implications for teaching. In particular, stances taken over grammar may valuably be replaced by explorations into usage. Usage is concerned less with the predictable structures and word forms, more with their changing status. A child needs help in acquiring varieties of structures and forms, and in selecting from among them those most appropriate to his purpose.

Children are readily interested in words and their uses. However, not all children will understand abstract terms, and any further teaching of grammar is best left until the transfer to the secondary department. Of course, most children of primary age will be learning a second language, and they will be confronted with some grammar almost from the beginning. But the grammar of English is quite different from that of another language, and the grammar of the latter is much better learned with the language itself.

When primary-age children learn a foreign language, their work in writing and translating can keep pace with the grammar they have learned, but when children use their own language they employ sentences and expressions which range far beyond their knowledge of grammar.

(f) *Drama*

The beginnings of drama are to be found in children's play. As children grow older they act versions of stories they have heard adding to them from their own imagination. At first the play will be through mime and movement, later the children add speech — usually very much to the point, and only secondary to the movement.

As the children get older the dialogue plays a bigger part and as fourth grade pupils the abler children will have little or no difficulty in writing their own scripts. An important aspect of the creativity of dramatic speech as distinct from writing is the inexhaustible fund of acceptable forms and idioms available to children from a very early age; only at the top of the primary school are the children able to interpret satisfactorily other people's plays.

(g) *Punctuation*

The use of some punctuation marks (a period, or question mark) is essential, and direct instruction in them is an economy of time. The use of others (a comma, an exclamation mark) may be a matter of judgment, and the writing of professionals shows that their use varies with a writer's intentions — indeed, the punctuation system is probably not adequate to all of our writing needs. Punctuation should arise from a child's own written work so that its purpose (and its variety) become apparent. Teaching could centre on full stops and commas, and on question and exclamation marks, while speech marks and possessive apostrophes might be left to the fourth grade or later. It may be necessary, and it could be illuminating for the child, to compare and contrast conventional usage in other languages in school, e.g. the use of the comma in German.

(h) *Spelling*

There is no single road to acceptable competence in spelling. Some children are better spellers than others, probably because their visual retention is superior. Many children assimilate correct spelling through reading, but some will need the support of a few rules and of systematic learning of the more common words which present spelling difficulties. Spelling is important, but it must take its appropriate place in the wider sweep of the child's learning, and if one of the main aims of the teacher is to help the child to express ideas on paper, then there is perhaps a reason not to over-stress correctness of spelling in the early stages. Spelling teaching which is based on lists of words almost wholly unconnected with the child's immediate

needs is unlikely to be of the same help as that which regards spelling as an integral part of the work which is being done.

Instilling a habit of consulting dictionaries is probably the most lastingly helpful thing a teacher can do.

(i) *Handwriting*

This is a complicated skill and no child acquires it naturally or easily. While it is being learned, the child can hardly be expected to give his full attention to what he is trying to communicate. Provision needs therefore to be made for the two activities — handwriting and communication — not to interact too forcibly one upon the other. A good form should be chosen to begin with, one from which each child can develop his own style.

(j) *Resources*

Of the material support essential to a teacher of the mother tongue, a plentiful supply of books, fiction and non-fiction, both in a school library and in classrooms, is paramount. Text books of varying kinds will be wanted by most teachers, and opportunities for the duplication of teachers' own material is very desirable.

Cassette tape records and simple recording facilities are increasingly important, with access to a record player, a slide projector, and radio and television programmes where appropriate.

**Scheme of work**

To permit a degrees of elasticity and to allow for differences in individual progress at this stage of education, the syllabus is arranged in three bands — Year 1 ; Years 2 and 3 ; Years 4 and 5.

**Year 1**

(a) *Oral English*

(i) *Speech and conversation*

Opportunities for play with materials and in situations which encourage speech, either egocentric or social. Conversation between child and child — time should be allowed each day for free conversation among themselves. Conversation between child and teacher, or indeed, other adults.

Encouragement to speak about topics of interest to the child himself, and to talk with others about them — arising from the home, the school environment, local environment, books and broadcasting.

(ii) *Stories, poetry, songs*

Listening each day to stories is very important to small children, and the wealth of folk, fairy and nursery tales from each country should be explored. Nursery rhymes should be read aloud, recited, sung, as should suitable modern verse. The children can retell and re-enact the stories and rhymes, which can also be a source of ideas for painting and a model for inventing their own stories.

(b) *Reading*

The class is likely to contain children who have not yet made any start on reading, but also some who have begun to read in other schools. For those who have not yet started, the gradual building up of a sight vocabulary, through name tags, list of children's names, job lists, weather charts, labels on furniture, nature table, etc. The provision of simple library books, largely illustrated. The use of flash cards and picture vocabulary lists, the introduction of graded reading material, and some phoneme and grapheme recognition.

Those who have made a start will be eased into this programme at suitable points.

Records of progress.

(c) *Writing*

Guidance in the use of books, crayons, paints ; rhythmic pattern practice ; letter patterns ; letters of the alphabet — upper and lower case in print script. Copying (writing over or underneath teacher's version) of captions, names, items of news. Progression to joined print script. Work books, news, diary, stories.

Records of progress.

**Years 2, 3**

(a) *Oral English*

(i) Conversation

- Incidental and free conversation between child and child, between child and teacher (important in multilingual environment).
- Conversation arising out of topics of interest to the child : the home, the school, the class, the previous country, the neighbourhood, people and their work, e.g. the postman, nurse, etc., local events.
- Child encouraged to listen intelligently to others. Listening exercises to promote this, e.g. identifying sounds on tape, listening walk, retelling of stories, etc. Child encouraged to improve his language by critical listening.
- Extension of topics for discussion as child's interest and knowledge grows. Television and radio, films, games and hobbies, news. Fantasy material — ghosts, adventure, etc.
- Environmental topics : plants, animals, pets, food, clothing, children of other sections in the school, children of other lands, etc.

(ii) Stories

Child listens to folk, fairy and nursery tales told or read by the teacher. Child retells story. He creates his own, being allowed to express himself freely. Conversation about stories read. Progression to simply told versions of legends of other cultures, to stories of historical background and tales of adventure.

Stories from child's own reading as he masters the technique.

(iii) Poetry, rhymes and song

Teacher reads simple poems and rhymes of interest to the children. Children recite and sing. Children compose their own poems having listened to a poem or seen a picture or heard music. Progression to narrative and nature poems, children memorize poems of their own choice. Group and individual recitation.

(iv) Drama

Dramatization of stories, poems, rhymes. Puppetry as dramatic expression. Children compose their own sketches and dialogues.

(b) *Reading*

Experience and interest-based reading, each child progressing at his own level.

— Pre-reading activities :

Oral work as described in (a).

- The extension of a basic sight-vocabulary, e.g. names, labels, flash cards, wall lists, greeting cards, posters, advertisements, weather chart, news sheet.
- Reading games : picture and word matching, matching words to words, matching captions to pictures.  
Reading of simple read-write cards.
- Use of suitably graded reading scheme or schemes.

- Word study, elementary phonic training, word groups.
- Availability of a variety of simple, well-illustrated books both factual and imaginative for children's use in book corner or library. As technique is mastered, children progress to independent, silent reading, both functional and recreational, with oral reading when necessary.

Discussion of matter read and questioning for comprehension.

Testing and recording.

(c) *Writing*

To enable the child to give written expression to his experience.

- Use of brushes, crayons, chalks, scissors to develop muscular coordination.
- The copying of words or phrases which give meaning to the child's picture or experience (in conjunction with reading activities).
- Formal letter and rhythmic patterns as an introduction to handwriting. Use of unjoined print script, at first, leading to the development of a fluent and finished style later.
- Child writes words or phrases from memory, e.g. his own name, labels, captions for pictures etc.

Simple read-write activities.

- Writing of simple news, leading to class diary, birthday cards, advertisements, etc. as technique is mastered.
- Personal and creative writing in response to stimulus, e.g. an experience, a visual or an aural image, an imaginary situation.
- Writing for individual and group projects and themes.
- Letter writing.
- Picture and word dictionaries in conjunction with oral work.
- Guidance in how to present and exhibit their work.

**Years 4, 5**

Language now becomes a more unified activity as the basic techniques are mastered.

(a) *Oral English*

(i) Continuation and development of speech and listening as outlined for younger children. Continued importance of incidental conversation between child and child, between child and teacher, of intelligent and critical listening leading to mature thought and appreciation.

- Discussion of topics arising out of personal experience. Project and theme work at individual group and class level: factual material, surveys, polls, interviews, commentary. News.
- Topics arising from other subjects: mathematics, environmental study, e.g. climate, clothing etc., art and craft activities.
- Topical events. Radio and television. Films, Games and hobbies. School outings etc.

Impromptu speech.

- Wide use of books, tapes, films etc.
- General extension of vocabulary in conjunction with reading activities.
- A more formal treatment of oral language: children helped in their everyday language by listening critically and imitating the examples of good speech.

Reference to grammatical terms where necessary.

Spelling as required.

(ii) *Stories*

- Narration and discussion of more difficult fairy tales, folk tales, legends, myths and sagas. Tale of adventure, of historical reference and biography.

- Selective reading by the teacher of extracts of good prose with a view to developing a critical and appreciative attitude in the children.
- Access to a wide range of books both non-fiction and fiction, in the school library.

(iii) Poetry and song

Use of anthologies of poetry by the children containing a wide range of lyrical and narrative poetry about people, animals, birds adventure, heroism, travel, etc.

Reading by teacher and pupils.

Discussion and explanation of some poems suited to the ability of the class in order to develop appreciation.

Memorization of poems of children's own choice.

- Class, group and individual recitation.
- Children encouraged to write in verse. Singing in cases where poems are set to music.

(iv) Drama

- Children dramatize plays, stories, poems heard or read.
- Children compose their own plays and dramatize them.

(b) *Reading*

- Extension of reading ability. Reading aloud where necessary.
- Development of functional and recreational reading.

Functional reading for projects and themes. Guidance in selection and note-taking, in the techniques of presentation.

- Creative reading as a stimulus to creative activity-talk, writing, music, drama, poetry, tape recording.
- Increased emphasis on silent reading.
- Extensive use of books and other reading material both fiction and non-fiction. Anthologies of prose and poetry, encyclopedias, reference books.
- The development of reading maturity through responses to selected works.
- Reading tests and records.

(iii) *Writing*

- Consolidation of handwriting skills.
- Development of personal and creative writing — stories, poems, letters, songs, class magazine, news sheet, diaries, dialogues, plays and scripts, events.
- Use of various stimuli, books, films, photographs, experiences.
- Development of objective writing : writing for projects and themes, note taking, reports surveys, etc.
- Direct guidance in presentation of written work, e.g. punctuation and paragraphing, sentence structure, etc. as the child requires. Child encouraged to revise and correct.

# Mathematics

## 1st year

### Preliminaries

Mathematics is a living science constantly developing.

Before the Second World War the field of mathematical application was chiefly quantitative and limited to the art of the engineer and scope of exact sciences. In the primary school we had at our disposal a programme of computation and geometry ; these first principles were adequate for everyday use.

Computation and the study of geometry remain necessary, but the work of mathematicians for more than a century now allows us not only to translate but to treat non-numerical problems relevant to the qualitative field.

These new contributions amongst which are found the ideas of sets, of structures, account for the gradual progress of mathematics into all the disciplines of contemporary science and more particularly in the social sciences.

As we took into consideration, on the one hand, that all known basic concepts of current mathematics are found at embryonic state in the common knowledge of children and, on the other hand, the psychology and the practical results of numerous experiments carried out on the assimilative ability of young children, teaching us that the latter are qualified to do mathematics from a young age, it obviously followed that a new programme was necessary in primary education.

Since the appearance in 1971 of a modernized programme, more and more experiments have taken place and although it is not yet possible to draw up a balance sheet, one can affirm that the initial results are encouraging.

In the light of experience, the Commission considered it a good idea to revise the text of the programme, in such a way as to give it a simpler more operational and more familiar form.

It has been expressed in terms laying stress on the ability of the child. It is he who must live the programme with the help of his teacher. His activities or ability are divided into themes which recur each successive year. It is essential to remember that this list of subjects is not by any means intended to be chronological, the themes should be dealt with in symbiosis for the better understanding of the individual ideas of the mathematics involved and in liaison with other class activities.

In a later publication, the Commission intends giving the teacher a way of forming the progression of one idea throughout the five primary years.

It would like to stress the fact that the aim of primary school mathematics, apart from supplying the child with the necessary tools for tackling life, is to develop in the child an inquiring, imaginative mind with an ability to simplify and organize in a constructive manner.

The new programme sees to it that a balance is introduced between mathematical thought and computation. One would have misread the document if one was to centre all the educational actions on only one of these two principles.

To neglect the aims of technical order and concentrate too much on thought development, to practise a reasoning separated from a concrete support would make for a sort of mental jugglery composed of strings and arrows, a free activity, the more attractive because it is a novelty, but the more free in that idea without sure tools is an invalid thought.

On the other hand to place ideas of sets and relations side by side with traditional arithmetic would only produce a porter as artificial as it would be useless.

The introduction of an idea will usually necessitate several successive tries. From the moment the child has ascertained the structures of a situation, he must be able to rediscover them several times and above all, he must learn to recognize them in different circumstances, in order to be able to sift them out and use them when confronted with a problem requiring their application. This is why it is necessary to vary the equipment and the context in such a way that the child can give free rein to his imagination and creativity. He will not fail on these occasions to make surprising and interesting discoveries. In any case one will avoid falling prematurely into the trap of formal mathematics.

## Programme

### 1. Sets

#### 1.1. Construction sets

- 1.1.1. Experience game situations where concrete sets occur.
- 1.1.2. Define sets by counting up their members or stating the characteristic property of the members.
- 1.1.3. Analyse situations and express in different ways whether an object does or does not belong to a set.
- 1.1.4. Portray the sets by diagrams and 'tables of belonging'.
- 1.1.5. Meet situations where one is led to form a part of a set. Notice why a set is or is not included in a set.
- 1.1.6. Sort out objects.

#### 1.2. Discover set situations (*complementary, intersection, reunion*) in conjunction with the terms 'not', 'and', 'or' taken in their mathematical sense.

### 2. Relations

- 2.1. Experience familiar situations giving rise to simple relations and portray them graphically.
- 2.2. Look for many varied examples which show the main types of relations :
  - 2.2.1. of one set towards another set (accentuating the idea of one to one correspondence) ;
  - 2.2.2. within a set.
- 2.3. Interpret 'mute diagrams'.
- 2.4. Occasionally handle some reciprocal relations in particular the reciprocal relation of numerical relations.

### 3. Numbers

- 3.1. Discover natural numbers.
- 3.2. Become aware that a natural number offers two aspects :
  - 3.2.1. the cardinal aspect discerned by means of the activities showing one to one correspondence ;
  - 3.2.2. the ordinal aspect shown by the arranging of natural numbers.
- 3.3. Represent numbers in base 10 (the use of bases of less than 5 will only be of use to explain the principle of the place value).
- 3.4. Introduce addition and subtraction. Be aware of the liaison :
  - 3.4.1. between the sum of natural numbers and the reunion of disjointed sets ;
  - 3.4.2. between the difference between two numbers and the difference between a set and one of its parts (complementary).
- 3.5. Use the operators  $(+ a)$  and  $(- a)$ .



#### 4. *Exploration of space*

- 4.1. To find one's way in a maze.
- 4.2. Respect instructions : to the right, to the left, above, below, between, on either side, under, behind...
- 4.3. Indicate a path by using arrows and travel on 'tree' diagrams.
- 4.4. Travel and take one's bearings, especially on grids.
- 4.5. Complete a shape which shows an axis of symmetry.
- 4.6. Recognize a straight and curved line, an open and closed line, the interior and exterior region on a closed curve.
- 4.7. Handle or observe familiar objects (logic blocks) in order to separate the mental pictures of the square, the rectangle, the triangle and the disc.

#### 5. *Problems*

- 5.1. Experience situations in order to separate non-numerical datum which will be presented in the form of plans, diagrams or tables.
- 5.2. Separate simple situations of numerical datum ; present this datum in the form of problems involving addition or subtraction.
- 5.3. Interpret silent graphs imagining the situations which correspond to them.
- 5.4. Invent little problems with numerical or non-numerical datum.

### **Commentary**

#### *Chapter 1: Sets*

##### 1.1. Construction of sets.

- 1.1.1. 'Set' is taken in its naïve sense. The idea is not to define the idea of the set, but to familiarize the child with the concept.

The child will construct the sets with varied objects and the results will be better if the objects are well known.

We will use the word object to indicate things, beings and ideas should the occasion arise.

In order to stimulate initiative and individual work, it is desirable that the children work out a part of the material which they will be using.

It would be ineffectual to list here examples. Each teacher will easily find the way to gather useful material.

- 1.1.2. As soon as possible we will ask the children to express themselves orally on the situations which they are experiencing. They will then have to be encouraged to describe the sets in a more precise way. The simplest way of defining a set consists of counting the elements. Example : Fred, Humphrey and Maud can be elements of a set.

When the powers of abstraction and expression of the pupils are more developed they will be able to define a set by stating the common characteristic of its elements. The existence of this characteristic allows one to say whether an object does or doesn't belong to a considered set. Example : the set of pupils in our class who have their birthday in January.

- 1.1.3. Once a set is known, one is concerned with checking that such and such an object does or does not belong.

At first we will merely state orally whether an element does or does not belong to a set : '... is an element of ...' and '... is not an element of ...' seem more precise than the expression '... belong to' and '... do not belong to'.

It is not absolutely necessary at this stage that the children know the symbols  $\in$  and  $\notin$ .

- 1.1.4. At first the sets of objects will be surrounded by a physical closed line, but later we will quickly pass to the representation by means of Venn diagrams and the teacher won't hesitate to represent the objects by dots, the power of abstraction of the pupils being of a much higher level than the adult imagines.

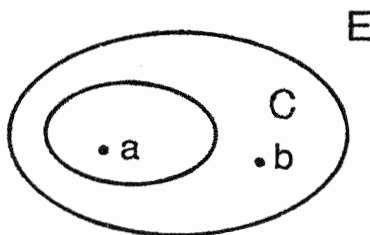
However, the representation of the elements of a set will be such that one can identify them in a non-ambiguous manner. This is why the dot which indicates an element will be accompanied at first by a distinguishing sign : drawing, letter, number. In a given situation, the same symbol will never be used to indicate two different elements.

Taking care not to condition the children to only one manner or representation, one could also use the Carroll diagram to represent certain situations.

With the same aim one could set up double entry tables of belonging for one set and later for two sets.

- 1.1.5. In a given set, one can discover subsets as parts of a set. The children should be conscious of the fact that each member of the subset is at the same time a member of the given set.

*Example :*



E is the set of pupils in the school.

C is the set of pupils in the class.

C is a subset of E.

Is 'a' a pupil in the school ?

Is 'a' a pupil in the class ?

Are all the pupils in the class pupils in the school ?

Is 'b' a pupil in the school ?

Is 'b' a pupil in the class ?

Are all the pupils in the school pupils in the class ?

- 1.1.6. The child should be introduced to arranging objects in sets first of all freely and then according to criteria, laid down either by himself or the teacher.

These criteria should be very precise and of such kind that there should be no doubt as to which set an object belongs.

*Examples :* Classification of logic blocks according to colour. Classification of pupils according to the month of their birth. If one desires to classify objects according to two or several criteria, it is a good idea to use the 'tree'.

*Example :* Sort logic blocks into sets according to colour and thickness. The tree will have two main branches, one relating to the three colours, the other to the two thicknesses. Thus one obtains six small branches or six subsets.

The subsets may contain no members, one, two or several members.

- 1.2. The aim of these activities is to develop an intuitive approach to the ideas concerned and to teach the children to apply them to real-life situations.

The ideas of membership and non-membership have already made the child familiar with the idea of negation. It is very helpful to think of the set which we are studying as a subset of a referential. The members of the referential, which do not belong (negation) to the subset, form the complement of this subset in relation to the original set.

In order to move towards the idea of intersection, one must make the children realize that overlapping sets exist, that is to say sets with common elements.

*Example :* In a set of logic blocks (a referential) we are considering two subsets : the set of blue blocks and the set of square blocks. The overlapping set is the one in which both blue and square blocks are to be found.

To prepare the child for the idea of addition it is necessary to invent situations where a number of dissimilar sets are joined together. It seems premature to introduce the logical connecting word 'or', that is the inclusive 'or' during the first year. Therefore one should only introduce the joining of overlapping sets if the standard of the pupils is sufficiently high.

The study of sets and the ordering of objects into sets lead to many exercises in the use of the appropriate language and will make the child aware of the necessity for precise terms in mathematics.

It is, however, only desirable to use such terms as 'complementary', 'intersection' and 'reunion' if the child has a perfect mastery of relevant concepts. It is to be remembered that the connection which exists between the operations of intersection of joining and complementation on the one hand and the words 'and', 'or' and 'not' on the other hand, will enable us to arrange numerous situations with the aid of diagrams.

## Chapter 2 : Relations

- 2.1. The concept of relation is basic to the structure of mathematics and sets considered independently of their relation to other sets are amorphous objects, serving no practical purpose.

In effect a relation is a set of pairs and it is easy to approach the concept of pairs with pupils of the first year. It is through the study of concrete situations that one may embark upon this concept. One introduces the Cartesian diagrams and makes the child aware that a pair is the result of ordering two elements of a set : (a,b) (b,a).

- 2.2. The teacher should use a variety of relations taken from everyday life, suggested by the child or by different materials available in the classroom. In this way the children are brought into contact first of all with *any kind of relation* of the type '... has as father ...' in a set of people, '... is intended for ...' in a set of parcels in relation to a set of people, etc.

### 2.2.1. Relations of one set to another :

The children should be introduced to verbalizing and making a concrete representation of such relations.

Examples of relations :

'... are the young of ...'

Source : a set of young animals.

Aim : a set of grown animals.

'... possesses ...'

Source : A set of children.

Aim : A set of toys.

(For each of the relations studied the source, aim, and verbal link should be specified.)

The bijection will become apparent without having been specifically named.

2.2.2. Relations within a set :

Having examined several different instances, it will be possible to affirm the presence of certain properties (symmetry, transitivity, reflexivity, non-symmetry, non-reflexivity), which one will explain in suitable terms to the children.

Relations such as :

'... lives in the same street as ...' within a set of children, '... has the same colour as ...' in a set of logic blocks, the notions of symmetry and transitivity are suggested.

Pairs of the same type may be introduced easily by use of a relation such as : '... butters the bread of ...' within the set of a family, '... takes the place of ...' in a set of children playing a game.

The relation '... is the same size as ...' in a set of rods having the same properties of reflexivity, symmetry and transitivity is an equivalence relation.

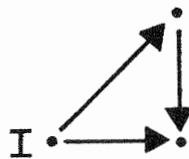
The latter leads to a classification of the rods. Thus relations of this type lead to classifications.

On the other hand the relation '... is larger than ...' in a set of children, possessing the properties of transitivity, non-reflexivity and non-symmetry is a relation of ordering. It creates an arrangement of children. Relations of this type teach the child to order objects and actions.

2.3. A representation of relations may be achieved either by the use of arrow diagrams or by Cartesian diagrams. In either case it is necessary to draw attention to the order of the elements of a pair. To begin with it is more appropriate to use the arrowed diagram.

A most valuable educational exercise of course will be to interpret mute diagrams in various ways.

Example :



May be interpreted by children in the following ways :

'... is heavier (smaller, larger) than ...'

(Ordering of objects according to mass or size.)

One may make a dual purpose chart (for example, the children in the class and the drawings which they have made).

	<i>Boat</i>	<i>House</i>	<i>Table</i>	<i>Fish</i>
A	x	x		x
B	x		x	x
C		x	x	

2.4. It is possible to deduce two relations from the above chart :

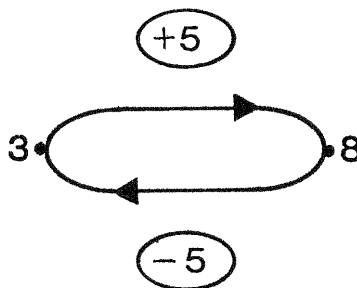
'... has drawn ...'

'... has been drawn by ...'

(The latter being the reciprocal relation of the former.)

The introduction of the reciprocal relation will play an important role in preparation for subtracting operations and the solving of certain problems.

Example :



### Chapter 3 : Numbers

3.1. On entering the primary school all children have a certain knowledge of natural numbers. Some children will have a knowledge of certain numbers by their cardinal aspect and a knowledge of other numbers by 'an idea of order' (ordinal). This rudimentary acquired knowledge does not necessarily imply a knowledge of the idea of numbers; it is that which must first be learnt.

3.2. The idea of number covers 2 aspects : *cardinal* (the cardinal is the number of elements which are all sets of the same class), and *ordinal* (rank of order in a series of numbers : 3 comes before 4, 7 before 9). Research has shown that with lots of children, it is on the ordinal aspect that the idea of number is founded, before consolidating with the help of the cardinal aspect.

3.2.1. The idea of number is one of the oldest there is. To count his sheep, a shepherd of long ago made a tally for each of them using either a stone or a notch in a branch ; this has now come to be known as 'one to one correspondence' (bijection).

One may propose a number of exercises where the children will be led to establish a relationship, one to one between the elements of two sets. All the sets between which it is permitted to establish a bijection will have the same number of elements. One says that these sets are equipotent or that these sets have the same cardinal number. It must be noted that the bijection allows it to be said that the two sets have the same number of elements even when it is a question of large numbers, which the children do not know by name.

By using the relation '... having the same number of elements ...' one determines a division into classes. To each of these classes, one will associate a natural number which (note this) is independent of the nature and the form of the objects. (Each element of a class may perhaps be taken as a representative of the class.) The cardinal number then is useful to us as a common property, not of objects but of sets. From a teaching point of view it will be a question of familiarizing the children with the natural numbers by numerous exercises on equipotent sets. For these numbers which at first, will be those less than 10, one will learn at the same time the name and the symbol. The digits are the signs to show the numbers.

3.2.2. The case, where it is impossible to establish a bijection between two sets, leads us naturally to a natural order. The signs  $>$  and  $<$  could have been introduced starting from the number of elements of the two sets between which exists an injection (such that each element of the range is at the tip of one arrow or no arrow).

3.3. The study of numbers will commence with numbers less than 10. For the numbers more than 10, a code of writing will be necessary. The coding and decoding of numbers is

merely the composition or a decomposition of numbers following a pre-agreed system. It goes to say that this work of coding and decoding will not be theoretical, but that it will depend on adequate material, bringing together or separating off the objects of a set according to a given law.

It is a question of familiarizing the children with an agreed system of writing, all numbers associating and ordering a finite number of symbols. One will show the connection which exists between a number and its name. This is connected to a system of numbering for the numbers greater than the chosen base.

The change of a number from one base into another base is not useful. The arithmetical exercises in different bases will be limited, the final and essential objective is calculations in the base of 10.

It is important to vary all that may be varied :

(a) The material (ordinary objects, abacus multi-base materials).

(b) The base of successive groupings :

- the children must be capable of grouping and exchanging the objects following a given method. From this it is necessary to propose certain preparatory games comprising methods of the same type ;
- they must be able to give some kind of written description of the result of each experiment.

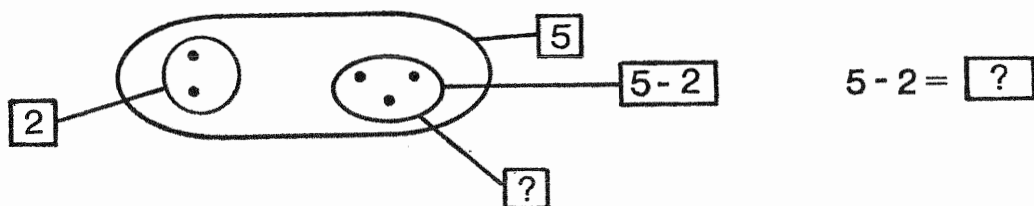
3.4. The operations on natural numbers normally lead from the operations on sets.

3.4.1. The addition of natural numbers will be connected to the intersection of disjoint sets. At the beginning, it will be a question of determining the number of elements in the intersection of the sets. Then one will make a step into the abstraction by speaking of the addition of 4 and 7, for example, and by writing it down perhaps as :  $(4 ; 7) \rightarrow 11$ .

The first numbers may be broken down into sums of two or more numbers. The children will make out the addition tables which will have the form of a double entry board. The numbers will have been arranged in the ordinary manner.

Multiplication can be considered. It will be in the form of particular cases of addition.

3.4.2. Subtraction will be connected to addition by looking for a number of elements complementary to a set in a given referential. The idea of difference will be approached by an exercise of the type  $2 + \dots = 5$  ; or in the following way :



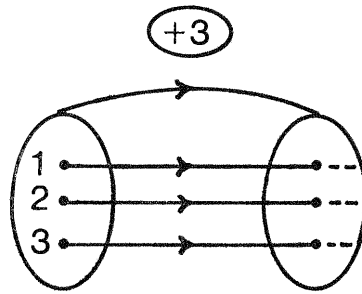
3.5. In the framework of numerical operations remember that the consideration of an operator ( $+ a$ ) and of its reciprocal ( $- a$ ) besides that of the compound of them can be used to good advantage.

Note that an operator acts on an initial set (logical blocks, numbers ...).

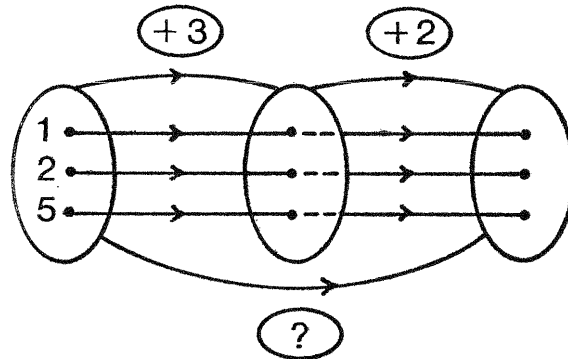
The utilization of machines serves to change the form ; the colour of the logic blocks or all other characteristics, according to the material used, will be a good preparatory exercise. One should start with simple examples, not ambiguous ones, for example 4 logic blocks of 2 colours and 2 shapes. Next one will be able to do more difficult exercises, on the condition that the work of the machine has been fully understood beforehand.

After these exercises, one will present the numerical operators as a machine of analogue function.

Example I



Example II



Chapter 4: Exploration of space

A six-year-old child arriving at the primary school carries with him a pre-geometric knowledge which has been developed in a spontaneous fashion during the first years of his life by more or less intensive contact with the world which surrounds him.

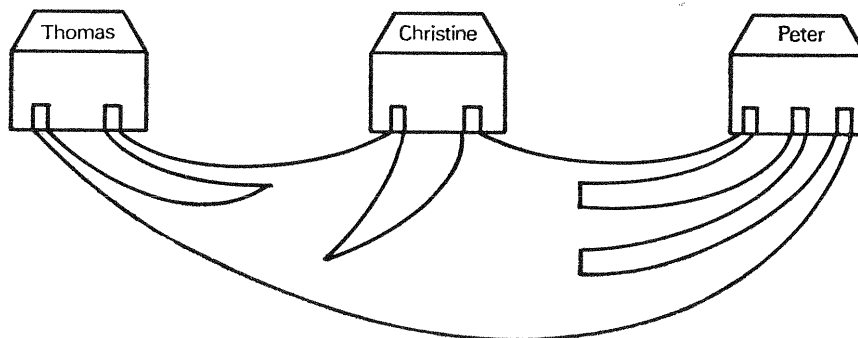
From birth the child explores space by looking and moving. During this exploration he makes contact with objects. He handles them, turns them, flatters them, distorts them, tries to open them and when he succeeds, looks inside.

The child discovers with pleasure that one may move in the space of a room but also that one may only go out through the openings, and that on certain things one may grip and that each object has a back and a front. These experiences reinforced by those that he acquires at nursery school, especially in the region of spatial relations. The child enters the first year provided with an already considerable knowledge.

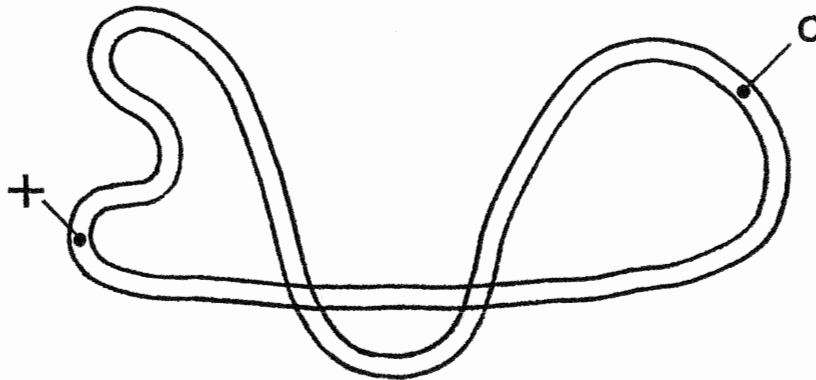
The primary school will encourage the blossoming of the child's personality by continuing the structuring of space in this way.

4.1. Here is an example of games which may be suggested to the children.

- (a) There are two paths leading from Thomas's house to Christine's house, and three paths leading from Christine's house to Peter's. Using arrows mark the path you would take to go from Thomas' house to Peter's.



- (b) John draws a large railway circuit. If one uses a cross to mark where the train goes from and a circle is used to mark the station of arrival. John must mark with arrows the route taken by the train.

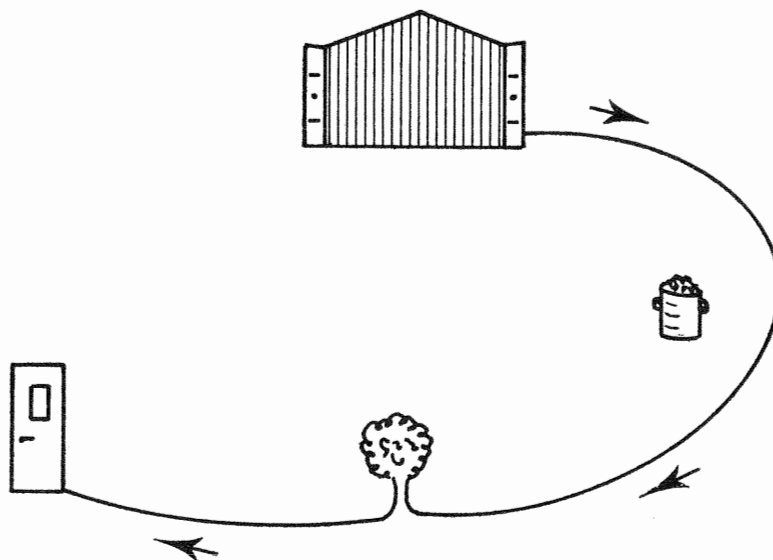


4.2. In the gymnasium one could suggest to the children :

- jump from one side to the other of a line going forwards ;
- turn around an obstacle approaching from the left and from the right following the rules of the road ;
- run a slalom course ;
- throw a ball into a vertical target and a horizontal one ;
- estimate the movement of a trajectory like throwing a ball on the ground and catching it on the rebound ;
- examine a course drawn on the ground or on a board and redraw it on a piece of paper in front of them.

4.3. Here is part of another example of a verbal order :

Start from the gate in the playground, pass first behind the rubbish bin, then under the plane tree and return in front of the classroom door.

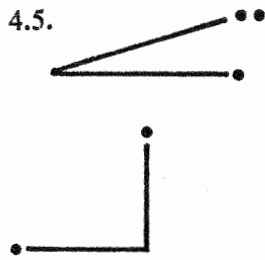


Ask them to colour in the shortest route on their diagrams. This, at the same time, serves as a graphic exercise.

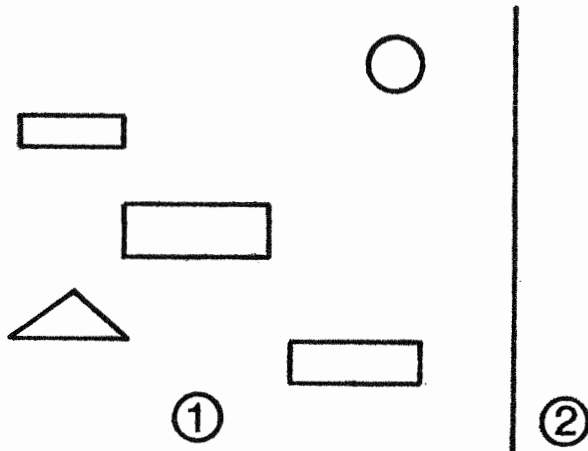
Overleaf, there is another example, using cakes.





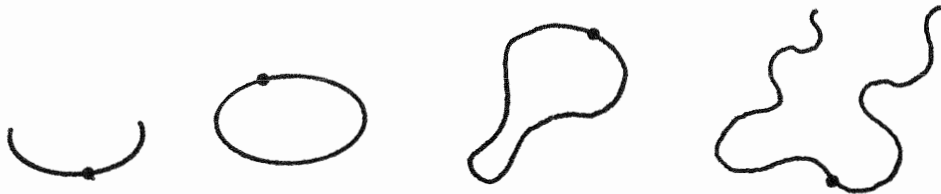


On one side of a line place 3 or 4 matches. Have the children compose a symmetrical figure in relation to the straight line.



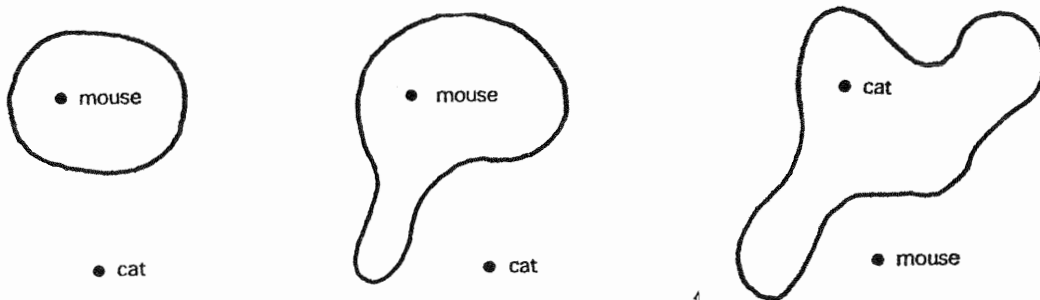
Still in relation to a straight line. Pupils are invited to place logic blocks to obtain in 2 the arrangement shown in 1.

4.6. Look at these drawings :



Pupils are asked to indicate, with a cross under the drawings, where the pearl slips off the string.

Game of cat and mouse :



The pupil is again asked to indicate by a cross under the drawing if he judges that the mouse may sleep peacefully.

4.7. To check the child's knowledge he is asked to examine a board that shows a group of the attributes of logic blocks, and to place a cross by the attribute corresponding to that of a logic block which he holds.

## Chapter V : Problems

To describe a situation consists of giving a series of relevant bits of information. This description will lead to a closed or open problem depending on whether or not the teacher indicates the elements to be drawn from information given.

The problems can be either numerical or non-numerical. However, themes will be chosen within concrete situations known to the child and close to the child's environment. It is essential for the child to be able to effect easily the transfer from a given problem to the corresponding operation. If reading ability in the first grade is not sufficiently advanced then the description of a problem should be given orally and depicted with the aid of either diagrams or arrows.

The reverse type problem consists of asking the children to interpret a mute diagram and is as interesting as the first one.

One should avoid standard problems.

*Time permitting*, one may give the children an occasional initiation to the notion of measurement of size. In the first place, one can take any units of measure that will justify the use of conventional units.

One does not have to limit oneself to measures of length. One also can introduce children to local currencies.

5.1. All situations arising out of normal life may be the starting point of the problem : the data of problems are not necessarily numerical. One may, for example, take the pupils of the class and find ways to classify them following precise criteria (wearing glasses, hats, has two brothers, has a sister, was born in December). Try to avoid criteria that do not allow an exact classification (colour of hair, eyes, style or colour of clothes).

Generally speaking all questions must lead to a single answer.

At this stage it is preferable to give only such information that will effectively be used to find the solution. The pupils' choice may be included in the choice of criteria, which, at this stage of the 'mathematization' of situations will bring useful discussion.

5.2. Generally speaking, one should bring forward numerical problems emanating from day-to-day routine.

*Example* : John has three marbles. Peter has five marbles.

— How many marbles do both Peter and John have together ?

— How many more marbles does Peter have than John ?

Linda has six sandwiches — she eats four of them.

— How many does she still have ?

Remember that the notion of addition comes from work with disjoint sets. Let us further consider that the idea of number of elements may be widened when one joins sets together.

For this, one may use certain situations to sharpen the critical mind of the pupil.

For example : Let us consider three problems.

(1) — Six tulips.

— Ten yellow flowers.

— How many flowers in all ?

(2) — Six poppies.

— Ten red flowers.

— How many flowers in all ?

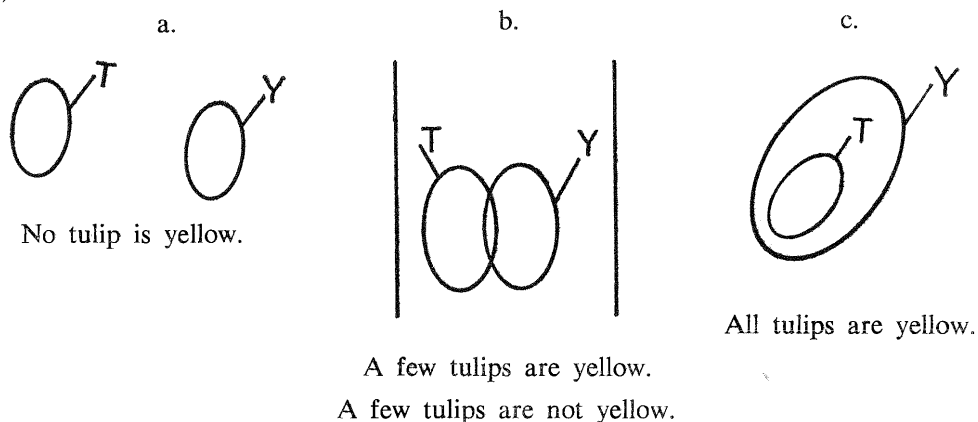
(3) — Six yellow flowers.

— Ten red flowers.

— How many flowers in all ?

*Discussion* : In the first instance, three possibilities exist, as shown in the drawings below :

(1)



A precise answer is only possible if additional information is given. The number of flowers must be between 10 and 16. If one presents the data without posing the question, one has an 'open problem' — It will, however, through reasoning, be possible to envisage different questions and even find all possible solutions to these questions.

*Similar example* :

I have 3 rods — 3, 2, 5.

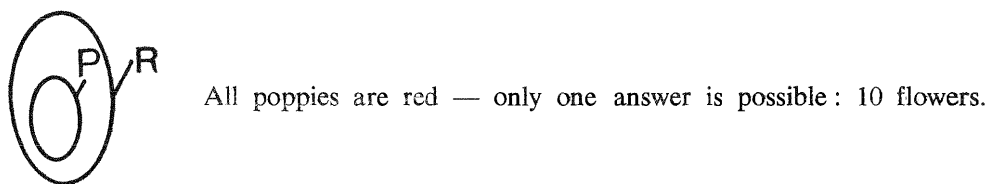
First instance : What may I do ? Open problem.

Second instance : I want to obtain 18. 'The problem is now precise'.

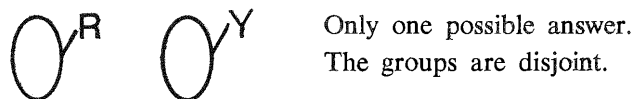
Is there more than one solution ?

Who can find the greatest number of solutions ?

(2)



(3)



Similar examples will help to further understand the idea of the cardinality of the reunion.

Only in the third instance does the total number of flowers correspond with the number of red flowers and the number of yellow flowers.

In example (1) to look for the number of flowers that are not tulips is to calculate the difference — introduction of subtraction.

In example (2) to compare the number of poppies with the number of red flowers also brings in the idea of difference, thus, the natural use of subtraction.

Examples of 'unorthodox problems' follow :

- (1) John plays with an electric train.
  - The train is composed of 7 carriages.
  - Three carriages and the engine are red.
  - How many carriages to the train ?
- (2) John plays with an electric train.
  - Exactly 7 carriages are new.
  - Exactly 2 carriages are old.
  - Exactly 3 carriages are red.
  - How many carriages to the train ?

In the first instance, amongst the information given one can also find the needed information. Others are useless.

In the second instance, the child must realize that only two elements of information are needed to find the solution. The third one is superfluous. One occasionally meets with this type of problem and should be recorded with caution, i.e. cases letting children use addition to solve complex problems.

5.3. Limit yourself to presenting simple examples, as shown in the following drawing :



The pupils are required to give an identity to the set and verbalize the relation (the link between the elements).

<i>Identity</i>	<i>Verbal link</i>
(1) group of students :	'gives a bar of chocolate to'
(2) group of men :	'is son of'
(3) group of people :	'lives just below'

One should discuss non-acceptable examples given by the children :

<i>Identity</i>	<i>Verbal link</i>
(1) group of people :	'lives just below'
(2) group of numbers :	'is taller than'
(3) group of children :	'is older than'

One could, eventually, modify the graphs to render them compatible to the new interpretation.

In passing, one should remember that one can equally convert group drawings into concrete situations.

This allows, in particular, to see better the liaison between the calculation and operations on the sets.

5.4. One should take great care to allow the children to invent their own problems. However, one must take care that the given data is discussed by the class in order that the above-mentioned principles are followed. This method links mathematical problems to those encountered in real life.

In the complex world of perception some of them are neglected and some are emphasized.

To take this step, one has to, first, correctly form the problem, or in other words invent it. This necessitates choosing and an effort at abstraction. Then one tries to discover certain stressed links amongst the sets of elements in question. Thus in class several approaches to the problems are possible :

- (1) Children invent freely (difficult).
- (2) One gives non-numerical or numerical data. Children invent problems re-using the data in various manners either in using them all or partially.
- (3) One gives data, poses a question the solution of which consists in a group of answers. Supplementary information is then necessary to arrive at the single solution. only. One leaves it to the students to find the latter, etc.

## 2nd year

### 1 — Preliminaries

The 2nd-year syllabus constitutes the logical sequence to the 1st-year syllabus and indeed the two form an indivisible whole.

In objective terms we could say that one of the general aims of the primary school is to initiate the child into mathematical thought and language, while at the same time calling to a large extent on his creativity.

Specifically, the instruction given during the first two years will have the following essential objectives :

- (1) A good knowledge of the natural numbers, including operations and numeration ;
- (2) An initial exploration of geometrical space ;
- (3) An initial study of measurement, which will specifically allow the gap between space and number to be bridged ;
- (4) A certain skill in expressing situations of everyday life in mathematical terms.

To achieve these objectives use will be made of the concepts of set and relation. These concepts are not so much specific points in the syllabus, as tools to enable the syllabus to be developed in a unitary manner. A secondary objective will be an initial awareness of the structuralizing nature of mathematics.

The general considerations set out in the preliminaries to the 1st-year syllabus, naturally apply equally to the 2nd year.

However, we would draw attention once more to certain essential points :

- (1) The vocabulary used is a vocabulary enabling an adult to synthesize concepts, ideas and properties. Clearly, young pupils will have to be brought into contact with these concepts by an experimental method. The acquisition of the vocabulary to enable the child to express verbally in precise terms what he has grasped intensively by experience, must proceed progressively during schooling, regard being paid as far as possible to each child's rate of learning.
- (2) The presentation of the syllabuses in the form of lists in no way implies a chronological order ; on the contrary, the various subjects fit into one another and complement one another ; it will often be best to make use of them simultaneously.
- (3) The syllabus is designed to maintain the necessary balance between mathematical activity on the one hand and calculation on the other.

## II — Syllabus and comments

### 1. Sets, relations, structures

#### 1.1. Sets

- 1.1.1. An element belongs to, or does not belong to, a set ; introduction of the signs  $\in$   $\notin$   $\{\dots\dots\dots\}$ .
- 1.1.2. Particular sets : empty set ( $\emptyset$ )  
set containing one element (singleton)  
set containing two elements (pair).
- 1.1.3. Parts of a set. Inclusion ( $\subset$ ,  $\not\subset$ ).
- 1.1.4. Classification, partition (without terminology).
- 1.1.5. Representation of 2 and 3 sets by a general Venn or Carroll diagram.

#### 1.2. Relations

- 1.2.1. Relation of one set A to another set B and relations between the elements in a set.
- 1.2.2. Reciprocal relation of a given relation.
- 1.2.3. Composition of relations, particularly applications and one-to-one correspondence.

#### 1.3. Initial contact with the structure of a group and the idea of isomorphism of groups

### Comments

1.1. Venn and Carroll diagrams and representation of relations by arrows are reliable images to which the pupil will continue to have recourse during his subsequent studies, but at this stage of teaching they enable the essential ideas to be brought out, without the use of a too difficult vocabulary. It is scarcely useful to make the distinction between the definition of a set in extension and in comprehension ; what is important is that the definition should enable the child to say precisely whether an element belongs to a set, or does not.

Passing from one definition to the other must not be an objective in itself, and will not be the subject of systematic exercises. As far as the parts of set are concerned, one could go only far enough to see whether a set is included in another set and no systematic study will be made of the set or the parts of a set.

The possibility of creating subsets of a set, given some supplementary criteria, must be emphasized. In any case, however, it should be shown that to make a partition, it is necessary that the subsets satisfy certain specific conditions. The word 'partition' will not necessarily be used.

The representation of two or three sets by a general diagram should be done starting from a wide variety of well-known situations drawn from everyday life, using various structured materials and finally using sets of numbers. During the 2nd year, the pupil must be brought to realize the various possibilities of an object belonging to, or not belonging to, one, two or three sets. In conjunction with the general diagram, it might be possible also to draw up double-entry tables with the equivalents of 'yes' and 'no', and also tree diagrams.

1.2. In the 2nd year, as in the 1st year, the children will very frequently be led to consider relations. It is inevitable that relations of different types will occur pell-mell at various points in the syllabus. These relations will be analysed progressively and their characteristics brought out (without distinguishing them by their specific names), so that it will be possible during the teaching in the subsequent years :

- (1) to define what a relation is ;
- (2) to classify relations as functions, applications, one-to-one correspondence of one set to another set, and as transformations and permutations within a set ;

- (3) to define the properties of the relations in a set and to distinguish the relations of order and equivalence.

The reciprocal of a relation is obtained by reversing the arrows in a given relation, which leads to a new description of the same situation, seen under a different aspect. Consideration of the reciprocals of relations will be a great help to us in solving problems. The composition of functions will be introduced starting from familiar situations and, in particular from family relations, such as grandfather on the mother's side, grandmother on the father's side.

Then again, the composition of numerical functions will help us to specify the operations of mental calculations and to solve certain problems, especially the exercises of 'mathematical golf'.

- 1.3. Structures are at the base of mathematics, so it is important for the children to come into contact with them, starting at the stage of elementary instruction.

The group, the most privileged of all structures, must be manipulated by the child as early as possible, without, however, the use of precise terminology. The child should be made accustomed to construct tables of operations and to analyse them. Tables of finite groups should be obtained, derived from various games, e.g. with clocks and calendars. These tables will allow us to demonstrate :

- (1) that the sum of two elements of a group is an element of the group ;
- (2) that an element (neutral) behaves in a particular manner ;
- (3) that given an element which is not neutral, another element exists, which added to the first, gives the neutral element.

It should also be demonstrated that the solution of an equation of the type  $x + a = b$ , can be obtained systematically, with the aid of a table if necessary.

Addition tables for finite groups having two or three elements will enable structures to be compared and the transitions from one to another to be effected with the aid of a little coding device. In the same way, the calculation of modulus 12 on a clock and an analogous calculation on the months of the year, will, as above, provide an initial idea of what an isomorphism may be.

It is important that the teacher, not the pupil, should know that there is in fact only one group with two elements, one group with three elements and one group with five elements, while there are two groups with four elements and three groups with six elements.

## 2. *Operations on sets and logic*

- 2.1. Intersection of two sets. The symbol  $\cap$ . Connection with the logical connector 'and'.
- 2.2. Union of two sets. The symbol  $\cup$ . Connection with the logical connector 'or'.
- 2.3. Complement of a set A in relation to another set taken as the reference set. Connection with the logical connector 'not'.
- 2.4. Initial idea of the properties of operations (without terminology).
- 2.5. Cartesian product of two sets.

### *Comments*

The word 'logic' in the heading of this paragraph could lend itself to confusion ; it is of course understood that there is no question of doing propositional logic systematically, but simply of specifying the meaning that we give in mathematics to 'and', 'or' and 'not', in conjunction with the operations of intersection, union and complementarity of sets. This work was prepared for the 1st year. In the 2nd year, it will suffice to multiply the examples, to make the children more conscious of what they are doing and to familiarize them with the symbols.

It is undeniable that the union of sets presents no intrinsic difficulty, but that the trouble it causes is due to confusion in the meaning of the word 'or' in ordinary language. Consequently it is essential to convince the children of the need to follow a convention



which excludes any possibility of confusion ; the choice of mathematician has fallen on the non-exclusive (inclusive) 'or'.

An empty set as the result of an intersection, turns up automatically in numerous examples. Advantage should be taken of such occasions to fix and deepen the idea of disjoint sets, which has been used subconsciously in the 1st year in connection with the operation of addition of natural numbers.

For a number of reasons, it has been considered preferable not to introduce the general idea of the difference between two sets in the 2nd year. It is in fact possible to produce confusion in the minds of the children (the difference between two sets does not necessarily correspond to the difference between the cardinal numbers); and the general difference does not find any immediate application. In fact, to arrive at the difference between a set and one of its subsets, it suffices to take the complement of the latter with respect to the former taken as a reference. ( $B \subset A \rightarrow \text{card } A \setminus B = \text{card } A - \text{card } B$ ).

It is easy to arrive at a demonstration of the commutativity of  $\cap$  and  $\cup$  as a property of operations on sets. As to other properties, one can limit oneself to discovering the associativity of  $\cap$  and  $\cup$ , on the basis of examples.

In regard to item 2.5, it must not be forgotten that stress must be laid on the distinction between a pair and a couple and on the fact that the Cartesian product of two sets is a new set whose elements are the couples ( $\text{card } A \times B = \text{card } A \cdot \text{card } B$ ).  $A \times B$  is read as 'A cross B'.

### 3. *The natural numbers (N)*

- 3.1. The natural numbers regarded as cardinals, ordinals, operators.
- 3.2. Representation of the natural numbers on the decimal and other bases.
- 3.3. Addition, subtraction, multiplication of natural numbers.
- 3.4. Initiation into the properties of operations (without terminology).
- 3.5. The relations  $<$ ,  $>$  in the set N.
- 3.6. Divisors, multiples and powers.
- 3.7. Initiation into division with a remainder.
- 3.8. Practice of the operations. Mental calculations.

#### *Comments*

As has already been said, it is not at all advisable to set an upper limit to the use made of the natural numbers, it being understood that systematic training will be given in respect of the numbers below 100.

During the course of the school year, the children should be shown the natural numbers under their triple aspect of cardinals, ordinals and operators, by means of as many examples as possible.

The numeration of position and the introduction of O have considerable influence on calculation as a tool, and a good basic knowledge of numeration is necessary to the child. Whilst the two most important bases are the decimal and the binary, it is nevertheless convenient not to start with either of these, the former being already familiar to some of the children, the latter being too special. Whilst the object of carrying out calculations on other bases than 10 is to provide better understanding of the principle of position numeration, it is nevertheless important that the training of the pupils in calculation should essentially be in the decimal system.

The four operations should be introduced on selected materials but in conjunction with the operations on sets. Multiplication may be introduced either as an iteration of addition, or in conjunction with the Cartesian product of two sets. In any case, the connection between these two ways of defining multiplication should be established.

Contrary to the old custom of leaving the properties of operation to the secondary stage

of education, these properties should be brought out during the first two years of primary instruction.

Distributivity has considerable importance, it being in practice, what conditions neutral calculations.

The strict order relations of  $<$  and  $>$  are more easily grasped at this age than the order relations  $\leq$  and  $\geq$ , and even than the relation of equality.

The introduction of powers should be limited to particular cases of multiplication.

#### 4. *Exploration and organization of space. First initiation into geometrical ideas*

4.1. Parallelism and perpendicularity.

4.2. The usual figures: rectangle, square, diamond, trapezium, parallelogram, triangle, circle, cube and parallelepiped.

4.3. Recognition of these figures in the natural environment.

4.4. Formation and drawing of these figures, folding, freehand drawing and the use of instruments (straight-edge, set square, compasses).

4.5. Observations and discovery of properties.

##### *Comments*

Whereas in the 1st year it was a question only of making initial contact with the usual geometrical shapes, now, in the 2nd year, it is a question of exploring space more systematically, which should enable the child successfully to approach the geometrical transformations which will be studied later.

Up to now, we have been content to recognize shapes and to measure them. Now they will be observed more closely and an attempt will be made to reproduce them and to discover their properties.

The objective is the study of plane figures. However, contrary to the current practice, there will not be progress from the simple to the complex, but the starting point will be natural space, the elements of which will be brought out.

Let us not forget, that during earlier years, and mainly during its physical training class, the child will already have become aware of relations between its body and the environment (movements, relative positions, points of reference, etc.). Then again, observation of the outside world, construction games, the use of structured materials, various special representations (diagrams, tables, trees, etc.), all (implicitly) make use of geometrical ideas. If clumsiness is exhibited in drawing shapes, one should not be discouraged. It must not be forgotten that certain ideas become clear only slowly and need to be manipulated on numerous occasions. It must not be forgotten either, that this approach will never be exhaustive and that the teacher will be able to profit by opportunities which arise in other fields, to emphasize certain points in geometry.

Conversely, it should be noted that the examination of plane and solid figures could be the opportunity to invite the children to study other mathematical ideas and particularly ideas of relation.

In this way, it is possible to classify geometrical figures in respect of certain criteria (parallelism of sides, perpendicularity of sides, number of sides, number of apexes, length of sides, etc.).

Starting from simple solids, such relations as the following can be studied :

- is directly connected to (in a set of apexes) ;
- is the same length as (in a set of edges) ;
- borders on (relation between edge and face) ;
- has the same area as (set of faces), etc.

It is possible to construct certain figures starting with two parallel bands which intersect and to study the different figures obtained by displacing the bands in relation to one another.

The experimental exploration of a plane will be carried out with a straight-edge (ruler without graduations), a parallel ruler, a set square and a pair of compasses.

The use of the straight edge will enable the teacher to bring home that :

- (1) given two points on a sheet of paper, it is possible to draw one straight line, and one only, which passes through the two points ;
- (2) given three points on a sheet of paper, it is not generally possible to draw a straight line through them (so making the distinction between points in alignment and points not in alignment) ;
- (3) a plane and a straight line can be considered to be without limits.

The parallel ruler demonstrates the relation of parallelism, a relation which can be considered as reflexive, in order to turn parallelism into a relation of equivalence.

It will simply be noted :

- (1) that a straight line is parallel to itself ;
- (2) that if a straight line is parallel to another straight line, that other is parallel to the first ;
- (3) that, if a straight line is parallel to another one and that one is parallel to a third, then the first and third are parallel.

The relations of parallelism and non-parallelism will be made use of in sets of straight lines in the same plane or in the sets of straight lines supporting the edges of a parallelepiped. It will be checked experimentally that given a straight line and a point, one, and only one, parallel to the straight line can be drawn through the point.

A plane will then be organized starting from an affine network. The child will be initiated in advancing along the network, advance which he will represent, code and decode.

The set-square will demonstrate the idea of perpendicularity.

It will be seen :

- (1) that a straight line is never perpendicular to itself ;
- (2) that if a straight line is perpendicular to another, the other is perpendicular to the first ;
- (3) that if a straight line is perpendicular to another and the other is perpendicular to a third, then the first is not perpendicular to the third, i.e., that the relation of perpendicularity is not transitive. In fact, the third is parallel to the first.

The perpendicularity to a straight line passing through a point will be constructed and the uniqueness of the straight line will be noted. The affine network of reference will now become a network of perpendicular straight lines.

The pair of compasses will enable us to transfer distances. In particular, affine and rectangular networks could be constructed, from then on, as equidistant parallels. (This condition of equidistance does not exist in the first two networks.)

Some games could be played on the shortest distance from one point to another, e.g. based on geoplans. In the course of his observations of the medium, of drawings and of manual work, the pupil will be lead to recognize, construct and utilize plane geometrical shapes.

In parallel with this exploration, the child must necessarily have studied the usual geometrical shapes. The analysis and reproduction of these shapes will take place in both the 1st year and the 2nd year and could take place during observation exercises, in drawing lessons or manual work lessons.

The cube and the parallelepiped will be constructed when during manual work and represented during a drawing lesson.

## 5. *Measurement of magnitudes*

5.1. Conventional units of measurement and the relationship to the decimal system of numeration.

5.2. The usual practice with these measurements : carry out numerous actual measurements of length, area, mass, capacity, temperature, carry out purchases and payments.

### 5.3. Relationship between the measurements of the same magnitude obtained in observation exercises.

#### *Comments*

The idea of measurement is an idea which children know instinctively. In everyday life, measurements are made of lengths, masses, speeds, petrol consumptions, gas and electricity consumption. This is, anyway, one of the traditional activities of the primary school, which has long since been modernized to the extent of providing a better comprehension of the conventional character of units of measurement.

We also know, that although the idea may be familiar, it is far from being clear, the length of a time is measured, but a temperature is not measured, it is located.

On the other hand, to determine the number of elements in a set is to carry out a measurement on the set.

Then again, the word measurement covers both an experience and the result of that experience. From a pedagogical point of view, it is important to approach the concept of measurement by bringing out the following essential ideas :

- (1) The choice of unit is clearly arbitrary. When the unit has been selected, a number can be associated with each magnitude measured ; this corresponds to the exercise carried out by children who measure the length of the playground by taking their feet as a unit of measurement. The choice of standard units of measurement and systems of measurement has been made to meet experimental and social convenience. But we know too, that not so long ago, the length of the king's arm was a unit of length and that it changed with each new king. We also know that up to very recently the Anglo-Saxons used a system of measurement which was less convenient than ours, but they nevertheless knew how to calculate lengths. What is important is not so much the unit and system used, as the underlying structures.
- (2) In practice it is not always true that a number can be associated with a magnitude as soon as the unit of measurement has been chosen. It is true on the following two conditions :
  - (a) that one has real numbers at one's disposal, which is not the case for children in the 2nd year ;
  - (b) that one possesses very accurate measuring instruments, hence the need to introduce the ideas of straddling and approximation.

Consequently, it is advisable not to be content with presenting examples in which the magnitude to be measured is a multiple of the chosen unit. As far as possible, one should start from natural situations, which lead the children into discussion and finally to give a result by means of two numbers.

- (3) In the case where we have two numbers which do not overlap one another and are such that their measurements can be given as whole numbers, it can be shown that  $A \cap B = \emptyset$ ,  $\text{meas. } (A \cup B) = \text{meas. } A + \text{meas. } B$ , a property which is comparable with those we have seen for the cardinals of two disjointed sets.
- (4) The use of systems of measurement and changes in units in a system, could each serve later to introduce numbers with a decimal point.

## 6. *Practical exercises*

- 6.1. Interpretation of graphs without texts. Criticism of graphs.
- 6.2. Counting the parts of a set in simple cases. Combinatorial games.
- 6.3. Numerical relations and machines.

Composition of relations, machine channels and reduction of machine channels.

- 6.4. Exercises on the forms  $\text{card}(A \cup B) = \text{card} A + \text{card} B - \text{card}(A \cap B)$ .
- 6.5. Problems requiring the solution of an equation of type  $ax + b = c$ , in simple cases.  
Problems of linear programming, within the scope of 7-year-old children.  
Problems relating to common multiples.  
Problems of sharing.

### *Comments*

This part of the syllabus must not be considered as distinct from the others, it does however appear to be essential to the extent that it allows teachers and pupils to exercise the inventive spirit. This creativity will be exercised not only in seeking the solutions of problems, but also in the statement of the problems.

The interpretation of graphs without texts has as its objective, the development of the imagination and the spirit of criticism of the children. The interest of the exercise resides in the fact that several interpretations of the same graphs are possible. Discussion of the various solutions suggested will prove to be very fruitful. The analysis of incorrect graphs can be regarded in the same way.

Initiation into combinatorial games should be undertaken starting in the primary school. Above all, it is a question of developing a forward-looking attitude of mind, which leads the children to make a choice in a universe of possibilities. This is why it is advisable to start by having the children check all the parts of a finite set having very few elements (2, 3, or at the most 4 for the best pupils). It must be emphasized that children find difficulty in detaching themselves from the real and imagined combinations which have not been materialized previously, so that it is advisable not to go beyond simple exercises, starting from concrete manipulations and to record the results with the aid of graphical presentations (tables, trees), or some other coding system.

It is an advantage to prepare for the study of numerical relations by means of games concerned with non-numerical relations. The numerical operators will also serve in elaborating techniques of mental calculation.

It is known that the cardinal of the union of two disjoint sets is the sum of the cardinals of the two sets. This is a particular case and it is interesting to introduce the children to some counter-examples where the sets have a common part.

From counts in a variety of situation, it is possible to derive the following general formula :

$$\text{Card}(A \cup B) = \text{card} A + \text{card} B - \text{card}(A \cap B);$$

which can also be presented in a more symmetrical form :

$$\text{Card}(A \cup B) + \text{card}(A \cap B) = \text{card} A + \text{card} B.$$

This should be placed in parallel with the analogous idea on the measurement of magnitude.

The use of graphs will enable equations of the type  $ax + b = c$  to be solved by composing the two operators ( $xa$ ) and  $(+b)$ . In general it will be useful to make use of the various means of studying one and the same situation, the various means will allow particular aspects of the problem to be explained.

Exercises of the mathematical golf type will supply us with an approach to problems of linear programming.

### III — Symbols and terminology

	Is read by the child as	Notes for the teachers
$\in$	is an element of	sign of belonging
$\notin$	is not an element of	sign of not belonging
$\{...\}$		
$\subset$	is a part of	sign of inclusion
$\not\subset$	is not a part of	sign of non-inclusion
$\cap$	inter	sign of intersection
$\cup$	union	sign of union
$\emptyset$	empty set	
$=$	is equal to	
$<$	is less than	
$>$	is greater than	
$\leq$	is equal to or less than	
$\geq$	is equal to or greater than	
$+$	plus	? (Sum of two numbers) ?
$-$	minus	difference of two numbers
$\times$	times	product of two numbers
$:$	divided by	

### 3rd year

#### I — Preliminaries

According to what numerous groups of psychologists have found, learning a concept is the result of long and slow progress which may extend over a number of years, even if the process of learning does not continue indefinitely.

It will therefore not be at all surprising to find again in the syllabus proposed for the 3rd year of study, numerous points which have been started on in the first two years, in an exploratory phase based on a large number of concrete situations.

During the 3rd year, the fundamental ideas will be considered again and made more precise ; their essential characteristics will be brought out from examples and counter-examples.

At this stage, the child will feel the need to communicate with others ; so, gradually, there will be insistence on correct formulation, using progressively the technical vocabulary and the symbols.

The work differs from that in the first two years, while retaining many elements common to the work already done. It is intended for children in a more advanced state of intellectual development and already having a more marked power of concentration.

The child, while continuing to base himself on his own experience, organizes his experience at a higher level and compares its elements more systematically than in the past. He continues to discover similarities and differences ; he becomes aware of the conservation of certain characters inherent in his material experience and the conservation of the properties of operations.

We must stress that it would be harmful to study in depth various concepts, one after the other ; on the contrary, it is advisable to develop the concepts simultaneously and gradually, since interactions are necessary and are favourable to the good understanding of the individual concepts. The environment, a word used so often these days, will provide the teaching situations which are the most stimulating for the child.

The syllabus set out below is an outline syllabus containing targets to be reached. All the sections need to be dealt with. It is important that the children should be given an understanding of the essential ideas contained in it. Certain points of detail may be left out. It is not required in any case to treat all the points exhaustively.

#### II — Syllabus and comments

##### 1. *Sets, relations, structures*

###### 1.1. Sets

- 1.1.1. An element belongs, or does not belong, to a set — truth or falsity of a proposition.
- 1.1.2. Parts of a set and inclusion.
- 1.1.3. Partition.
- 1.1.4. Representation of two and three sets by means of a general Venn or Carroll diagram.

###### 1.2. Relations

- 1.2.1. Relation of one set to another :
  - Relation considered as a set of couples.
  - Cartesian product of two sets.
  - Reciprocal relation of a relation.
  - Different representations of a relation.
  - Distinction between relation, application and one-to-one correspondence.

### 1.2.2. Relation in a set

- Comparative study of relations and discovery of the properties of reflexivity, antireflexivity, symmetry, antisymmetry and transitivity.
- Observation of diagrams.

#### *Comments*

- 1.1. During the course of exercises revising the idea of a set, it should be made clear that a set always contains subsets and that a subset is itself a set. The pupils must be reminded of what constitutes equal sets, equipotent sets, disjoint and non-disjoint sets, including subsets.

In conjunction with the idea of belonging, the idea of property and non-property should be made clear and a logical value, true or false should be attributed, subconsciously perhaps, to a proposition or propositional form.

It should be demonstrated that it is possible to materialize information on property and non-property in respect of the elements of a set, by means of perforated cards.

The utility, and often even the necessity, of clearly mentioning a frame of reference has already been stressed. It is not by starting from this frame of reference, anyway, that one can speak of complementing a set. Venn and Carroll diagrams will make clear the connection existing between complementing a set and negating a propositional form.

The idea of inclusion and of part of a set has already been dealt with in the 2nd year ; it should be made precise and studied more deeply in the 3rd year class.

The idea of partition is obtained by carrying out classifications in an initial set. In the 2nd year, pupils were asked to make classifications based on two different criteria ; in the 3rd year, these classifications could be made, based on a number of criteria. In the course of exercises, attention must be drawn to the universality of general Venn and Carroll diagrams.

- 1.2. During the first two years the pupils were familiarized with the idea of relation considered in a concrete context. The various way of representing a relation visually should be brought out again at the start of the 3rd year. Games on relations will lead the child to conceive any relation as a set of couples. The idea of set and of relation will have been sufficiently dealt with previously to make it possible now to proceed to a conscious structuralization of ideas. The child is ready to approach the concept of relation as a set of couples and numbering these couples will provide a new way of representing a relation, to be added to those already known. The child should be made accustomed to coding and decoding relations in various ways and to pass from one mode of expression to another, although this is not essential.

It goes without saying that the idea of a set of couples leads to the idea of a Cartesian product. The child ought to be conscious of the fact than any element of a set can be associated with any element of another set and he ought to be capable of representing the set of all these couples in various ways.

The determination and visual presentation of subsets of this product of sets, which provide a check of a given condition, then enable any relation to be considered as a subset of a set of the product of sets. Up to now, most relations had been presented with their reciprocals represented by an arrow in the opposite direction and an appropriate verbal connection. From now on, the teacher will be able to introduce a language which is more mathematical, particularly to express the reciprocal relation itself.

The set of the product of two finite sets will now be able to be represented by a tree diagram ; a relation will then be represented by a certain number of the branches of the tree. It should be noted that this representation as a tree can be generalized to represent a set which is the product of more than two sets.



The teacher should find examples to illustrate the ideas of function, application and one-to-one correspondence and at the same time, to introduce the child to the ideas of 'at most one' and 'at least one'. A function is a relation in which each element 'a' of the initial set is associated with at least one and at most one image in the final set. This is equivalent to saying that each element in the initial set has one image and only one.

An application is a function in which each element in the initial set is associated with at least one and at most one image in the final set. This is equivalent to saying that each element in the initial set has one image and only one.

A function will always be able to be reduced to an application if the initial set is limited to the subset of the initial set, thus each point has one image.

It is quite clear that the words 'function', 'application', and 'one-to-one correspondence' are not necessary, but it is essential that the child should be able to distinguish between these different types of relations.

As to the relations in a set, which are presented initially in a global manner, they will be analysed subsequently.

The properties of reflexivity, symmetry, antisymmetry and transitivity, which are observed separately at the start, will now be looked at more synthetically to enable the ideas of pre-order, strict order, order and equivalence to be made clear.

Reflexive and transitive relations provide a pre-order ; anti-reflexive, anti-symmetric and transitive relations provide a strict order ; reflexive, anti-symmetric and transitive relations provide an order ; and reflexive, symmetric and transitive relations provide an equivalence.

The teacher should avoid formulating relations in the form of verbal connections without specifying the reference set, otherwise serious mistakes will be made, especially in searching for properties.

In the 3rd year, one can always be content with a language expressed in images, without necessarily introducing the technical vocabulary.

## 2. *Operations on sets and logic*

- 2.1. Intersection of two sets. The symbol  $\cap$ . Connection with the logical connector 'and'.
- 2.2. Union of two sets. The symbol  $\cup$ . Connection with the logical connector 'or' (inclusive or).
- 2.3. Complementing a set in respect of another set taken as the reference set. Connection with the logical connector 'Not'.
- 2.4. Properties of operations (commutativity, associativity, distributivity).

### *Comments*

The elements belonging to the intersection of two sets should be characterized by using the conjunction of properties. The detailed characterization belonging to the union of two sets should be carried out by using the disjunction of their properties. The characterization of the complementary set should be carried out by using the negation of the propositional form which characterizes the elements of the given set.

The  $\cap$  and  $\cup$  rules, and also the logical connections 'and' and 'or' have three remarkable properties : commutativity, associativity, distributivity. These are properties which condition all calculations, whether mental or written. Consequently the pupils must be familiarized with these properties, which can be established very clearly with the aid of a Venn diagram, provided care is taken to use boundary lines of different colours. Here, as elsewhere, the teacher should judge when the time is right to introduce the vocabulary and insist upon correct formulation.

At this level, numerous logical games and games of conjunction, disjunction and negation are desirable. It should also be possible to have the pupils carry out a series of exercises enabling them to exercise the deductive faculties.

The method of dealing with perforated cards to obtain sets by intersection, union and complementing, should be demonstrated.

### 3. Numbers

#### 3.1. Natural numbers :

- 3.1.1. Numeration.
- 3.1.2. The four operations and their properties.
- 3.1.3. Relations of order in  $\mathbb{N}$ .
- 3.1.4. Multiples and divisors.
- 3.1.5. Exact division and Euclidian division.
- 3.1.6. Residual classes.
- 3.1.7. Powers of a number.

#### 3.2. Decimal numbers :

- 3.2.1. Introduction of the decimal point for measurements of length and for currencies.
- 3.2.2. Comparison of two decimal numbers.
- 3.2.3. Exercises on the addition and subtraction of decimal numbers.

#### 3.3. Fractions :

- 3.3.1. Taking a fraction of a number, a length and an area.
- 3.3.2. Comparison of two fractions having the same denominator.

#### 3.4. Operating techniques :

- 3.4.1. Mental calculation :
  - addition and subtraction of whole numbers up to 1000 ;
  - multiplication tables from 1 to 10, with the corresponding divisions ;
  - multiplication by a one-figure number.
- 3.4.2. Written calculations :
  - addition and subtraction of natural numbers ;
  - multiplication and division by a one-figure natural number ;
  - addition and subtraction of decimals.

#### *Comments*

- 3.1.1. Numerous manipulations will have enabled the child to grasp the notion of natural numbers, considered as the property of a set, starting from the one-to-one correspondences which can be established between these sets. During the first two years the children have had practice in making groups of objects in accordance with rules chosen in advance, this enabled us to name natural numbers and to represent them by a limited number of symbols.

Exercises on numeration should be continued to make clear the basic principles of all position numeration. As during the first two years it is not advisable to fix an upper limit to the natural numbers of which use may be made, it being understood however that systematic training should be given in respect of the natural numbers below 1000.

- 3.1.2. Amongst the four operations, two are essential : addition and multiplication ; subtraction and division attach themselves to these respectively. These operations are carried out on numbers and on cardinals of finite sets, and not on the sets. As far as concerns the properties of operations (commutativity, associativity and

distributivity), these will enable various calculating procedures to be elaborated ; these should be invented by the children and not imposed by the teacher.

Addition tables will retain their value and must not be neglected, but they should rather take the form of Pythagorean tables.

It is not sufficient to learn to associate two given numbers mechanically with their product ; the relations between the different products must also be established.

Multiplication, which was presented in the 2nd year as a series of additions, should be related in the 3rd year to the set of the product of sets, they being incidentally a particular union of parts having the same cardinal numbers. Since this partition can be presented in two different ways, it will provide us with the commutativity of multiplication. Stress should be laid on the role of the elements 0 and 1 or in addition and in multiplication.

The teacher has at his disposal a number of ways of leading the children to use the four operations properly and of discovering their properties. The solution of problems which require the use of one of the four operations, is facilitated by graphic layouts, Venn diagrams, representations by arrows, tables, etc. The formulations and solution of the inverse problem to the problem given, will aid the child to understand the reciprocal operation of a given operation.

3.1.3. The comparative relations 'more than', 'less than', 'smaller than' and 'greater than' should be manipulated and symbolized during the work in the 3rd year.

3.1.4. The multiplication of two numbers being known, it will not be difficult to familiarize the child with the sequence of multiples of a number  $a$ , and to see that this sequence is only the sequence obtained by repeated use of the operator  $+ a$ , starting from 0.

The common multiples of two numbers  $a$  and  $b$ , are the natural numbers which are multiples both of  $a$  and of  $b$ . These common multiples are therefore the elements of the intersection, obtained by considering the two sets formed by the multiples of  $a$  on the one hand, and the multiples of  $b$  on the other. It is clear that these common multiples are the common terms of the following two series.

0,  $a$ , 2  $a$ , 3  $a$ , ...

0,  $b$ , 2  $b$ , 3  $b$ , ...

The notion of a divisor of a number is intimately linked to that of multiple since if a number  $a$  is a multiple, which is not zero, of a number  $b$ ,  $b$  is called a divisor of  $a$ . While the multiples of a number  $a$  are infinitely numerous, the divisors of a number, on the other hand, are finite in number. The common divisors of the two numbers  $a$  and  $b$  are the elements common to the set of divisors of  $a$  on the one hand and the set of divisors of  $b$  on the other. We should point out that the relations 'is a multiple of' and 'is a divisor of', are transitive relations.

3.1.5. Distribution problems will naturally lead to the notion of Euclidian division and to exact division, which is anyway only a special case of Euclidian division.

In the case of the exact division of two numbers  $a$  and  $b$ , one can write :

$$a = bq \quad \text{or} \quad a : b = q.$$

In the case of Euclidian division, attention should be drawn to the relation :

$$a = bq + r \quad \text{where} \quad r < b,$$

and, where necessary, the exact quotient of one or the other should be noted in the following ways :

$$a \div b = q \quad \text{or} \quad [a : b] = q.$$

To find the quotient of two numbers, use should be made of either a Pythagorean table, or, of one or other of the multibase materials.

- 3.1.6. If the natural numbers are divided in turn by a given natural number  $n$ , a series of quotients and remainders is obtained and natural numbers which have the same remainder can be grouped. These groups establish a partition of the natural numbers into  $n$  parts called classes of natural numbers of modulus  $n$ .

The presentation of these classes in a star is very suggestive and it is desirable, if time allows, to carry out certain operations on these classes.

- 3.1.7. The pupil will already previously have discovered the idea of the power of a number, introduced as a special case of multiplication. The variety of exercises and games on bases of numeration could serve, in the 3rd year, to promote the consolidation of this idea. Examples drawn from geometry could also contribute to clarifying concept (area, volumes).

Naturally, all this study of numbers should be linked continuously to that of relations, through the intermediary of operators, or mechanisms which transform numbers. The numerical operators of the type  $+ a$ ,  $- a$ ,  $\cdot a$ , and  $: a$  should be studied, being applied preferably in a real context. Each operator should be presented with its reciprocal, this will enable us to construct problems which are the converse of one another. The multiplying operator will serve to introduce the very important idea of proportionality.

The composition of relations prepares the way for the composition of numerical operators; in this way chains are obtained, some of which can be reduced to a single operator. As was already stated in the second year, it is always useful to precede the study of numerical operators by the study of some operators which transform the properties of objects, e.g. the colour or shape of a logic block.

- 3.2.1. The pupils will discover the idea of a decimal number by making use of the conventional units used for measuring lengths and used in currency.

Anyway, decimal numbers are only special cases of numbers with a point, which is a more general notion relating to numeration in various bases. The very existence of numbers with a point is linked to the fact that the numeration used is a position numeration. Generalizing from decimal numbers to numbers with a point will be carried out in later years.

It is necessary to draw attention to certain points, particularly to the fact that the natural numbers can be identified with certain particular decimal numbers, or that the natural numbers have been immersed in a bigger set, and also to the role played by 0 in writing decimal numbers, a role which is different from the one which it plays in the numeration of the natural numbers when it is placed either to the left or to the right of the number.

However we note that as far as the 0's situated on the right of a decimal number are concerned, although mathematically they can be suppressed without inconvenience, physically they may be of considerable importance, particularly in indicating the degree of precision of a measurement.

- 3.2.2. The relation of order which exists in the set of natural numbers, should be extended to the set of decimal numbers.

- 3.2.3. The pupils should learn to add and subtract decimal numbers in connection with problems drawn from everyday life. It should be verified that these operations have the same properties as those already observed in the set of natural numbers. Numerous mental and written exercises should ensure that these operations can be handled with speed and certainty.

- 3.3. An initial contact with fractions was made in the 1st and 2nd years. In the 3rd year, the notions should be developed by considering fractions as operators applied to magnitudes. Comparison of fractions should not be neglected, particularly of those having the same denominator.
- 3.4. Although teachers have been urged, in numerous situations, to do mathematics without numbers, it is nevertheless true that one of the important objectives in the teaching of mathematics is, of course, to render the child capable of mastering the various techniques of calculation. This mastery will depend on the interest taken in giving understanding of the fundamental properties of the operations (commutativity, associativity, distributivity).

On the basis of the knowledge already acquired, and proceeding by analysis and synthesis, the child should be led to discover more rational and faster systems of mental calculation and he should base his written calculations on this procedure.

It is essential to have recourse to these techniques as often as possible and not to use them only in senses specifically reserved to them. When practising measurements in particular, there will be numerous opportunities of carrying out calculation exercises.

- 3.4.1. Mental calculation, which is enriching and educative, must remain one of the teacher's prime concerns. Exercises in mental calculation should be carried out regularly, during fairly brief periods. It goes without saying that it is essential that the exercises should become progressively slightly more difficult; this involves careful preparation by the teacher.

For the four operations, the result can often be obtained in different ways. The pupils must be allowed the possibility of trying them out. Nevertheless, the quickest amongst several possible ways should briefly be made clear.

- Addition and subtraction of natural numbers from 0 to 1000.
- Revision of the two operations in the domain of the natural numbers up to 100.
- Operations, with variations, of the following types :  
 $300 + 400$  ;  $300 + 60$  ;  $372 + 9$  ;  $648 + 20$  ;  $648 + 28$  ;  $170 + 80$  ;  
 $178 + 85$  ;  $230 + 420$  ;  $230 + 490$  ;  $236 + 493$  ;  $900 - 300$  ;  $400 - 80$  ;  
 $893 - 2$  ;  $893 - 9$  ;  $648 - 20$  ;  $648 - 60$  ;  $648 - 68$  ;  $880 - 640$  ;  
 $880 - 690$  ;  $880 - 694$  ;  $832 - 644$ .
- Multiplication and division of the natural numbers from 0 to 1000.  
 Multiplication tables from 1 to 10 : progressive revision and consolidation.  
 The inverse operation :  $16 : 4$  ;  $16 = 4 \times \square$
- Multiplication and division of natural numbers from 100 to 1000, of the following types :  $60 \times 4$  ;  $65 \times 4$  ;  $360 : 3$  ;  $366 : 3$ .
- Problems with a verbal text, requiring mental calculations using the 4 operations.

- 3.4.2. Although written calculations using the 4 operations should finally reach the stage of becoming almost completely mechanical, it is very important to have the pupils clearly grasp the meaning of each step and of each phase of the operation required. It is certain that pupils who have had contact with bases other than ten, will fairly easily grasp the part played by the position of the figures in these operations. As with the mental calculation, some gradation in the difficulty of the exercises should be sought and care should be taken to spread the exercises over the whole of the school year.

- Initiation into written addition of 2 or more numbers of 1 to 3 figures, using the following types :
    - Without carrying forward :  $321 + 458$  ;  $113 + 27 + 357$  ;  $7 + 21 + 501$ .
    - Carrying forward once :  $312 + 430 + 128$  ;  $4 + 72 + 314$ .
    - With two degrees :  $263 + 182 + 345$  ;  $139 + 60 + 213 + 397 + 91$ .
  - Initiation into written subtraction using the following types :
    - $874 - 671$  ;  $90 - 67$  ;  $907 - 384$  ;  $713 - 458$  ;  $700 - 581$  ;  $1000 - 345$ .
  - Initiation into written multiplication of numbers with 2 or 3 figures by a multiplier of 1 figure only :
    - $82 \times 4$  ;  $273 \times 4$  (the product not exceeding 1000).
  - Initiation into written division of numbers less than 1000 by divisors of 1 figure, initially without remainder, later with remainder.
    - Types :  $428 : 2$  ;  $336 : 4$  ;  $319 : 6$ .
  - Problems with written texts, requiring the use of the 4 written operations.
- The exact result should be obtained whatever operating techniques is used.  
In-line calculation should be practised.

#### 4. Exploration of space

##### 4.1. Particular sets in space :

- 4.1.1. Classification of any space from observations on the space.
- 4.1.2. Cube, right-angled parallelepiped, cylinder, sphere.
- 4.1.3. Right-angle parallelogram, rhombus, square, triangle, circle.
- 4.1.4. Plane representation.

##### 4.2. Location of a point :

- 4.2.1. Location of a point on a straight line.
- 4.2.2. Networks.
- 4.2.3. Location of a point in the plane on a cylinder, cone, sphere.

##### 4.3. Transformations :

- 4.3.1. Transformations in space : shadow cast by the sun (parallel projection), shadow cast by a torch (central projection).
- 4.3.2. Inspection of aerial photographs.

#### Comments

4. The exploration of objects of 3.2 or 1 dimension(s) should be carried out with the aid of a ruler, set-square and pair of compasses. Its objective is to observe, identify and construct various properties and classifications.

This exploration should enable the child :

- (1) to improve his mastery of the real ;
  - (2) better to grasp the transition 'reality-image' and 'image-reality'.
- To do this, preference will be given to exercises in three dimensions.

- 4.1. The syllabus comprises the study of solids, surfaces, straight lines and points and, of course, the study of the properties of these and the relations which may exist between them.

Solids and their surfaces should be studied first, followed by surfaces and their straight lines and their straight lines and their points.

4.1.1. The pupils should be able to manipulate all sorts of solids ; at this level, teaching should result in making clear the common characteristics, introducing mathematical vocabulary and carrying out classifications, starting with free classifications, followed by classifications in accordance with certain criteria.

4.1.2. In regard to the cube, it will be shown that the faces are isometric squares and it will be noted that any cube has six faces, eight apexes and twelve edges. The parallelepiped, or slab, also has six faces, eight apexes and twelve edges, but in this case the faces are not squares, but rectangles, of which some are isometric.

A certain number of relations between apexes, edges and faces could be studied, particularly in reference to cubes and parallelepipeds, and these relations could be represented.

The cylinder and the sphere will be the subject of certain investigations. The teacher could perhaps show that these solids can be developed from a disc, which moves parallel to itself for the cylinder and rotates round one of its diameters for the sphere.

The sphere could also be regarded as an extension into space of the notion of a circle in a plane.

There should not fail to be verification of the fact that a ruler can be applied to the surface of a cylinder and a whole series of parallel segments can be obtained thereby, whereas this is clearly impossible on a sphere.

4.1.3. Various polygons appear during the observation of solids. Then again, work analogous to classification carried out for solids, can be carried out for the polygons, giving rise to the classes of quadrilaterals and triangles particularly.

The new classifications can be carried out, e.g. on the quadrilaterals, and these will make clear the differences and similarities between the various elements of the set of quadrilaterals presented to the pupils.

A parallelogram is a quadrilateral whose opposite sides are parallel. It should also be verified that the opposite sides are isometric, while adjoining sides are not necessarily so, and that the same applies to the diagonals. Generally, the diagonals may be at any angle, but they intersect at their centres, which are at the centre of symmetry of the solid. A rectangle is a special case of a parallelogram, having adjacent sides perpendicular to one another. The angles of a rectangle are right angles. Rectangles have all the properties of parallelograms and, in addition, their diagonals are equal.

A rhombus is a special case of a parallelogram, having two adjacent sides isometric. The four sides of a rhombus are equal. Rhombuses have all the properties of a parallelogram. In addition, the diagonals occupy a privileged position ; they are perpendicular to one another.

A square can appear like a rectangle having its consecutive sides equal, or like a rhombus having consecutive sides perpendicular to one another.

The set of parallelograms thus contains two subsets : the set of rectangles and the set of rhombuses, the intersection of which provides us with the squares. A square therefore has all the properties of a parallelogram, a rectangle and a rhombus.

The study of any triangle and of right-angled, isosceles and right-angled isosceles triangles can be carried out in a way similar to that used for studying quadrilaterals, and can be carried out the same time, if the types of triangles mentioned are shown to be halves of parallelograms, rectangles, rhombuses and squares. In quadrilaterals and triangles it will also be possible to establish a certain number of relations between the figures which compose them.

In a plane, a circle is the set of points situated at a given distance from a fixed point called the centre, and the surface limited by a circle is a disc. A circle divides up a plane into two regions, one being the disc which it bounds, the points within which are at a smaller distance from the centre than the length of the radius, the other having all its points situated at a greater distance from the centre than the length of the radius, with the circle being the common boundary between the two regions.

Numerous exercises bearing on sets of circles can be carried out with the aid of a pair of compasses.

At this level, triangular inequality can be made clear for the best pupils.

It is important that the pupils, in addition to observing and describing geometrical models, should also :

- construct plane figures with the aid of a parallel ruler, a straight-edge, a set square and a pair of compasses ;
- work out the same figures on a geoplan ;
- using paper, scissors and glue, themselves made a cube, a right-angled parallelepiped and a cylinder.

It must not be forgotten that concepts do not teach ; it is necessary to create situations and experiments which aid the children to assimilate them.

- 4.1.4. The representation of the space which surrounds us, on a plane, is an exercise which is extremely fruitful, but which proves to be difficult to approach. This is why it is necessary to be continuous in the choice of the exercises to be done and to limit the choice to the immediate surroundings of the child, the proportions being respected as far as possible.

At the end of the 3rd year, the pupil should be able to draw a plan, e.g., of the classroom and to have a simple notion of scale. The teacher should not fail to couple this plane representation with the location of a point in a plane.

- 4.2. Whereas in the 2nd year, the pupil will already have learnt how to locate a point on any line, straight line or network, in the 3rd year these exercises will be taken up again, but more systematically and extended to space (network on a sphere, cylinder, cone).

The use of coordinates is very important for the study of certain aspects of geometry (distances, transformations, etc.).

When the children have acquired some facility for placing points on a square network and for finding the coordinates of a given point (couple), they could be given various exercises, in particular representations of the variations of a magnitude which is measurable or locatable, transference of figures from one network to another and displacement on a network starting from a node.

- 4.3. We move the objects which surround us and change their position. We can also transform these objects. The properties of transformations form a branch of geometry : one observes what is conserved and what is not conserved.

- Transformation with conservation in respect of distances and parallelism : shadows cast by the sun (parallel projections).
- Transformation of an object in its number : shadows cast by a torch (central projections).



### *Examples of exercises*

#### *Shadows cast by the sun :*

The figures to be projected should be figures cut out in cardboard or thin wood (square, triangle, etc.).

- Present a figure to the sun in such a way that it has a visible shadow ;
- Move it in various ways and examine the different sorts of shadows obtained.  
What properties are conserved ?

#### *Shadows cast by a torch :*

Same exercise. Compare the results.

The pupils should also be initiated into the notions of symmetry and rotation by means of games played in the playground or the class room (e.g. with the aid of mirrors).

### 5. *Measurements*

- 5.1. Measurement of length.
- 5.2. Measurement of masses.
- 5.3. Measurement of capacities.
- 5.4. Measurement of areas.
- 5.5. Measurement of durations.
- 5.6. Measurement of velocities, outputs (compound units).

### *Comments*

Measurement, one of the most ancient of mathematical notions, was already practised in Egypt and Babylonia both by land surveyors and for the purposes of commerce. It is known for certain that the Egyptians knew the volume of a frustum of a pyramid and the area of a sphere.

As was already stated in the comments on the 2nd year syllabus, measurement is a traditional activity of the primary school and the study of certain aspects of measurements has already been modernized.

5. Speedometers, the indicators on petrol pumps and balances with dials have placed the child in a situation where it is easy for him to admit that a number can be associated with a series of events.

Given a set of physical objects, to measure means here, to associate a number with each of the objects. A measurement is thus an application of a set in a numerical set, which, for the mathematician, is the set of real numbers.

At the 3rd year form level, this set will be the set of the natural numbers, with the addition possibly of known fractions, and, at the end of the school year, the set of decimals. This application is clearly not just any application ; it must satisfy a certain number of conditions, to which we shall return when we have studied the measurements of length, mass, capacity and area in more detail.

- 5.1. In regard to the measurement of lengths, we shall give below a progression which every teacher should endeavour to know and understand, but which clearly it is not always necessary to pass on to the pupils.

- (1) In a set of rulers, we have already seen that we can divide them up into various stocks by comparing them.

In the set of rulers, we thus distinguished the rulers which are equal in length and we formed mathematically equivalent classes having a characteristic in common : the length of each of the rulers.

- (2) If we consider the rulers belonging to two different classes, we can then consider the relation of strict order 'is smaller than' or 'is greater than'. This order relation existing between two rulers can also be applied equally to the classes and also to the lengths.
- (3) Placing rulers end to end leads us to consider an addition in the set of classes, i.e. an addition of the lengths attached to these classes. This addition is clearly independent of the particular representative chosen from each class.
- (4) Having defined an addition of lengths, we can immediately deduce the operation of subtraction.
- (5) Given a natural number and a length, it is possible to associate with this couple a new length obtained by considering the sum of  $n$  lengths equal to the first length  $A$ . This provides us with an example of an external operation, the natural number playing the part of an operator. A new length  $B$  is associated with the couple  $(n, A)$  and one can write  $nA = B$  and note, in particular, that  $1.1 = 1$ . Fractions can also play a part similar to the natural numbers.
- (6) The relation  $n.A = B$  can also be written as  $\frac{B}{A} = n$ , and so one length is a multiple of another and we can define the ratio of these two lengths.
- (7) The choice of the smallest class as unity, applied to a representative of the class, enables us to associate a whole number to each of the classes, the number being the measurement of the length of the rulers in the class, in terms of the chosen unit naturally.
- (8) A class other than the smallest can equally be chosen as the unit ; it will enable us to associate a whole number to a certain number of the rulers, but only a bracket for the others.<sup>1</sup> We note that the ratio of two lengths appears as the measurements of the first, when the second is taken as the unit.
- (9) We now consider, no longer the rulers, which are privileged materials, but stalks or rods ; one can then choose a unit length and with every length we can associate a natural number, a number with a decimal point or a bracket.<sup>2</sup>
- (10) The necessity for communicating with others implies the choice of conventional units, which, at the 3rd year level, can be limited to the metre and the centimetre. It is important that when the child leaves the primary school he should understand the utility of a system of units linked to a system of numeration, for the reason that calculation are thereby made simple.
- (11) Let us note :
  - (a) that the measurement of the sum of two lengths is equal to the sum of their measurements ;
  - (b) that the measurement of the difference between two lengths is equal to the difference between their measurements ;
  - (c) that the measurement of a length  $n.l$  is equal to  $n$ . (measurement of  $l$ ) ;
  - (d) that the quotient of two magnitudes is equal to the quotient of their measurements.

It is of course understood that these properties apply only if the lengths in question have been measured with the same unit.

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<sup>1</sup> If instead of limiting oneself to natural numbers, numbers with decimal points are considered, then greater precision is obtained and with each ruler can be associated a number with a decimal point, or lacking that, a bracket.

<sup>2</sup> The teacher should also know that a knowledge of real numbers enables a specific real number to be associated theoretically with every length.

*Some remarks :*

- (1) The word 'length' is a mathematical expression, which, in everyday life as also in life at school, covers the words 'length', 'width', 'thickness', 'height', 'depth', etc. If only two points are given, it is better to use the word 'distance', which in everyday language, means the length of the interval between two towns.
  - (2) Other legal units exist, apart from those habitually used, amongst them being the light-year and the ångström.
  - (3) It is desirable to calculate the length of a jagged line, the perimeter of a triangle, a quadrilateral, a square, a rectangle and even to assess the length of part of a curve and a circle.
- 5.2. The idea of mass, being a magnitude which is constant for a given body, must take precedence over the idea of weight, which is not constant, as is now known by all our children who have seen astronauts walking on the moon.

Here again, it will be a question of studying, within the set of bodies, first a relation of equivalence and then a total order. A balance enables this problem to be solved, the equilibrium of the pans being a sign of the equivalence of the masses.

The process is analogous to that described for lengths ; the conventional metric system units of mass to be introduced in 3rd year classes are the gramme and the kilogramme.

- 5.3. Before proceeding to measurements of capacity, there is need to ensure that the fact of the conservation of the quantity of a liquid regardless of the shape it occupies, has been properly assimilated. That being so, it will be possible, for capacities, to go through, point by point, what has been said for lengths and masses.

The property of transitivity however will be accessible only if the conservation mentioned earlier has been well established. The legal units to be introduced are the litre, the decilitre and the centilitre.

- 5.4. The child will already have been introduced to the concept of surface in the course of the 2nd year and the concept will continue to be refined in this 3rd year, particularly by breaking down a surface into elementary surfaces and reconstituting it again.

It will now be a matter of specifying what is meant by measurement. The problem is in the difficulty of comparing surfaces.

We can however make use of the balance and of cutting out, and so, within the set of plane surfaces, define equivalence classes having a characteristic in common, namely, the area, and we can supply a relation of total order for this thin set of areas.

We can imagine what the sum of two areas and the product of an area by a number might be and we can check, using simple examples, that the measurement of the area of the sum of two disjoint surfaces is equal to the sum of the measurements of these two surfaces.

At the end of the school year, the metric units area, the square metre, the square decimetre and the square centimetre should be introduced, but one should not venture to calculate the measurement of the area of a figure, from its dimensions.

By an abuse of language in primary instruction, the word area is often used for measurement of an area.

- 5.5. The arbitrary units here are very varied, including the count of numbers of days and nights, burning of a calibrated candle, water-clock, (sand) hour-glass, heart beats, drops dripping from a tap, metronome, watch, etc.

The duration measured, and the duration measured by the unit of measurement, are simultaneous in time and the result of the measurement is generally a bracketing.

Clearly, we can carry out different measurements and compare the results and we must bear in mind that these measurements must be made at the same time.

The legal units of hour, minute and second, should be seen in conjunction with a watch with a centre-second hand or a stop-watch. Here we have a system of numeration on a system other than the decimal system.

*Remarks :*

Just as the measurement of lengths enables us to locate a point on a straight line, the measurement of durations enable us to locate an instant on the 'line of time'. The use of the calendar should be taught. Calculation of days and months should be carried out in conjunction with the remaining classes.

- 5.6. The association of the two magnitudes, length and duration, enables the idea of velocity to be obtained. In fact, the quotient of a distance divided by a duration is a velocity. Similarly, the association of the two magnitudes, volume and duration, enables output (flow rate) to be defined. The units must correspond in both cases.

The structure of the name of the unit is parallel to the units chosen for the magnitudes which are involved.

We have already said that a measurement is an application of a set of objects in a set of numbers. This set of numbers, serving as a measurement here in primary education, is  $N$  or  $D$ . These are sets provided with an addition and totally ordered.

For magnitudes, we have equally defined an addition and a total order ; the measurement must respect this addition and this order. This is expressed more mathematically by the formula :

$$\text{Measurement } (A \cup B) + \text{measurement } (A \cap B) = \text{measurement } (A) + \text{measurement } (B).$$

If we recall what we said earlier in the 2nd year syllabus, namely, that the cardinal of a set can be considered as a measurement, we see that a certain unity appears in the mathematical domain.

In this way too, the output rate of a worker, like velocity and flow rate, can be considered as a ratio of two magnitudes : the set of objects manufactured on the one hand, and the duration of the working time on the other ; the measurement of the output rate is obtained by dividing one by the other.

In practical measurement, there is need to distinguish :

- (a) the magnitude attached to the objects of a set ;
- (b) measuring or mesuration, which is the practical operation which enables us to associate a number with a magnitude ;
- (c) the unit of measurement, magnitude of the same nature as the unit to be measured ;
- (d) the result of the operation, a number which is the measurement of the magnitude.

We shall note too, that the pupil must be capable of choosing, not only the suitable unit, but also the suitable instrument ; and that he must be able to convert the measurements in so far as the conversions are justified.

It is a good thing to invite the child to assess approximately the result of the measurement before it does the measuring.

*Remarks :*

The value of an object is not a measurement, the nature of the monetary unit not being the same as that of the object. Furthermore, the value of the object is far from being constant.

## 6. *Practical exercises :*

- 6.1. Problems of counting.
- 6.2. Problems of sharing.
- 6.3. Games with structures.
- 6.4. Deriving equations from problems.

### *Comments*

The richness and variety of the mathematical experiences of a child contribute quite certainly to the harmonious development of his personality.

Exercises in applied mathematics should be considered from two points of view : the initiation of the pupils into the understanding of the world around them and the motivation for the introduction of new ideas.

Solving a problem, whether numerical or not, requires a certain number of phases :

- analysis of the data ;
- search for elementary situations ;
- connection between these situations ;
- analysis of the question set, or of the different questions which could be set ;
- expression in mathematical terms of the elementary situations (e.g., definition of the nature of the sets involved) ;
- search for the solution, or solutions, by studying the relations between the elementary situations and the properties of these relations ;
- communication of the result of the investigations in mathematical or everyday language.

The data should be drawn from everyday life, from various games and from abstract situations ; they should be capable of arousing the interest of the child and motivating it affectively and not artificially. The data should be complete, or if incomplete they should always give rise to discussion within the class or within the teams of pupils.

Advantage should be taken of these occasions to develop creativity. It is important constantly to stimulate the curiosity and imagination of the children. This assumes that their imagination must have an opportunity of manifesting itself in the mathematics class. Series of problems where the same operation is applied mechanically, must be avoided.

An attitude of research on the part of the children should be favoured and the class should not be conducted in too rigid a manner, in the hope of creating a forward-looking attitude to mathematics. Such an attitude will make them understand the utility of mathematics as a tool for the comprehension of the world around them. The presentation of the exercises should be very varied.

The child should be encouraged to express his personal reflections on the various situations. At the beginning, undoubtedly, his replies will be clumsy and disordered gropings. Value will be placed on replies which are logical and coherent.

Too often in the past, questions have been posed by the teacher and the pupil had to be content with giving the expected answers. We are hoping for a pedagogical situation where the pupils' questions take priority over the teachers'.

As has been said above, the pupils should complete the statement of the problem where the data are insufficient. Making up problems, on the other hand, is a most beneficial exercise which obliges the child not only to examine the situations, but also to choose carefully the particular data for the problem. An open problem gives children the possibility of finding many answers, the number of which can then possibly be reduced by the introduction of supplementary conditions.

It is desirable that the pupils should give themselves rules of procedure and discuss the advantages of them and discover their consequences.

The operation of expressing a situation mathematically should appear as just as important as the answer itself.

Discussion of the solutions suggested by the pupils should enable the teacher to determine the degree of comprehension of his class and to estimate its progress.

Once the solution, or solutions, have been found, it will be a question of communicating this solution to the others, and possibly also the way in which it has been reached. In the 3rd year class, importance should be attached to written answers to problems.

*Remarks :*

- (1) In the solution of problems, mental calculations should be preferred, as far as possible, to written calculations.
- (2) If the operations are too complex to be carried out mentally, an approximate estimate of the result could precede the written operation.
- (3) Problems could be suggested either by one particular pupil, or by an organized group, or could arise from common experience.
- (4) The teacher's role is :
  - discreetly to guide the children's researches ;
  - to condition the environment in such a way that the children may draw from it the materials required for making use of mathematical ideas ;
  - to encourage the search for information which will later be able to be used in the class in the most appropriate way.

6.1. The problems of counting, which have already been presented in the earlier classes, will be continued. Use should be made of dichotomic and trichotomic trees which can be made use of in situations, whether multiplicative or not.

6.2. In any process of sharing, a distinction should be made between the set of elements to be shared and the set of allottees (these are generally persons). The sharing may be equitable, or, in the most general case, subject to certain restrictions (e.g. decision of the donor).

Partition is a sharing which is not necessarily equitable, but in which every allottee necessarily receives part of the 'loot' (no part is empty).

Other cases of sharing depend on Euclidean division, with or without a remainder. In the case where the remainder is nil, the division is exact and the sharing equitable. In the case where the remainder is not nil, sharing will not be accomplished, but it may possibly be made equitable by reference to suitable submultiples.

There are all sorts of devices which are often useful to aid the understanding of the idea of sharing (pieces of string, strings of objects or persons, trees, etc.).

6.3. Games with the finite sets of 3, 4, 5 and 6 elements should not be neglected. The laws of composition in these sets should be considered and tables corresponding to the laws drawn up. The properties of these laws should be brought out and, in certain cases, equations could be solved with the aid of these tables of the laws of composition.

6.4. Contrary to a widely held, traditional view, equations and inequalities can have a place in primary education. Formulating equations and solving them are facilitated anyway by the technique of operators and reciprocal operators. Everyday life offers numerous opportunities for drawing up equations which are within the scope of 3rd year children.

## 4th year

### Syllabus

#### 1. Sets

- 1.1. Consolidation of the vocabulary concerning sets, which was introduced during the first three years.
  - 1.1.1. Belonging, propositional form.
  - 1.1.2. Complementing a set, negation of a propositional form.
  - 1.1.3. Inclusion, logical deduction.
- 1.2. Operations on sets ( $\cap$ ,  $\cup$ ,  $\subset$ ) and links with the logical connectors.
- 1.3. Properties of operations on sets (commutativity, associativity, distributivity) and the consequence for the connectors 'and' and 'or'. Negation of the connector 'not' (double negation).
- 1.4. Expressions by diagrams : — Venn and Carroll diagrams ;  
— trees.
- 1.5. Preparation for the comprehension of the idea of quantification by the introduction of the following expressions :
  - for any element ;
  - for at least one element ;
  - negation of these expressions.

#### 2. Relations

- 2.1. Relation of one set to another :
  - 2.1.1. Consolidation of the ideas of relation and of product of two sets. Various representations.
  - 2.1.2. Distinction between relation, application and one-to-one correspondence.
  - 2.1.3. Reciprocal relation of a given relation.
  - 2.1.4. Composition of relations. Associativity of the law of composition. Non-commutativity of the law of the composition of relations.
- 2.2. Relation within a set :
  - 2.2.1. More systematic study of the properties of relations (reflexivity, symmetry, transitivity, antisymmetry).
  - 2.2.2. Relation of equivalence, equivalence classes, partition.
  - 2.2.3. Order relations. Partial order. Total order.
  - 2.2.4. Transformation of a set and permutation of a set (special case : constant transformation and identical permutation).

#### 3. The numbers

- 3.1. Natural numbers (set  $\mathbb{N}$ ) ;
  - 3.1.1. Numeration.
  - 3.1.2. The 4 operations and their properties.
  - 3.1.3. Order relations in  $\mathbb{N}$  ( $\leq$ ,  $\geq$ ).
  - 3.1.4. Divisors, multiples.
  - 3.1.5. Euclidian division.
  - 3.1.6. Residual classes.
  - 3.1.7. Factorizing.
  - 3.1.8. Power of a number.
  - 3.1.9. Equations and inequations in  $\mathbb{N}$ .

- 3.2. Integers (set  $\mathbb{Z}$ ):
- 3.2.1. The integers 0, 1,  $\bar{1}$ , 2,  $\bar{2}$  ... (without limit).
  - 3.2.2. Order within  $\mathbb{Z}$ .
  - 3.2.3. Addition - properties.
  - 3.2.4. Subtraction - introduction.
- 3.3. Limited positive decimal numbers :
- 3.3.1. Number with a point.
  - 3.3.2. Decimal numbers.
  - 3.3.3. Order in the numbers with points.
  - 3.3.4. Addition - subtraction - multiplication of decimals by a natural number - approach to the division of a decimal by a natural number.
- 3.4. The fractions  $\frac{a}{b}$  ( $a \in \mathbb{N}$ ,  $b \in \mathbb{N}^*$ ):
- 3.4.1. Fractions considered as operators: find a fraction of a number.
  - 3.4.2. Equivalent fractions. Simplification of a fraction.
  - 3.4.3. Comparison of 2 fractions, the denominator of one being a multiple of the denominator of the other.
- 3.5. Mental calculation :
- 3.5.1. Addition and subtraction of natural numbers up to 100 000.
  - 3.5.2. Addition and subtraction of usual decimal numbers.
  - 3.5.3. Multiplication and division. Revision of multiplication tables from 1 to 10.
  - 3.5.4. Multiplication of 2 to 3-figure numbers by a 1-figure number.
  - 3.5.5. Multiplication of natural numbers by a power of ten.
  - 3.5.6. Multiplication of natural numbers by numbers made up of a significant figure followed by a number of zeros.
  - 3.5.7. Multiplication of 2-figure natural numbers by 11, 12, 13, 14, 15.
  - 3.5.8. Division of natural numbers having 2 to 4 significant figures by one-figure numbers (with or without a remainder).
  - 3.5.9. Division in  $\mathbb{N}$  by 10, 100, 1 000 (with or without remainder).
- 3.6. Written calculation :
- 3.6.1. Addition and subtraction of natural numbers and decimals.
  - 3.6.2. Multiplication and division within  $\mathbb{N}$  by numbers of two and more figures.
  - 3.6.3. Introduction to the division of natural numbers or decimals by a natural number less than 10 to an exact or approximate decimal approximation.
  - 3.6.4. Division of natural numbers and decimals by 10, 100, 1 000.
- 3.7. Numerical functions :
- 3.7.1. Mechanisms to transform objects, then numbers.
  - 3.7.2. Addition operator  $+$  a, its reciprocal  $-$  a and the derived compositions.
  - 3.7.3. Multiplication operator  $\cdot$  a and its reciprocal  $: a$ .
  - 3.7.4. Composition of 2 multiplication operators and their reciprocals.
  - 3.7.5. Introduction to the fractional operator  $\frac{a}{b}$  as composed of the operator  $\cdot a$  and the operator  $: b$ .
  - 3.7.6. Proportional magnitudes.
  - 3.7.7. Solution of equations with the aid of chains of operators.



#### 4. *Organization of space*

This exploration is to be carried out with the aid of a ruler, set square and pair of compasses.

##### 4.1. Particular sets in space and various classifications :

###### 4.1.1. Cube, right-angled parallelepiped, right prism, tetrahedron, cylinder, sphere :

- study of various relations connecting edges, faces and apexes ;
- plane development.

###### 4.1.2. Polygons :

- parallelogram and its special cases (intersection of two bands) ;
- triangles ;
- disc - circle.

Principal properties of these figures.

Construction starting from organigrams.

##### 4.2. Location of a point in space :

###### 4.2.1. Location of a point in the plane on a cylinder, a cone, a sphere.

###### 4.2.2. Models of a network.

###### 4.2.3. Transfer of figures from one network to another (keeping the same coding).

##### 4.3. Transformations in a plane :

###### 4.3.1. Prospective study of transformations (by observing diagrams with arrows, the rule for the transformation of a plane on itself is discovered).

###### 4.3.2. Translations :

- Displacements on a square grid ;
- Compositions of translations and coding ;
- Translations in a limited square grid (congruences).

###### 4.3.3. Symmetries :

- Contractions of symmetrical figures in relation to a straight line and a point.

#### 5. *Structures*

##### 5.1. Idea of the law of internal composition.

##### 5.2. Commutativity or non-commutativity of a law.

##### 5.3. Associativity or non-associativity of a law.

##### 5.4. Neutral element.

##### 5.5. Symmetrical element.

##### 5.6. Idea of group and commutative group.

##### 5.7. Equations in a group.

#### 6. *The measurement of magnitudes*

##### 6.1. Measurement of lengths :

- comparison of segments ;
- idea of measurements and the necessity of it ;
- comparison of segments and comparison of measurements ;
- conventional units : metre - multiples and sub-multiples ;
- bracketing ;
- changes of units.

##### 6.2. Measurement of areas :

- reflection on the puzzle, mosaic and tiling problem ;
- comparison of surfaces ;
- measurement by bracketing (various networks, non-conventional units) ;

- surfaces measurable exactly ;
  - conservation of area by translation ;
  - area of plane figures (rectangle, square and possibly parallelogram) ;
  - plane figures of equal area ;
  - conventional units :  $m^2$  and sub-multiples.
- 6.3. Measurement of masses :  
 — introduction of the conventional units.
- 6.4. Measurement of capacities :  
 — conventional units.
- 6.5. Measurement of volumes :  
 — volumes measurable exactly in non-conventional units (match boxes).

## 7. *Problems and work*

- 7.1. Problems of sharing.
- 7.2. Proportionality :  
 — unit price - total price ;  
 — problems of percentage.
- 7.3. Problems of counting and combining elements.
- 7.4. Elements of statistics and probabilities.
- 7.5. Expressing problems in terms of equations.
- 7.6. Organigrams.

## 5th year

### 1. *Sets*

- 1.1. Revision : Sets and sub-sets.
- 1.2. Operations on sets (union, intersection, complementary set) and ties with the expressions 'and', 'or' & 'not' and their effect on current reasoning.
- 1.3. Properties of set operations (commutativity, associativity, distributivity).
- 1.4. Introduction of the expressions — 'For all elements',  
 — 'For at least one element'  
 (In propositional forms).  
 Negation of these expressions.

### 2. *Relations*

- 2.1. Relations of one set towards another considered as a set of ordered pairs.
- 2.1.1. Revision : relations, functions, applications ;  
 one-to-one correspondence ;  
 Inverse relation of a given relation.
- 2.1.2. Composition of relations :  
 Non-commutativity and associativity of the law of composition.
- 2.2. Revision : Relation within a set.
- 2.2.1. Study of the properties of the relations (reflexivity, symmetry, transitivity, anti-reflexivity, anti-symmetry).
- 2.2.2. Consolidation of the notions :  
 Ordering relations ;  
 Equivalence relations.

- 2.2.3. Transformation of a set : permutation of a set (particular cases : transformation which is constant and identical permutation).

### 3. Numbers

- 3.1. Natural numbers (set of  $\mathbb{N}$ ).
- 3.1.1. Revision : counting ;  
The 4 operations and their properties ;  
Ordering relations in  $\mathbb{N}$  ;  
Division with remainder ;  
Dividers, multiples, decomposition into factors ;  
Powers of a number.
- 3.1.2. Residual classes modulo  $n$ .
- 3.1.3. Prime numbers. Decomposition into prime factors.
- 3.1.4. Equations and inequations in  $\mathbb{N}$ .
- 3.2. Whole numbers (set  $\mathbb{Z}$ ).
- 3.2.1. Revision : whole numbers  $(0, 1, \bar{1}, 2, \bar{2}, \dots)$  ;  
order in  $(\mathbb{Z}, +)$ .
- 3.2.2. Addition - properties.
- 3.2.3. Subtraction in  $\mathbb{Z}$ .
- 3.2.4. Compatibility of ordering in  $(\mathbb{Z}, +)$  with addition and subtraction.
- 3.3. Positive decimal numbers.
- 3.3.1. Revision : decimal numbers ;  
Structure of ordering decimal numbers - bracketing ;  
Addition and subtraction of decimal numbers ;  
Multiplication of a decimal number by a natural.
- 3.3.2. Division of a decimal by a natural.
- 3.4. Fractions  $\left(\frac{a}{b}, a \in \mathbb{N}, b \in \mathbb{N} \setminus \{0\}\right)$ .
- 3.4.1. Revision : fractions considered as operators ;  
Taking a fraction of a natural number ;  
Equivalent fractions - simplification of a fraction.
- 3.4.2. Comparison of two fractions.
- 3.4.3. Rational positive numbers as equivalence class of fractions ;  
Simple representation of these classes (simplification of fractions).
- 3.4.4. Addition and subtraction of fractions of the same denominator.
- 3.4.5. Multiplication of a fraction by a natural number.
- 3.5. Mental arithmetic.  
Upkeep of mental arithmetic covered up to now.
- 3.6. Written arithmetic.
- 3.6.1. Revision : addition and subtraction of natural numbers and decimals ;  
Multiplication and division of natural numbers by numbers of two digits.
- 3.6.2. Multiplication and division of decimals by naturals.
- 3.7. Revision : numerical functions.  
Operations of the following types  $+ a, - a, \times a, : a$  ; and composition of these operators ( $a$ , being a natural).
- Introduction of the fraction operator  $\frac{a}{b}$  being composed of the operator  $\times a$  and the operator  $: b$ .
- Proportional sizes.  
Resolution of equations by means of chains of operators.

#### 4. *Organization of space (Spatial geometry)*

##### 4.1. Revision :

##### 4.1.1. Particular sets of space and various classifications :

Regular tetrahedron,

Rectangular prism (cuboid),

Sphere,

Cylinder,

Study of various relationships considering vertices, sides (faces), edges,

Trapezium,

Parallelogram and its particular cases (rectangle, rhombus, square),

Triangle,

Disc - Circle (be careful about this terminology. The disc is considered as the set of the points on a plane bounded by the circumference of a circle),

Principle properties of these figures.

##### 4.1.2. Coordinating a point on a flat surface by means of two coordinates.

##### 4.1.3. Transformations on flat surfaces :

Translations, rotations,

Symmetries : axial symmetry and central symmetry (point reflection).

##### 4.2. Nets of the cube, regular prism, cylinder and regular tetrahedron.

##### 4.3. Construction of figures according to information on flow charts.

##### 4.4. Compositions of transformations on a surface of two dimensions.

##### 4.4.1. Composition of two translations.

##### 4.4.2. Composition of two axial symmetries of parallel axes (translation).

##### 4.4.3. Composition of two axial symmetries of perpendicular axes (central symmetry).

##### 4.4.4. Composition of two axial symmetries of intersecting axes (rotation).

#### 5. *Measurements of size*

##### 5.1. Revision of conventional units.

##### 5.2. $m^2 = \text{centiare}$ ;

Are, hectare.

##### 5.3. Area of a parallelogram.

##### 5.4. Volume : conventional units.

#### 6. *Problems and work*

##### 6.1. Revision : problems of sharing ;

Proportion work (problems like : 'Divide up 50 sweets between 2 children in a ratio of 5 to 1, 10 to 1 etc.) ;

Unit price, total price, problems of percentage ;

Putting problems into the form of equations.

##### 6.2. Proportion work : scale, uniform movement.

##### 6.3. Problems of counting and combinations of counting.

##### 6.4. Exercises to introduce statistics and probability.

##### 6.5. Flow charts.

## SECOND LANGUAGE : ENGLISH — FIRST FOREIGN LANGUAGE

### Years 1-3

#### A — General aims and objectives

##### 1. *General aims*

The general aims of teaching English as a first foreign language should be :

- (a) to contribute to the child's personality growth and general education ;
- (b) to give the child a sense of achievement and the enjoyment of being able to understand and express himself in another language ;
- (c) to facilitate the integration of the child in the European School system by giving him an understanding of the language and culture of other children ;
- (d) to develop his sensitivity to language in general ;
- (e) to attempt to meet the differing needs, abilities and previous linguistic experience of all the children.

##### 2. *Objectives*

The overall objective of the 5-year primary English course should be to give the child the necessary mastery of the language in its 4 aspects of understanding, speaking, reading and writing in order to enable him to follow those courses for which a knowledge of English is required, first of all at primary level and later in the secondary school.

##### (a) First year :

The objective should be to introduce the child to English by exposing him to the language in as pleasant and informal an atmosphere as possible. Basic structures should be assimilated in a natural milieu of activity and play. In this way a favourable attitude to English should be developed in the child.

##### (b) Second year :

The objective in the second year should be to build on the language already acquired but now in a somewhat more structured manner, not losing, however, the atmosphere of informality. Early and sustained use should be made of various audio-visual materials in order to ensure realistic, lively and interesting presentation and reinforcement, while at the same preparing the child for the use of a full audio-visual course in the third year.

##### (c) Third year :

Reading and writing should form an increasingly important part of the third-year course. Oral skills remain, however, of paramount importance. Language structures and lexical items will be presented and learned more systematically — leading to the child's increasing mastery of the language.

#### B — Methodology

##### 1. *General introduction*

As teachers and classes vary, a flexible approach to the teaching of the language is recommended. The following basic principles, however, need to be consistently borne in mind.

Firstly it must be remembered that the children with whom this programme is concerned are within the 6-9 years age-group and cannot be expected to engage in work involving maximum concentration for more than about 10 minutes in any one lesson. This needs to be taken into account when planning lessons. It also underlines the importance of employing an active *audio-visual approach* to vitalize the work. Activity games, songs, rhymes and poems, simple stories, dance and drama can all be used to reinforce, consolidate and sometimes introduce linguistic items. This should help to make language learning pleasurable and thus probably more effective.

Since language which arises directly from the child's experience and interests is the most meaningful for him, a *thematic approach* is recommended in order to reinforce structures and to introduce and practise lexical items. Themes are best introduced in an order which begins with the child himself and his immediate surroundings and progresses to the less familiar and the unknown.

*Listening* is a key activity in language learning and frequent opportunities must therefore be given to the child to listen to English language. Material chosen for listening practice need not consist solely of language items which the child knows and can use actively but may usefully contain a number of items he knows only passively — and, indeed, an occasional completely unknown item. This will help to develop the skill of listening with understanding. This can be done by having children listen to the teacher read or tell a story using a book with pictures which can be shown to the children to help them understand — or by letting the children listen to taped stories with accompanying illustrated material. The 'language master' and tape-recorder clearly have a useful contribution to make in this area of the work.

The use of *group-work* in language teaching has many advantages : it allows for greater oral practice for the individual child, it helps to remove barriers of shyness and self-consciousness and, especially at the stages when reading and writing have been introduced, it enables the children to work and move forward at different levels.

The *introduction of reading and writing* should not necessarily happen at a pre-determined point in the course. Some classes will be more receptive than others and classroom settings and circumstances will differ greatly. Pre-reading activities can usefully take the form of training in the recognition of word and sentence patterns using name-cards, labels, captions, picture-cards, picture books, etc.

*Reading* should be introduced and developed through :

- flash-card work (in association with the course chosen),
- themes,
- work-books and structured readers,
- supplementary readers.

Additional readers have to be chosen with care ensuring that the language they use is related to the oral language and interest level of the class. Some early training in sound correspondences (listening to how pairs of words begin and end) will be necessary, leading to more specific phonic training later.

*Writing* in the early stages needs to be closely linked with the language the children can use orally with confidence and understanding. The children will progress from elementary copying — e.g. names, labels and captions for pictures, etc. to writing of work-book exercises — to writing closely linked with readers — to expressive writing.

The children will not be expected to change the style of handwriting which they have mastered in their mother tongue. The teacher's writing must always be in clear script.

## 2. *The third year*

It is recommended that the work of the third year be based on the audio-visual course : *Look, listen and learn* — G. Alexander. Set One.

Most teachers will prefer to start at the beginning of this Set One and use the earlier lessons as a revision of the material taught during the first 2 years. The rate of progress will vary from class to class depending largely on the amount of language already mastered and on the existing class situation. In the case where the children progress rapidly, supplementary work in the form of additional readers and work-books can be introduced.

Flexibility, above all, is recommended in dealing with Set One of the course.

### 3. *Teaching unit*

Duration of lessons :

1st and 2nd year — maximum 30 minutes.

3rd year — possibly 45 minutes.

*The basic composition of each unit* might usefully follow this outline :

- (a) Material (linguistic unit) — listening and passive comprehension.
- (b) Material — oral repetition by children.
- (c) Active comprehension and use of the material.
- (d) Application of the linguistic unit to new situations.

Breakdown of the above elements :

- (a) Present the material, preferably in the form of dialogue, although in the very early stages structural sentence patterns of a very simple nature will be found essential.

Explain the situation or material. Much of this 'explanation' can be done visually and actively using materials which appeal to all the senses, e.g. pictures, felt figurines, natural objects, etc.

Comprehension is very important as an aid to retaining language. The teacher should therefore try by all means to ensure that the situation is clearly presented. Simple questions in the second language should make it clear whether or not the material is understood.

- (b) Repetition of the material or dialogue by the pupils, section by section. Correction of pronunciation with care for the rhythm, stress and intonation of the language. Good speech must always be encouraged. Correction should be done in a positive manner with encouragement for good effort ; negative correction may discourage the child from active participation in the work.

Pronunciation exercises can be practised either by individuals or, for the less extrovert, in small groups.

- (c) Active comprehension and use of the material by applying it to different situations. The teacher's task here is to consolidate the new material using a variety of stimuli so that the children do not become bored by too much repetition. For example, if the teacher wishes the children to consolidate their use of the pattern 'He is drinking a glass of milk' — originally encountered as the reply to the question and stimulus 'What is John doing?' — he must elicit the same response by changing the situation and varying the question and stimulus — 'What is father — the boy — uncle doing?'.

- (d) Application of the material to new situations. This is where the new item needs to be extended and rearranged by applying it to new situations, e.g. patterns in the original item can be substituted — the action can be substituted ; the person or object can be substituted :  
'John is drinking a glass of milk' ;  
'John is eating a slice of bread' ;  
'Mary is ...', etc.

The new item or items can be used in a creative way by dramatizing dialogues or playlets in which the new pattern is integrated with patterns already known. An excessively free use of language must be avoided, however.

This necessitates the planning of a course in which each unit builds upon and makes active use of material taught in the previous units. One way of doing this would be to begin each lesson with a brief session of controlled revision. This also has the advantage of 'tuning-in' the children's ears to the unfamiliar language and, by beginning with material they are likely to know well, of establishing their confidence before they are asked to attempt new and unknown work.

This type of approach should not be rigidly adhered to. Where circumstances require, the teacher should use considerable flexibility.

## C — Content of lessons for first three years of English as a first foreign language

### 1. Introduction

The *structures* listed below should be introduced during the first 3 years. Some are intended for the child's understanding only ; others are intended for the child's active use and must be thoroughly and confidently mastered. The latter are set in italics in the list.

The list is not an exhaustive one and the choice with regard to order of presentation and grading is to be left to the individual teacher.

The social organization and interaction of the class — classroom business in short — gives rise to a fair amount of incidental language which the children can be encouraged to acquire and use. The use of this language by the teacher and eventually by the child should be appropriate and occur naturally in the normal active life of the classroom. A basic list of words and phrases associated with this language is provided on page 164.

Much structured vocabulary should be presented in the form of *themes* ; this will of course be individually supplemented in the varying classroom situations. A selection of suitable themes with their associated vocabulary is provided on pages 164 to 166. The order of presentation of these themes is left to the individual teacher to decide (but see Section B — Methodology, 1. General introduction, paragraph 3).

Learning through traditional *songs, games and rhymes* is an integral part of the 3 years' work and should be given an important place in the programme. Intonation and natural emphasis are both helped by these learning methods. As much use of the *natural dialogue pattern of speech* as possible should be employed by the teacher. This needs to be integrated with *centres of interest* and *traditional dramatization*.

During the third year most of the previous 2 years' grammatical structures and vocabulary will be revised, renewed and strengthened through the introduction of a complete audio-visual course.

### 2. List of structures

<i>What's your name ?</i>	<i>My name's</i> . . . . .	<i>It's</i> . . . . .
	<i>His name's</i> . . . . .	<i>Her name's</i> . . . . .
<i>What's this ?</i>	<i>It's a</i> . . . . .	<i>This is a</i> . . . . .
	This is) a, an, my,	
	That is) his, her, your	
Is this a . . . . . ?	<i>Yes, it's my</i> . . . . .	
Is this your . . . . . ?	<i>No, it isn't my</i> . . . . .	
<i>Whose pencil is this ?</i>	<i>It's his, her, my, etc.</i>	
	<i>Tom's</i>	
Are you a . . . . . ?		
Yes, I'm a . . . . .	<i>No, I'm not a</i> . . . . .	
Is he a . . . . . ?	<i>Yes, he's a</i> . . . . .	<i>No, he isn't</i> . . . . .
Who's this . . . . . ?		
Who's that . . . . . ?	<i>It's</i> . . . . .	<i>It's not Tom</i> . . . . .
You're not/You aren't		
<i>Where's your</i> . . . . . ?	<i>Here it is</i>	<i>It's here</i>
<i>Where are your</i> . . . . . ?	<i>Here they are</i>	
<i>What colour's</i> . . . . . ?		
<i>He's, she's, you're, they're, we're</i>		
<i>There's, they are, here's</i>		
<i>My books are/aren't</i>		
<i>Your books are/aren't</i>		
<i>His books are/aren't</i>		
<i>Their books are/aren't</i>		



<i>Where's Mary?</i>	She's there/here
These are/those are/aren't	
Whose is this?/Are these?	
<i>What's the time?</i>	<i>It's nine o'clock</i>
That's all	
<i>How many books are there . . . . .?</i>	There are/aren't
Are there any?	There aren't any
	There are some
<i>I've got a/I've got two/he's got/she's got</i>	
We've got/I haven't got	
<i>He/she hasn't got/they haven't got/we haven't got</i>	
<i>On/in/under/next to/to</i>	
Above/our of/at/in front of/	
behind/between/across/round/	
from/along/with/near	
<i>Where is . . . . . /are . . . . .?</i>	It's behind, they're on/under, etc.
Let's play/sing/dance	
<i>I can see/I can't see</i>	<i>He can see/can't see</i>
	We can/can't
I can see it/him, her/them	
Let me see	
<i>What are you doing?</i>	<i>I'm playing/singing</i>
<i>What's he doing?</i>	<i>He's playing/jumping, etc.</i>
	<i>She's talking/running</i>
<i>What are we doing?</i>	<i>You're sitting/standing</i>
<i>What are they doing?</i>	<i>They're holding/coming</i>
What am I doing?	It's rolling
	We're writing
<i>Where are you going?</i>	
How old are you?	I'm seven (years old)
What's he looking at?	
What's he reading?	
She's putting her coat on	
He's taking his coat off	
He's taking it off	
<i>Is there . . . . .?</i>	
<i>Are there . . . . .?</i>	
<i>Is there any milk for me?</i>	Yes, there is — No, there isn't
Please give me some . . . . .	
Please pass me some . . . . .	
Please may I have some . . . . .	
There are some . . . . .	
There isn't much time	
There aren't many apples	
There is a lot of noise	
There's very little	
There are a few	
<i>I like/I don't like</i>	
<i>Do you like . . . . .?</i>	
Do you want . . . . .?	<i>I want/I don't want</i>
What's your favourite?	It's . . . . ./my favourite is . . . . .
<i>Does he like football?</i>	<i>Yes, he likes/no, he doesn't like</i>
What does he/she want?	<i>He wants/he doesn't want</i>
What do they want?	They want/they don't want
<i>How many cakes do you want</i>	<i>I want/I don't want any</i>
How much milk does he want?	He wants/he doesn't want

Do you play/watch, etc.

Does he/she

*I'm Italian*

I come from Italy

*He's French/Dutch/German, etc.*

He comes from France/Holland/Germany

What languages do you speak?

*I speak/he speaks*

What's the weather like today?

. . . in spring/in winter, etc.

When is it cold, foggy, etc.?

What's it like in summer?

When's your birthday?

*Every day I go to school*

*In the morning/in the afternoon*

*In the evening/at night*

*I'm going to/he's going to/*

*she's going to/it's going to*

*you're going to/they're going to*

*we're going to*

By bus/train/car, etc.

*What's the time?*

*Yes, I do/no, I don't*

Yes, he does/no, he doesn't

*It's sunny/it's cold, etc.*

*It's on . . . . .*

*It's quarter to/past*

*It's half past*

Five, ten, twenty, twenty-five past/to

Tomorrow I'm going to go by car, etc.

I'm not going to

He's going to/he's not going to

you're not going to/they're not

going to/we're not going to

I'll go by car/he'll go by car

they'll go by car

you'll/we'll/it'll

*Comparison*

Small/smaller/smallest

Good/better/best

Bad/worse/worst

*When do you get up/go to bed, etc.?*

Does he get up at . . . . .?

*What did you do yesterday/at the weekend?*

*Where did you go?*

When did you have . . . . .?

Did you . . . . .?

Who did . . . . .?

What happened?

*We were/you were/they were*

*We weren't/you weren't/they weren't*

What were you doing?

What was he doing?

What were they doing?

*I get up at/he gets up at*

Yes, he does/no, he doesn't

*I went/we went*

I had/he had/they had/we had

I didn't have

Yes, I did/no, I didn't

*It was/he was/I was*

During the third year most of the previous 2 years' grammatical structures and vocabulary will be revised, renewed and strengthened, through the introduction of a complete course entailing reading, writing and audio-visual material.

### 3. *Incidental vocabulary*

Good morning/good afternoon  
Come in, close the door  
Open the window/sit down  
Close your books/put your pencils down  
Look at me/at the blackboard, etc.  
Show me/give me  
It's raining today/it's sunny today  
(snowy, stormy)  
Clean the blackboard  
Good boy/girl, naughty boy/girl  
Listen to me  
Touch, point to, hold up  
Draw a, paint a, colour a, cut out, fold  
Hold hands, make a circle  
Stop talking, be quiet  
Goodbye, see you tomorrow, have a nice weekend  
Excuse me, I'm sorry I'm late, may I go to the toilet?  
Thank you, all right  
Quickly, hurry-up  
That's very nice, that's lovely, that's funny  
Leave Tom alone  
Wake up, turn round, left, right  
that's right  
Oh, sorry, just a moment/minute please  
How are you? Fine thanks  
What's the matter? It doesn't matter  
Who's finished? Have you finished?  
Put your hands up  
Line up  
Of course you can  
On Saturday/on Sunday, etc.  
It's your turn now  
Leave it alone  
Oh dear, never mind  
Are you/we all ready?

All together  
Put your hands up  
Put your books away  
Have you forgotten your books?  
Sit next to X  
Switch the light on/off

Don't push  
Speak English please, not . . . . .  
Right

Good

Now then

Off you go

Be good, etc.

That's correct  
Wash your hands  
Pick it up  
Go to Mr X  
Stop work  
Clear up  
Mix

### 4. *Structured vocabulary within themes*

The classroom and school  
boy, girl, teacher, class, story, work  
table, chair, desk, cupboard, blackboard  
book, pencil, pencil-case, rubber,  
scissors, glue  
chalk, bag, wastepaper-basket  
window, floor, door, playground  
team, paints, paint-brush, pot

red, blue, green, yellow, orange  
black, white, grey, pink, brown

big, little  
thin, thick  
right, wrong  
lazy, clever

### *Numerals 1-10*

House and garden  
flat, wall, garden-gate, grass, flower,  
tree, gate, fence  
bedroom, bathroom, toilet, hall  
kitchen, living-room

nice, lovely, pretty

various items of furniture, TV, etc. garage, car, bicycle	
All about the child	
head, face, eyes, nose, ears	clean, dirty
mouth, hair, arms, legs	wet, dry
hands, feet, 'tummy', body, knee	
Clothes	
coat, hat, gloves, shoes, boots	new, old
pullover/jumper, trousers, shirt	
dress, skirt, socks, pyjamas, pocket	
handkerchief, umbrella, glasses	
Family	
mother, father, brother, sister	old, young
grandmother, grandfather	
parents, grandparents	
cousin, aunt, uncle, baby, friend	
Toys	
train, doll, soldier, drums, trumpet	wooden
teddy-bear, rabbit, elephant	soft, woolly, furry
Animals	
dog, cat, mouse, bird	noisy, smelly
(various zoo animals)	
lion, tigers, etc.	
noise, smell, cage	
Going to the doctor	
sick, hospital, nurse,	
operation, injection,	
dentist, tooth, teeth	
A railway station	
engine, steam-engine/electric	
platform, guard, whistle, flag	
luggage, suitcase, seat,	
smoke, dirt, excitement, holiday,	
weekend	
Going on holiday	
names of certain countries	getting ready, packing
France, Italy, Holland, England	by train, by boat, etc.
Scotland, Ireland, Wales	English, French, Italian, German, etc.
sea-side, beach, swimming	
sand, pyjamas, towels, ice-cream,	
film, money, exciting, mountains	
on a farm, farm animals, tractor	
forest	
Telling the time	
clock, watch, breakfast	quickly, at once, immediately
dinner-time, tea-time, bed-time	it's early, it's late
play-time	suddenly
Town	
street, shop, cinema, church	busy
bus, bus-stop, traffic lights,	
policeman, police-car, crossing, lorry	
fireman, fire-engine, people	
man, woman, men, women	hot, cold
picture, park, bridge, double-decker	

*Food and associated vocabulary*

breakfast	hot, cold
bread, butter, jam, milk, rolls	
eggs, cocoa, tea and coffee, orange-juice	
toast, jam, marmalade, potatoes	sticky
fish and meat, vegetables, etc.	hungry, ready
	thirsty, empty, full
cup, saucer, teapot saucepan, frying-pan	half, I'm starving
sink, water, cooker, knife, fork	
spoon	
a bottle of	
a cup of	
a slice of	
a piece of	
various fruits, e.g.	
banana, apple, orange, pineapple	sweet and sour
a bunch of grapes, lemon, pear	favourite

*Numerals 1-100*

*Season/weather*

summer, autumn, winter, spring	It's raining, it's pouring
leaves, gold	freezing
rain, wind, sun, snow, fog, ice	
skiing, skating, snowman, scarf	

*Seasonal festivities*

Christmas, Father Christmas, Saint Nicholas, happy, sad  
surprise, chimney, presents, toys, reindeer, sledge, cards  
Easter, ribbon, party, firework  
holiday-times, etc.

**D — Materials and aids**

*1. Introduction*

The teacher of English must endeavour to build up resources which will prove stimulating and helpful to his teaching. Firstly, an evocative atmosphere must be created in the classroom by the use of techniques such as labelling and captioning of pictures and objects, providing interesting work-books for the children and, in general supplying the stimulus from which language will naturally arise. By building up a store of appropriate aural and visual aids such as are listed here, the teacher can overcome many of the limitations of the classroom situation in language teaching. His task will be easier if his language teaching can take place in a classroom used solely for this purpose — or, if that is not possible, in his own classroom, or in an English classroom.

*2. For use by children*

Scrap-books for drawing and sticking in pictures ;  
Glue, scissors, etc. ;  
Picture-book ;  
Personal toys ;  
Course material plus additional readers (3rd year onwards).

*3. For use by teacher*

Flannelgraph, teazlegraph, magnet-boards ;  
White board — for use with felt pens, as a screen or blackboard ;  
Wall charts (e.g. dolphin and nursery rhyme charts) ;  
Pictures and picture-cards ;  
Equipment for making large size pictures and for photocopying ;  
Material for making games such as 'lotto'. Models and puppets ;

Overhead projector and tape-recorder ;  
Record-player ;  
Picture dictionary ;  
Songs and rhyme books.

#### 4. *For general use*

Expendable materials ;  
A class library ;  
English games and puzzles ;  
Anything of visual impact (which is of English origin, with which to decorate the class).

### **Years 4-5**

#### **1. Introduction**

The programme for the fourth and fifth years is provisional. The compilers' lack of previous experience in this area means that its suggestions must be experimental and that individual teachers must be allowed to interpret them with a certain degree of freedom.

Bearing this in mind, however, there are arguments in favour of limiting fourth- and fifth-year work to one book of the core-course for each year. Thus fourth-year children would work on L.G. Alexander 'Look, Listen and Learn', Book 2, and each teacher would be expected to undertake additional consolidation work without actually starting on Book 3 of the course until the fifth year. This leaves ample scope for the individual teacher to exploit and extend the scheme while he limits himself to 'a book a year'.

#### **2. Objectives**

##### *Fourth year*

The fourth-year course should aim at a controlled increase in structures and vocabulary with constant revision of the patterns encountered in the first three years.

The reading and writing scheme should consolidate the basic skills of understanding and speaking already acquired and reinforce the new patterns. Pupils should be prepared for more advanced and varied reading in the fifth year. A pleasant and spontaneous atmosphere should, however, continue to prevail.

##### *Fifth year*

The course should now take into consideration the child's gradually maturing interests. Progress is achieved through a change in subject matter, in centres of interest and in the method of presentation. Consolidation and expansion in the form of guided reading and writing should lead to a more creative use of the language.

By the end of the fifth year the pupil should have attained a level of proficiency in English, that will enable him, within his range of interest and experience, to communicate intelligibly and confidently in simple English.

During these two years attention should continue to be paid to developing the pupil's knowledge of the social and cultural background of the English-speaking world.

#### **3. Methodology**

##### *(General recommendations)*

##### *Listening*

The importance of listening as a key-activity in the language-learning process has been referred to in the general introduction to the programme for the first three years (see page 130/14). During the fourth and fifth years, pupils must be given the opportunity to listen to more difficult language with increasing emphasis on comprehension through context. The use of an

audio-visual method demands especially attentive listening. Lexical items and structures are presented in the form of dialogues, plays, stories, poems, songs, rhymes and games. The pupils must be encouraged to listen carefully to others using the language, individually and in group, in order to promote accuracy and self-correction. Much of this practice can be given in an interesting way through group activities. A variety of aural and visual aids (such as the 'language master', tape-recorder and headphones, record-player, film-strip, radio and where possible, the language laboratory) is necessary in order to promote interest and good listening.

### *Spoken English*

The overall objective of teaching spoken English is the facilitation and extension of communication.

The immediate aims are ready comprehension and fluent, clear speech. Good speech depends on attentive listening and understanding.

*Pronunciation* : In practice, pupils will tend to copy their teacher's pronunciation and other speech characteristics.

The variety of vowel sounds peculiar to the English language should be taught in all their natural forms (e.g. unstressed vowel-sounds such as the neutral vowel — etc.). The same applies to consonants that offer particular difficulties.

Teachers should pay special attention to the varying difficulties which arise out of differing linguistic backgrounds.

*Stress and intonation* : Differences in stress and intonation should be kept in mind by the teacher, and emphasized when this is appropriate. Pupils must be given practice in saying phrases and sentences so that they acquire a feeling for what might be called 'contextual stress'; failure to achieve this certainly retards their comprehension of everyday English speech, and may restrict their own spoken English to a stilted variety.

While primary school children may well be too young to cope with (or need) intonation pattern drills, they *do* need, by the fourth and fifth years, to recognize that there *are* intonation patterns, so that they may perceive them when they hear English spoken, and begin to associate these patterns with meaning. Such patterns require to be demonstrated, and pupils taught to pronounce them correctly.

*Method* : The teaching of spoken English should make use of all forms in which English is used orally, keeping in mind the children's age group and interests.

### *Reading*

The purpose of reading in English is manifold. Reading can be a means of obtaining a great deal of pleasure in any language, and this is equally true of reading in a foreign language. However, reading for these classes should be much more than merely a source of pleasure : it is a very important way of consolidating structures and vocabulary already encountered orally. Reading is also a means of introducing new themes and expanding structures and vocabulary.

Later reading will become a means of gaining factual information, of appreciating literature and of generally helping the children who study English as a 'living language' to understand the cultural background of the English-speaking world.

Therefore, it is important that the children should enjoy reading and develop good reading habits as early as possible.

Reading is not an entirely new skill to these children, since they have been reading in their mother-tongue for at least three years. The teacher should be aware of those children who already have reading problems in their own language. Difficulties arising out of unfamiliar vowel and consonant combinations need special attention (see also under 'Spoken English'). Reading is a skill which has to be mastered fairly early in most courses (e.g. L.G. Alexander : 'Look, listen and learn' Book 1, Unit 14 — third year). Courses usually recommend the

parallel use of 'link readers' at various set stages. Therefore, a classroom library should be started with structured readers, and also with suitable reading schemes used in the teaching of English mother-tongue, some time during the fourth year. Use should be made of as much reading material as possible to consolidate words met and also to vary the pace and form of a lesson (see appendix on suitable additional reading material such as flash-cards, etc.).

In the fourth and fifth years opportunities for reading beyond the structural readers provided should be given to those children who are able.

Reading should go outside their active use of the language. By the end of the fifth year it is to be hoped that a broad range of suitably selected books will be available for use in either the suggested library or in a 'book corner'. Additional reading schemes and reading material in general would have to be checked for lexical problems, new structures, reading age and interest level.

The reading in the fourth and fifth years should lead to a more confident use of the language. At the same time, it is important that reading be guided and that adequate steps be taken to ensure that the children comprehend what they read. All forms such as silent personal reading, group-reading and reading aloud need to be encouraged. The teacher has to ensure that the intonation and rhythm of the language are not lost through hesitation and that pronunciation remains of an acceptable standard. Reading should be regarded as an important means of broadening the pupil's command of English, of helping to develop fluent writing and of extending his general knowledge and his background knowledge of the English-speaking world.

### *Writing*

The skill of writing will have been introduced in a simple form during the third year.

Written work must at all times during the primary course, follow the mastery of the spoken word and familiarity with the reading of the word.

Reading and writing skills are inextricably woven, and although reading will precede writing skills, the intense enthusiasm of most children to write down what they can read should not be totally ignored or worse still actively discouraged.

Flash-cards will have been used in the third year, and a careful selection of these will provide a sound introduction to the skill of writing. Used as simple captions for drawings in scrap-books, for example, these familiar words will soon be fluently, confidently and correctly written. The 'Pupil's Workbook' of the core-course (Workbook II) can then be tackled with more confidence and success.

Phonetic spelling lists and simple dictations based upon these will prove a useful reinforcement to writing skills. Towards the end of the fourth year the children should have mastered the writing skills to the point where simple 'guided' composition — perhaps allied to pictures — should be introduced. The transition from fourth to fifth would see the introduction of simple written comprehension.

The final stage, at the end of the fifth year, would be the introduction of free creative writing, in which the pupil is, by the use of known structures and vocabulary, able to express himself in good, fluent, simple English.

Correction of written work should be dealt with promptly and constructively, i.e. positively rather than negatively. The merits of occasional selective marking need to be considered.

### *Evaluation and assessment*

The recommended core-course provides built-in techniques for evaluation and assessing the pupil's progress.

If these are found to be inadequate the teacher must devise his own method of continuous assessment of both oral and written work. Such assessment should indicate difficulties met by individual pupils and suggest relevant reinforcement work.

Provision should be made for pupils who have not reached the level required ; either because they are late beginners or have individual difficulties.



#### 4. Content

##### *The syllabus*

The syllabus for years 4 and 5 is contained in the core-course (L.G. Alexander 'Look, listen and learn', Books 2 and 3). The grammatical structures are clearly indicated in the Teacher's Books for this course. It is advisable to follow the order indicated, although teachers are free to present and supplement the work in their own way.

The children are expected to understand the structures and use them confidently and fluently in a variety of situations. They should also be able to understand and practise them in the newly-acquired skills of reading and writing.

The greater part of the pupil's work is still oral, however.

##### *The structures*

In Book 2, lessons 1-16 the structures and vocabulary already learnt in Book 1 are revised (including : present continuous, present simple, 'going to' future, etc.).

Lessons 17-42 continue the revision while at the same time some new structures are introduced.

In lesson 43 the past simple is introduced and in lesson 85 the present perfect. These two tenses are revised and contrasted.

By the end of Book 2, the pupils should have a good basic knowledge of the language and the four most frequent tenses.

Book 3 covers an intermediate stage and contains revision lessons (1-16) and more advanced structures (e.g. auxiliaries, present perfect continuous, past continuous, conditional 1, and some relatives, etc.).

By the end of this year the children will have acquired a good standard of English.

*The vocabulary* : a complete list of the vocabulary covered is given at the end of the Teacher's Books.

Suitable songs and stories are also included. The individual teacher is advised to supplement this material as he wishes.

#### **Appendix on additional reading material**

1. *Posters and postcards* with titles on them are displayed around the classroom.
2. *The blackboard*. Children often want to use and write a word which they can pronounce.
3. *Drawings* which are done by the children can have captions under them.
4. *Scrapbooks* can be made and arranged by the children. Captions can be written or cut out to put under the pictures.
5. *Calendars* with English scenes, names, and dates in English can be hung on the walls.
6. *Wallcharts* which are used for language teaching may have some written words on them.
7. *Flash-cards* can have both pictures and words written on them.

These may be used in several ways :

- (a) To teach new language structures,  
e.g. Have you got a *dog*? (word plus picture).
- (b) To play team games by giving instructions,  
e.g. Touch the table. Go to the door.
- (c) To play team games, matching words to pictures.

8. *Children's games* with pictures and words printed on them.
  - (a) Bingo or lotto can be played by pupils in groups with the teacher (or a pupil) calling.
  - (b) Dominoes can be played in groups first with the numbers on one side, and then with the pictures and words on the other side (animals, Disney characters).
  - (c) Jigsaw puzzles can be played in groups too. Words can be printed or struck on certain pictures.
  - (d) Snap can be played in twos or more.
  - (e) Happy Families. This is especially suitable for names and professions.
  - (f) Junior Scrabble. Suitable for fourth and fifth years.
  - (g) I-Spy, etc.
9. *Comic strips and cartoons* from newspapers, comics or magazines, cut out or copied by the teacher.
10. *Graded readers*, e.g. Longmans or Ladybird, may be used for private, group or class reading for 10-15 minutes per week.

These may be used in the following ways :

  - (a) For comprehension aural and written.
  - (b) For four-line dialogues and intonation practice.
  - (c) For acting scenes.
  - (d) For consolidating structures already learnt and therefore they must be suitable for the level of the class.
11. *Other readers*, e.g. traditional stories. These can be used at the teacher's discretion and provided they are suitable for a younger reading age.
12. *Songbooks* can be used, if the children have already learnt and sung the songs before.

## European periods

The pupils of the six linguistic sections are grouped in common courses, according to age or sex, for the following subjects :

- Musical education,
- Art,
- Needlework or arts and crafts,
- Physical education.

# History

## *Introduction*

At the primary school, the teaching of history ought to be a simple and lively initiation, based, as often and for as long a time as possible, on personal observation.

## *Aim*

This introduction has as its aim :

- (1) Revealing to the child the existence of the past and interesting him in it.
- (2) Giving him a precise sense of the duration and notion of time.
- (3) Teaching him the idea of the evolution of civilization by supplying him with concrete and representative knowledge on past epochs.
- (4) Giving him a clear and lasting knowledge of the principal facts and personages of the history of Europe, at the same time as a glimpse of the way in which the national unity of his country has been effected from the end of the eighteenth century to our own day.
- (5) Preparing the child for international understanding, underlining the interdependence of peoples, presenting the personage and the facts with a rigorous objectivity.
- (6) Leading the child to understand and utilize an elementary historical vocabulary.
- (7) Completing his civic education.
- (8) Arousing in him the desire for more complete information and the taste for historical reading.

## *Methodology*

- (1) In the three lower classes history will not be taught systematically. The teacher will find, however, numerous possibilities for carrying out an occasional initiation. The observation and utilization of the local and regional milieu, the utilization of the present time, the commemoration of certain events, reading texts, etc. supply excellent motivation. In this way the child will become progressively aware of the existence of a past different from what exists now. He will likewise have the opportunity of placing himself in relation to some historical facts, which will introduce him into the extremely complicated understanding of the passage of time.
- (2) In the 4th year, the teaching will be an historical initiation beginning, as far as possible, from the exploration of the local or regional milieu or, otherwise, from original material (authentic documents, furniture, utensils, books, arms, lamps, etc.) or from reproductions (prints, photographs, transparencies, films, models, etc.).

To make this teaching still more active, the teacher will encourage the pupils to seek the basic documentation themselves, to collect pictures, picture postcards, photographs and texts ; to reproduce sketches and engravings, etc.

In the 4th year, the teaching is still not chronological. The programme provides for the development of a certain number of different themes. Each of them may give rise to a series of patch studies.

The facts will be arranged, therefore, in relation to each other. With the passing of the school year, this line will progressively fill out and the pupil will gradually acquire an exact knowledge of the life of mankind in the past at the same time as a vision, still general but sufficient, of the succession of events in time.

To encourage this, the teacher will take care periodically to group the facts studied in partial syntheses. He will conclude his course, at the end of the year, with an overall synthesis which will regroup all the suitable elements on the time chart, divided, this time, into centuries. This frieze will accompany the class into the 5th year.

- (3) In the 5th year, the major periods of the history of Western man will be studied, in chronological order. The facts of political and military history will still be excluded :

what should be understood by the pupil is the march of the European people through all the vicissitudes of previous centuries towards their present social, economic and cultural condition. The last lessons of the course will be devoted to evoking the achieving of national unity by each of the countries and to the major events of contemporary history (since approximately 1789), in order to give the pupils an insight into their recent national history.

It would be advantageous to give a concrete form to this instruction by starting with authentic documents, reproductions, models, simple and stimulating texts, etc.

Each period will be illustrated by one or several historical figures, chosen not only from personalities who have made their marks on events, but also from those — saints, heroes, artists, scientists — who represent a moral or spiritual value and whose life constitutes an educative example. These personages will be presented in their historical context, so that the major events can be evoked through them, as can the types of life, the interests and aspirations of the men of the past.

As in the 4th year, the facts will be placed on the time chart. But the relative approximation of the previous year will give way, here, to a precise localization on a frieze divided into equal parts corresponding to the succession of the centuries.

Particular topics within periods can be studied. They could evoke a whole period in its various aspects (historical facts, famous persons, types of life, innovations and progress) or compare between them several periods envisaged from a given point of view (habitation, transport, navigation, freedom of the individual, etc.).

Some examples of topics :

- (a) the constant search for domestic comfort ;
- (b) the progress of transport and communication media ;
- (c) the efforts made to ease the labour of the urban and farm worker ;
- (d) the progress of education in school ;
- (e) the technical evolution from the discovery of fire to the great inventions of the twentieth century.
- (f) the artistic past.

### *Programme*

#### **4th year**

#### *Notes*

- (1) All the themes do not have to be dealt with in the course of one school year. Accumulating material is much less important than aiming at awakening historical curiosity in the children. The utilization of seven to eight themes a year can contribute to this. The content of these themes has only an indicative value for the teachers.
- (2) They should not necessarily be dealt with in the order given below.
- (3) As far as possible, a theme should relate to contemporary events and to the interests of the pupils. In this way, the past can be explored in connection with the present and comparisons will be more fruitful.
- (4) The teacher will employ the progressive or regressive method, in relation to the theme he is studying.
- (5) The synthesis at the end of the year is obligatory. It will occupy at the minimum a whole lesson.

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A — *The life of the child through the ages*

1. The life of the child
 

The life of the child in the caves. He is introduced to hunting and domestic work. He also plays (dolls, knucklebones).

In the Middle Ages : closed economy, early work for the child of a serf, castle-life for the child of a lord (tournaments, troubadours, hunting).

Village life : the child very soon carried out the work of his parents. He takes part, however, in the entertainments organized in the villages (fairs, theatrical presentations).

In the period of the machine : the young child is sent into the factory, the mines, the fields. He lives in misery.

The present century : the century of the child.
2. The school and education
 

The palace school, the school of Charlemagne. The village school in the communal period and later. The education of girls is neglected. The school after the French Revolution. The spread of compulsory education.
3. Writing and the book
 

The inscriptions in caves and on clay tablets.  
The invention of writing.  
The copiers in the monasteries (illuminated manuscripts).  
The invention of paper.  
Printing : Gutenberg. The spread of the book and culture.

B — *The life of the family*

1. Food
 

Hunting and fishing, cooking food, salt. Gathering food, the nomadic life.  
Agriculture and stock-rearing, baking bread, preserving meat.  
Cultivating the vine.  
The first vegetables : peas, beans.  
The spices imported from the East. The introduction of the apple.  
Beet sugar.
2. Clothing
 

Animals' skins.  
The weaving of vegetable fibre, then of wool. A weaver at work at the time of the guilds.  
The silks of the Orient. The manufactured articles.  
The spinning and weaving mills.
3. Habitation
 

Man seeks shelter : in trees, caves, a hut, lake dwelling.  
A Gallic or Germanic village. A Roman villa. The Merovingian farm. The feudal castle. A town in the Middle Ages and its wooden houses. Stone houses. Fortified towns. Modern towns.
4. Heating
 

Man learns about fire (spontaneous burning of bushes or trees).  
Maintenance of fire. Tools to make fire : flint.  
In the hut, hearth in the centre. Smoke escapes through the roof.  
The Romans : central heating, braziers.  
Middle Ages : wood fires in large fireplaces. Hearths in fireproof brick. Coal heating in cast-iron stoves. Central heating.

Study themes	Developments
5. Lighting	<p>The light of the fire.  Oil-lamps.  Torches.  Candles.  The paraffin-lamp.  Gas lighting.  Electricity.</p>
<i>C — The occupations of men</i>	
1. Agriculture	<p>The period of food-gathering and hunting.  Cultivation : corn. The first implements : hoe, spade, sickle.  Man tames the animals, then domesticates them : the sheep, the pig, geese, the horse.  Livestock.  The animal-drawn plough (stake).  The wheeled plough.  Man cleans the forests and dries out the marshes.  Extension of cultivation : flax, potatoes, the sugar-beet.  Improvement of the land. Fertilizers. Intensive cultivation.</p>
2. The working classes and industry	<p>Man invents tools. Working in stone, ivory. Working in pottery. Plaiting and weaving. Working in metal.  The working classes in the Roman period, in the Carolingian period.  The working classes in the communal period. The guilds.  The workshops of the Old Régime.  The introduction of machinery and large-scale industry.</p>
<i>D — Relationships between men</i>	
1. The human groupings	<p>The family, the clan, the tribe in the primitive periods.  A Gallic village.  The Roman society (the rich, the proletariat, the slaves).  Feudal society : Serfdom.  Conquest of liberties in the communal period.  The Old Régime : nobility, clergy, third estate.  The revolution of 1789 : liberty, equality, fraternity.  Present organization of a State.  From local organizations to international ones.</p>
2. Communications and transport	<p>(a) <i>By road</i></p> <p>The primitive period : tracks, conveyance on the back (human energy).  Domestication of animals : horse, ox (animal energy).  Invention of the wheel. The wagon, the Gallic chariot, the Roman chariot.  The Roman road.  9th century : the horse-show and the draught collar. From the XVth to the XVIIIth century : improvement of the roads.  Coaches.  XIXth century : steam traction.</p>

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- (b) *By water*
- The floating tree trunk, the raft without oars. The sail and oar-ships of the Romans. River and maritime voyages. The Dakkars of the Norsemen. The compass. The caravels and the voyages of discovery (Columbus, Magellan). The Hanseatic ports. Steam navigation. River and maritime commerce.
3. Communication of news In antiquity : the messenger. Oral transmission, then written (invention of writing). The Roman post and relays. The *missi dominici* of Charlemagne. The town-crier in the Middle Ages. Printing. Posters. The mail-coach. The Chape telegraph. The Morse telegraph. The telephone. Radio-telegraphy. Radio and television.
4. Commerce Man makes use of various means of communication to trade. Barter in the primitive ages. The appearance of money. Trade by way of the Roman highways. Exchange of goods and also ideas and knowledge. In the Frankish epoch the flow of commerce spreads to Germania, the Scandinavian countries, England. The birth of towns : markets, fairs, ports. The improvement of the means of transport favours the increase of the exchanges. The railway. The major European commercial axes.

E — *The spiritual and artistic impulses of men*

1. Man and his spiritual preoccupations Primitive man : His metaphysical or religious speculations, the Druids. His artistic expressions : the decoration of caves, pottery, plaiting, music and epic songs. The Roman : religion, artistic creations. Birth and spread of Christianity. The monasteries, their cultural work. The art of the Middle Ages : Romanesque then Gothic (Rheims, Bamberg). The Protestant religion (Luther). Painting and sculpture (Dürer, Michelangelo, Rubens). Music (Bach, Mozart, Beethoven). Literature (Dante, Shakespeare, Cervantes, Molière, Goethe). The arts in our own time.

F — *Synthesis*

1. Regroup the various elements dealt with on the time chart, classifying them by century. Make a synthesis of the unrolling of the evolution of the life of Western man, from primitive times to the present day.
2. What does our country give to the other peoples of Europe ? What does it receive from them in its turn ?  
Conclusion : the interdependence of the peoples of the West.



## 5th year

### Notes

- (1) The programme forms a whole. All the periods will be evoked in such a way that the children will have an adequate view of the continuity of the historical evolution. The teacher will assess, in relation to his class, the importance to give to each of the points enumerated.
- (2) The teacher will recall the notions considered in the 4th year.
- (3) One avoids, in principle, any development of political and military history, apart from in the last lessons which deal with national history. Then it is proper to be very objective and to avoid arousing sentiments of hatred or chauvinism.
- (4) Throughout the course, it is necessary to emphasize the interdependence of the people of Europe, the advantages to be drawn from their agreements, the material and mental misery produced by their disagreements.
- (5) The partial syntheses made during the year and the final syntheses should contribute to creating in the pupil a very clear idea that, as well as belonging to his own nation, he belongs to Europe with millions of other Europeans, jointly responsible and destined to live together in good harmony.

Periods	Topics to study
1. Man and prehistory	He lives from food-gathering, hunting and fishing. He lives in caves, huts, lake dwellings. He discovers fire. He makes tools and arms : in stone, horn, bone, finally in metal. Weaving, pottery. The beginnings of agriculture and the domestication of animals. The invention of the wheel. Prehistoric paintings. The megalithic monuments and the appearance of the religious sense. The invention of writing (at first, ideographic).
2. The Mediterranean world and West Europe ( $\pm$ 1st century BC to $\pm$ 500)	Europe 2000 years ago : in the Roman world, in Gaul and in Germania. Contribution of the Romans to the West : the Roman Peace, the roads, the towns, the commercial transactions. The cultural contributions. Balanced assessment of the first attempt at European unification : order and prosperity.
3. New attempt at European unification ( $\pm$ 500 to $\pm$ 800)	The invasions : mixing of peoples and civilizations. The extension of Christianity. The monasteries and their civilizing work. A great emperor : Charlemagne. Second attempt at the unification of Europe. The Carolingian Golden Age, the teaching, the arts and letters. The division of the empire : decline of commerce and civilization.
4. The feudal system : parcelling-up of Europe (9th - 12th century)	The feudal system. Everything is owned by the lord. Life in a fortified castle. The life of the serf. The crusades : reopening of the Mediterranean. Consequences from the point of view of civilization. The arts : Romanesque churches. Balances assessment of this period : parcelling-up of Europe.

Periods	Topics to study
5. Birth of the towns (12th - 15th century)	The towns and the communal movement. The middle classes reclaim their liberties. Rebirth of commerce, itinerant merchants, fairs. The Hanse. Life in a country and in a town in the twelfth century. The workmen and the guild system. The Gothic cathedrals. The universities. Dante Alighieri.
6. The strengthening of the great States (16th - 18th century)	The king reigns. The great discoveries and technical progress : economic consequences. Vasco da Gama, Columbus, Magellan. Printing : Gutenberg. The Renaissance and the Reformation : Luther, Erasmus, Breughel, Dürer, da Vinci, Raphael, Michelangelo. Social organization under the Old Régime. Technical progress : steam-engine, vaccines. The intellectual life : Shakespeare, Cervantes, Racine, Molière, Rubens, Rembrandt, Bach, Mozart : A baroque church.
7. Towards the sovereignty of the people (1789)	The people struggle against the absolutism of Kings. Voltaire, Rousseau, the Encyclopaedists, Beccaria. The French Revolution. The Rights of Man and of the Citizen. The ideas of the Revolution spread through Europe.
8. The West in the contemporary period	Programme to be laid down by a group of teachers of each nationality. These lessons will be devoted to evoking the achieving of national unity by each country and to the major events in contemporary history (since approximately 1789) in order to give the pupils an insight into their recent national history.
9. Syntheses	Drawing on examples from history, show that : (a) Europe is an historical, economic and cultural entity. (b) Its epochs of prosperity, social progress, artistic and cultural refinement have coincided with periods of association and unity. (c) The periods of decline were most often the result of divisions and oppositions between nations.

# Geography

All lessons will be based on observation of the local environment, on the explanation of prints and photographic documents.

Plans of the class, the house, the road, the commune, the town will serve as an initiation in the understanding of a map.

The lessons will be conceived as means of introducing the child to observation and comprehension of the major geographical facts and their customary vocabulary.

## **3rd year**

- (a) Local geography : study by the most direct observation possible of the village or the town and of the surrounding region.

The making by the pupils of small monographs of the district, village or town. Plans of the class, the school, the district, the town.

- (b) Cardinal points. Weather-type seasons. Features of the earth. Tides. The sea. The habitations and grouping of men : their different work and ways of life. The means of communication and exchange.

## **4th year**

- (a) Principal geographical features of the national country with constant use of the map, board, print, photographic documents.
- (b) Initiation into the notion of scale, map-reading.
- (c) Terrains. Types of vegetation.

## **5th year**

A more complete study of the national country and brief presentation of the countries of the European Community.

Notion of scale.

The continents and the oceans (exercises in locating on the map).

# Moral education

## I — *Preamble*

Moral education is intended to meet the demand of parents for children for whom moral education has its fundamentals in a philosophical attitude independent of any religious doctrine. It has as its aim the preparation of the pupils to live in the real world as balanced, generous, liberal and tolerant people open to the brotherhood of man. The task of the teacher is to guide the children entrusted to him, examining with them the problems of individual life and life in society and helping them to solve these. He should demonstrate the most scrupulous objectivity in examining these problems and contribute to the development of their personality while allowing them freely to establish their convictions.

## II — *Methodology of moral education in the primary school*

The primary school child, particularly between 6 and 10 years of age, learns morality in action and, to the extent that he can, from the experience of everyday living. Between 6 and 8 he notes what is good, what is bad, and the craft of the teacher consists in persuading him to do this because it is good and not to do that because it is bad. Between 8 and 10, the simple establishment of a fact is reinforced with very simple attempts at explanation and justification. Between 10 and 12, explanations can become more reasoned, based on elementary value judgments and lead to the formulation of some major principles of moral living.

## III — *Teaching process*

School life offers an occasion to enlarge the teaching of moral education well beyond the hours of the course devoted to it. Any lesson, any hour of play or work has its moral aspects which the teacher should seize on 'from life'.

Between 6 and 8, the teacher will endeavour to place the children in a 'moral situation' in class, encharging them with small responsibilities to the extent necessary; he will assess the way they have been discharged, note the small sacrifices, create emulation in the personal context, stimulate exchanges of ideas on the facts experienced at school, in the street, at home. Finally, the teacher will be able to use readings, narratives and works suited to this age; these narratives can be illustrated, acted by the children, dramatized by their older school-fellows.

Between 8 and 10, exposition, although having a more major place, will never be more than a part of the lesson; it will be followed by a discussion in which the pupils will take part and which will end in the formulation of a moral judgment.

A brief summary may be written in the moral education exercise book. At this stage, the teacher will make use of present-day events, the local environment, film, reading and narrative: games, use of documents.

Beyond the 10th year, every means of information (press, radio, cinema, magazines, UNICEF publications, etc.) will be extensively used. Reading will hold a large place, it will be followed by oral reports and discussions.

Silent reading followed by well-prepared questions will exercise the critical faculty and judgment of the children.

## IV — *Programme of topics*

### **1st year**

- (a) The duties of the child towards himself:
  - What is good, what is bad (discovered by short investigations);
  - Cleanliness;

- Assiduity, precision ;
  - I respect my clothes ;
  - I learn not to be shy ;
  - I am not a meddler (I am careful) ;
  - I am not indiscreet. I do not speak badly of others ;
  - I want to be truthful. I keep my promises ;
  - I learn at school (how ?) ;
  - Lies and truth ;
  - The good of others.
- (b) The child and those who are around him (rights and duties) :
- I respect others ; I am polite, understanding ; I avoid quarrels ;
  - I respect animals ;
  - I respect plants ;
  - I learn to walk in the street, to cross at a crossroad ;
  - I behave well at home ;
  - I behave well at school ;
  - I am polite on all occasions.
- (c) The child and society :
- Respect for parents ;
  - Brothers and sisters ;
  - The family together ;
  - The small services ;
  - The role of the child in the family ;
  - The good friend.

## 2nd year

- (a) Duties of the child towards himself :
- Patience at work and play.
  - We are always polite.
  - We are neither jealous or envious.
  - We do not lie.
  - We do not look for quarrels with other people.
  - We respect the property of other people.
- (b) The child and those around him :
- We learn to take responsibilities.
  - The dangers of the street (ball on the pavement, etc.).
  - How to use the tram, the bus, the train.
  - We draw and play with road signs.
  - We behave well, in the street, on a visit, at home.
- (c) The child and society :
- How to show our parents, our brothers and our sisters that we love them.
  - We are pleasant, tolerant, considerate towards our friends.
  - The children of other countries are like me, they are my friends also.

## 3rd and 4th year

- (a) Duties of the child towards himself :
- We respect and strengthen our body (games, sport, hygiene).
  - We tell the truth at all cost.
  - We accept responsibility for our words and actions.
  - We endeavour to recognize and fight against our faults.
  - We are careful (explain the meaning of certain safety first signs : danger of death, emergency exit, death's head, high tension, etc.).

We are economical, we do not waste.

We respect the property of others, we hand in objects found, we make amends for our wrongdoings.

(b) The child and those around him :

We do not judge lightly : grave consequences of our errors, of our lies.

We make amends for our unjust actions.

Preserve a secret, a confidence (gossiping).

Actions of the association for the prevention of cruelty to animals.

Usefulness of certain animals.

We learn to ride a bicycle properly.

We help smaller children to cross the road.

How we behave in public, at table.

We learn to know our friends from other countries better, to play with them.

(c) The child and society :

I do unto others as I would wish they would do unto me.

My responsibility increases as I become bigger : the idea of the community, the mayor, public services, the police, the fire brigade, the traffic police.

The Red Cross.

Example of some great men (making use of the present).

Work, need for it, effort and progress, interdependence and the brotherhood of man, respect for the products of labour.

## 5th year

(a) Duties of the child towards him or herself :

We do good for the sake of doing good without expecting a reward.

We always act according to our conscience.

We do not allow ourselves to be governed by base sentiments (boastfulness, vengeance, bitterness, cheating, calumny, etc.).

We are careful (dangerous products).

We are careful in our judgments (do not trust in appearances, in first impressions).

We are provident.

We are brave without rash.

Perseverance and obstinacy.

True and false heroes.

Property and theft.

Sincerity, candour.

The learning process.

Pioneers of science.

(b) The child and those around him :

Respect for the rights of others.

Respect for work.

How boys behave with girls and vice versa.

Respect for the integrity of other people.

Respect for private and public property.

Respect for life.

Basic traffic regulations.

The organization of traffic.

The cyclist on the road.

Road courtesy.

Politeness.

Friendship.

Tolerance, its limits.

- (c) The child and society :  
Kindness and egoism.  
Patience and devotion.  
Interdependence and cooperation between men, in the national context, in the international context.
- Uno, Unesco, Unicef.  
The International Red Cross Organization.  
The European Communities.  
Great examples and figures of humanity.

# Music

*At a minimum one song a month will be learnt*

## **1st and 2nd year**

Very simple songs by listening.

## **3rd and 4th year**

Study of simple songs for one voice or in canon by listening.

Formation of the voice and ear.

Study of sounds, of the scale, of simple intervals (third fifth), of the voice compass.

Study of the durations: the round, the minim, the crochet and the corresponding silences.

## **5th year**

School songs learnt by listening.

Formation of the voice and ear.

Continuation of the previous studies with exercises containing new values (quaver, dotted note and corresponding silences).

Study of quadruple time and triple time.

Listening to major musical works.



# Arts and crafts

## 1st and 2nd year

### *Boys*

Paper mosaic used to make abstract or figurative works.

Small exercises : plaiting, folding, weaving with silk, raffia, paper, etc.

Cutting up of paper, collage of silhouettes on paper.

Pinning, cutting and sticking silhouettes on paper.

### *Girls*

Exercises taken from the programme above.

Introduction to crochet-work and knitting.

## 3rd, 4th and 5th year

### *Boys*

(1) Work involving tracing, cutting up, collage in association with lessons in geometry and observation exercises :

(a) Plane geometric figuration ;

(b) Representation and execution of solids in card, geometry and further development.

(2) Preparation for daily living : sewing buttons, making a parcel, covering books and exercise books, making various objects (cardboard, wood, string, wire).

Cutting up with the saw, making outlines of parts for assembling with glue or pins.

Modelling : plasticine and clay.

### *Girls*

Exercises taken from the programme above.

Alphabet and figures by running stitch on coarse muslin.

Standard needlework : simple sewing, over-sewing.

Flat seam in cross thread, stitched hem : pieces with one corner over-sewn.

Repairs, darns on knitted material.

Knitting : plain and purl.

Crochet-work : in chain, half-treble, treble, double treble.

Introduction to embroidery.

# Art

Whether it be work with the pencil or pen, powder colour or stencils, crayon or water-colours, art teaching should respect the three forms suitable for pupils of six to ten years of age : spontaneous art, art from nature, decorative art.

Spontaneous art is the most natural graphic or pictorial mode of expression in the world of the child ; in this case, he express himself in his own way, spontaneously, through the subjects which interest him. Any possible correction of this work should not consist of retouching or erasures, or inopportune suggestions, but it should allow the child to see progressively more clearly, by means of which he will be helped to correct himself ; keener reflection and observation will guide him in this process.

Tracings and copies are not advisable because they are processes impeding the spontaneity of the child and contrary to integrity and good taste.

The aim of art from nature is to awaken in the child the spirit of observation and to give him practice in representing objects by means of lines and colours according to his personal vision. For this form of art, the corrections of the teacher, who must himself have a very sure artistic taste, are more important.

Decorative art should develop and encourage in the child a spontaneity of rhythmic expression, graphic as well as pictorial. Decorative compositions should reflect the spirit of inventiveness of the pupils and draw inspiration from the environment and the local artistic traditions to give them stimulus and ideas.

## **1st and 2nd year**

Free pencil drawing, with black pencil, coloured pencil, free painting with water-colours. Grouping and aligning objects (cubes, sticks, pebbles, grains, etc.) in the form of silhouettes, borders, rosettes, etc. Drawing in black pencil or coloured pencil of very simple objects placed before the eyes of the pupils.

## **3rd, 4th and 5th year**

Drawing of simple familiar objects, examples taken from the animal or vegetable kingdom. Drawing from memory : illustrations of exercises in the mother tongue, history or geography. Decorative arrangements. Introduction to the harmony of the colours with a view to practical application. Use of the black pencil, the coloured pencil, water-colours, gouache.

# Physical education

## **1st and 2nd year**

Continuation of song and mimed rounds. Exercises for suppleness and coordination, mimed or non-mimed.

Abdominal and dorsal exercises in lying down or seated position, movement exercises under the form of natural exercises, aiming at developing dexterity, speed, agility.

Breathing and singing exercises, sensory games, theme games (specially for the 2nd year). Introduction to corrective gymnastics, postural exercises in seated position, standing, kneeling.

Abdominal and dorso-lumbar exercises.

## **3rd, 4th and 5th year**

Various manœuvres (circle, hairpin, ring, etc.).

Complete lesson on ground.

Lesson on various circuits.

Start of the introduction to sport, sprints, relays, high-jumps, running and standing.

Major games involving sides, Prisoner Ball, bars involving making up and disbanding of teams during games.

During indoor lessons, only in times of bad weather, insist especially on exercises and walking to singing. Carry out abdominal, dorsal and lumbar exercises — seated and lying position, with and without equipment — and agility exercises.

All classes should involve a number of exercises to prevent or correct bad posture.

Introduction to swimming.

Added to this general programme, more especially for the small girls, are rounds, mimed songs and an introduction to rhythm and dancing.

## LIST OF SUBJECTS

### Note on the structure and organization of studies at the European School

#### I — Timetables and harmonized programmes for the secondary classes

Harmonized timetables for the secondary cycle . . . . .	5
Harmonized programmes	
Mother tongue — English . . . . .	7
Classical languages : Latin . . . . .	17
Greek . . . . .	17
Philosophy . . . . .	18
Modern languages : English — foreign language . . . . .	22
History . . . . .	35
Geography . . . . .	38
Economic geography . . . . .	41
Mathematics . . . . .	43
Applied mathematics . . . . .	54
Economics . . . . .	56
Sociology . . . . .	60
Law . . . . .	62
Biology . . . . .	63
Chemistry . . . . .	68
Physics . . . . .	70
Music . . . . .	75
Non-denominational moral education . . . . .	77
Social studies . . . . .	79

#### II — Timetables and harmonized programmes for the short terminal cycle :

##### 4th and 5th years

Harmonized timetables . . . . .	83
Harmonized programmes	
History . . . . .	84
Economic geography . . . . .	86
Mathematics . . . . .	88
Science . . . . .	89
Optional subjects . . . . .	91
<i>Group 1</i>	
Geometrical drawing . . . . .	91
Technology . . . . .	92
Arts and crafts . . . . .	92

*Group 2*

Book-keeping . . . . .	93
Commercial arithmetic . . . . .	94
Typing . . . . .	95
Shorthand . . . . .	95
Commercial correspondence . . . . .	95

*Group 3*

Child care and development . . . . .	96
Home economics . . . . .	97
Art education . . . . .	98

**III — Timetables and harmonized programmes for the primary classes**

General introduction to the programmes of the primary school . . . . .	101
Harmonized timetables . . . . .	103
Harmonized programmes	
Mother tongue — English . . . . .	104
Mathematics . . . . .	112
Second language : English - First foreign language . . . . .	158
European periods . . . . .	172
History . . . . .	173
Geography . . . . .	180
Moral education . . . . .	181
Music . . . . .	185
Arts and crafts . . . . .	186
Art . . . . .	187
Physical education . . . . .	188