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MATHEMATICS CARRICULUM FOR ORDINARY LEVEL

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1. Introduction

Mathematics constitutes one of the disciplines that lead to the initiation and the drive to logical and coherent reasoning of the student. It is also a key to other branches taught at secondary school.

To satisfy all these expectations, the proposed curriculum for ordinary level consist of the notion of sets, sets of numbers, numerical activities, geometrical element, the solving of equations and inequalities, calculus, simple numerical functions with real variables and the concepts of descriptive statistics.

Each topic is approached in a systematic way while taking into account difficulties it presents and the leaning age of the student who receives it.

The 1st year deals with the basic concepts of sets as the basis of the mathematical concepts of the course, while consolidating what had been acquired in primary school. At this juncture, it ensures a transition between the primary level and secondary school education in updating the students. At this year, we study the sets of numbers such as $\mathbb{N}$, $\mathbb{Z}$, ID *and* $\mathbb{Q}$ and; basic concepts in geometry that constitutes a wide opening in thinking for the coming years ; as well as the introduction of the descriptive statistics to allow the students learn more and to be easily integrated in social and Community life.

The 2nd year continues with the teaching of sets of numbers such as: set $\mathbb{R}$ of the real numbers; introduction of algebraic equations and the solving of the equations and inequalities in $\mathbb{R}$; specific transformations of the plan is also done to establish the relation between the geometrical figures and to justify certain properties.
Introduction to demonstration is begun in order to develop deductive reasoning of the student. At this level, calculation on central parameters of a statistical series is made in order to allow the student to adapt to the everyday life.

The 3rd year deals with numerical functions, solving of equations, inequalities and systems of the 1st degree and the two unknown factors in $\mathbb{R}$ in geometry, concepts intensify in exploiting the isometrics and its applications. In order to acquire tools to be applied in other sciences and in everyday life, descriptive statistics is consolidated at this level.

Programs developed in the following pages include:

1. General objectives of the cycle;

2. General objectives for each academic year ;
3. Specific objectives, notion contents, methodological remarks, proposition of the revised subject at each academic level;
4. Bibliographical references of the cycle and the list of the mathematical symbols done at Ordinary Level of education.
5. Evaluation approach;
6. Particular factors in the teaching of mathematics.

1. General guidelines

Referring to the revised curriculum for primary school, with the need for the prerequisite Mathematics level that a student must have before proceeding to the second cycle of secondary education; The mathematics curriculum for ordinary level has the following topics:

- the notion of sets;
- sets of numbers;
- numerical activities;
- elements of mappings and geometrical solids;
- the solving of equations and inequalities;
- notion of descriptive statistics;
- Numerical functions of the simple and variable real numbers.

These concepts allow our young students to have appropriate terminology and to
use the basis of these concepts
In addition, the teaching of mathematics at this level must provide basic concepts in order to facilitate the students to learn other subjects such as: physics, chemistry, biology. These various general topics will be tackled in parallel.

3.Generals Objectives of the cycle

The teaching of Mathematics at Ordinary level aims at making the student capable to:

1. correctly use specific symbolism of the fundamental concepts in mathematics;
2. apply acquired knowledge in Mathematics in solving problems encountered in everyday life;
3. use the acquired concepts for easy adaptation of other disciplines in the learning of the student;
4. correctly deduce a given situation from a picture and/or a well drown out chart;

5. To read and interpret a graph.

3. Curriculum for each academic year

4.1. Curriculum for the 1st year

4.1.1. General objectives

At the end of the training of the Mathematics intended for the first year at the Ordinary Level, the student will be capable to:

1. correctly use simple language structure, vocabulary and suitable symbolism for Ordinary Level Mathematics;
2. carry out quickly and correctly numerical calculations;
3. solve simple equations of an unknown factor in $\mathbb{N}$, $\mathbb{Z}$, ID and $\mathbb{Q}$;
4. use methodical and coherent reasoning in solving problems;
5. solve problems in relation to percentages, rule of three, movements, interests, divisions, the surfaces areas and volumes of figures;
6. correctly draw figures by the help of geometrical instruments and describe them using appropriate terms;
7. locate area position from numerical data;
8. Make simple charts from series of a statistical data.

4.1.2. Detailed Curriculum

SPECIFIC OBJECTIVES	CONTENTS	METHODOLOGIAL REMARKS
At the end of the 1st year the student will be able to: - represent a set through a Venn diagram - correctly use various symbols of a set language - identify part of a set - define in extension and comprehension a set - correctly carry out various operations on sets - illustrate these operations and their properties by Venn diagrams - express in extension and comprehension the results of various operations carried out	4.1.2. Notion contents 1. Notion of sets 1.1. Sets, elements, is member of (symbol $\in,\notin$) notations of a set, empty set, definition in comprehension, equality, graphical representation, part of a set, inclusion (symbols $\not\subset \subset$); all subset members in a complete set. 1 2. Set operations Intersection ($\bigcap$), union of a set ($\bigcup$), difference (\); complementary set; and symmetrical difference (Δ); properties of operations: commutative, associative and distributive.	- This notion has already been seen at primary school**,** we go back to the same topic without spending much time on it. - The teacher will choose examples from environment that is familiar to the student**.** - In case of the numerical examples one will choose the elements of set $\mathbb{N}$. - The teacher must always use Venn diagrams in order to identify different notion in relation to set exercises.

SPECIFIC OBJECTIVES	CONTENTS	METHODOLOGICAL REMARKS
	1.3. Relations	
- write a pair and its reciprocal - determine the Cartesian product of two sets - express in extension and comprehension the graph of a relation between two sets or in the same set - draw up the sagittal and/or Cartesian diagram of a relation in a set or between two sets - distinguish an application from a function - distinguish an injection from a subjection and a bijection	- Couples, Cartesian product - Mapping between two given sets, graph of a relation, equality of two relations, reciprocal relation, particular relations (function, application, injection, subjection, bisection);	- With given examples, discover to the student the concept of a pair of set and Cartesian product of two sets - Lead the student to discover the notion of the relation between two sets using the examples and representations by Venn diagrams - With the student show the relation of properties in a set.
- determine the domain and the image of a function	- Domain and image of a function	
- identify a relation of equivalence and the associated partition - identify a relation of order	- Relation in a set and properties (reflexivity, symmetry, antisymetry, transitivity); relation of equivalence, partition; relation of order.	

- compose relations and in particular functions and applications - use the notation $(g \circ f)(x)$ or $(f \circ g)(x)$	1 4. Composition of relations: definition, not commutative on the composition of two relations, composite functions, two applications, two bijections; reciprocal of two made up relations.	- lead the pupils to read correctly and to define the composition of two relations while insisting on non-commutative $(g \circ f)(x) \neq (f \circ g)(x)$ composition of the relations while using sagittal diagrams - Using simple functions and varied operations, to initiate the student to use the notations $(g \circ f)(x) \neq (f \circ g)(x)$

SPECIFIC OBJECTIVES	CONTENTS	METHODOLOGICAL REMARKS
	2. Sets of numbers 2.1. The set $\mathbb{N}$ of the natural numbers	
- build equipotent sets - determine the cardinal of a complete set - enumerate some elements of a set - carry out operations in set $\mathbb{N}$ - apply the properties of various operations in $\mathbb{N}$ - correctly use the appropriate terminology of each operation - apply properties of the relation "… is a multiple of…" or "… is a divisor of…" - apply characters of divisibility by: 5; 4; 25; 8; 125; 3; 9; 10 and11 - determine the LCM and the HCF of two or several natural numbers - solve equations of the 1st degree by an unknown in $\mathbb{N}$	- Cardinal of a complete set - Order in $\mathbb{N}$ - addition and subtraction and their properties - multiplication and its properties - Numerical factors, literal factors, notation of a product containing literal and numerical factors; distributive application: to develop a product and prove by factorization. Indices: significance of notation; properties: product of power to the same number, indices, power to the product; - Multiples of power: definition; multiple set: definition, notation, properties of relation "… is multiple of…"; properties of multiples of a set : sum of two multiples, multiple of a multiple.	- Guide the student to define the complete cardinal set leading to define the whole set - lead the pupils to give properties of the operations in $\mathbb{N}$ and to use it in varied exercises - let the students discover for themselves divisible characters - lead the students to determine the multiples; divisors of a set; the LCM and HCF of two or several set - the teacher will have to put more emphasis on appropriate terminology of each operation - give varied exercises on the solving of equations in $\mathbb{N}$ and insist on the solving of sets

OBJECTIVES SPECIFIC	CONTENTS	NOTES METHODOLOGIQUES
- convert natural numbers into various bases (a number lower or equal to 12)	- division: divisors of a set; sets of divisors: definition, notation, properties of relation "…is a divisor of …" - Euclidean division: definition; divisible numbers by 2, 5, 4, 25, 8, 125, 3, 9 and 11; composed of prime numbers, numbers, lowest common multiple, highest common factor. - equations of 1^{st} degree with unknown in N - Numeration: binary notation, decimal notation, numeration in base a (a number lower or equal to 1 2); conversion, operations.	- accustom the students to make conversions through varied exercises - the teacher will show the students how to use base $a \geq 10$
- distinguish a positive integer from a negative one - determine the absolute value of a number - arrange numbers in ascending and descending orders - determine the opposite of a number - carry out various usual operations in $\mathbb{Z}$ - apply various properties and usual operations in $\mathbb{Z}$ - solve equations of the 1^{st} degree with an unknown in $\mathbb{Z}$ - solve simple problems of equations in $\mathbb{Z}$	2.2. The set of whole numbers of $\mathbb{Z}$ - The set and its subsets: all integers excluding zero, positive integers and negative integers. ; absolute value, opposed numbers , order in $\mathbb{Z}$ - Operations in $\mathbb{Z}$: addition, subtraction, algebraic sum, multiplication, indices and their properties. - Equations of the degree with unknown in $\mathbb{Z}$ - Simple Problems in $\mathbb{Z}$.	- With concrete examples, lead the students to build set $\mathbb{Z}$: -Examples: - temperature - Forward and backward movement - Profit and loss - illustrate the elements of $\mathbb{Z}$ on a progressing line - Examples of problems will be chosen from the student's every day's life. - Insist on operations of properties of the set $\mathbb{Z}$.

SPECIFIC OBJECTIVES	CONTENTS	METHODOLOGICAL REMARKS
	2.3. Set *ID* of decimal	
- Give characteristics of ID set of decimals - distinguish positive decimal and negative ones - write decimal while using scientific notation - carry out the operations in *ID* correctly	- Decimal numbers order in $\mathbb{Z}$, four scientific operations and their properties, scientific notations of decimals.	- throughout the exercises, lead the students to convert limited decimal numbers into fractions so as to later on introduce set $\mathbb{Q}$ - put more emphasis on scientific notation of decimal
	2.4. The $\mathbb{Q}$ set of rational	
- identify a rational from its periodic and unlimited decimal development - enumerate some elements of $\mathbb{Q}$ - carry out operations correctly in $\mathbb{Q}$ - apply operations properties in $\mathbb{Q}$ - solve equations of the 1^{st} degree with unknown and problems in $\mathbb{Q}$	Fractions; $\mathbb{Q}$ set, four operations and their properties. - Equations of 1^{st} degree with unknown in $\mathbb{Q}$	- inform the students that the whole rational is a fraction, and therefore, shows that $\mathbb{N} \subset \mathbb{Z} \subset \text{ID} \subset \mathbb{Q}$ - put more emphasis on properties of fractions using examples and/or exercises (simplification; reduction of fractions with the same denominator) - Point out the use of the LCM in addition and subtraction of fractions

SPECIFIC OBJECTIVES	CONTENTS	METHODOLOGICAL REMARKS
- Solve the problems referring to: percentage, rule of three, movements, simple interests, made up interests and divides. - explain the compatibility or incompatibility of a point on one part of the figure - determine in the figure : • the intersection of two lines • the intersection and crossing of two half-lines • the intersection and joining of two half-surfaces - Measure the angular sectors and to recognize those which are complementary or supplementary. - carry out operations of the measuring angular sectors - differentiate internal alternate angles, external alternate angles, and the corresponding angles - plot parallel lines and perpendicular lines in various situations	<u>2.5 solving the problems</u> Percentages, a rule of three, movements, simple interest, compound interests and shares. <u>3. Geometry</u> <u>3.1.Points and sets of points</u> - figure, point, straight line, first axioms, relative line positions, (secant, parallel), Euclid's axiom, line direction ; half-line, line segments, regular graduation of a half-line, measuring the length of a line segment; half-surface, stretch, angular sector; internal alternate angles, external alternate angles, corresponding angles; - Measurements of the angular sectors, use of a protractor (straight line, degree), complementary angular sectors, supplementary angular sectors, operation and measuring angles, bisecting angle.	- After pointing out the concepts of percentages, movements… The teacher will give varied exercises to be done in groups or individually - the teacher will have to practice the concept of a set in geometry - In geometry lesson, the teacher will choose the notations to be used to indicate the lines and the points without inter changing Examples: by convention, one uses the small letter to designate a point and the capital letter to designate a line and vice versa - the teacher must always possess geometrical instruments - invite the students to draw on the board, in their exercise books with suitable instruments

- draw the mediator of a line segment and bisecting an angular sector - define the direction as being the class of equivalence for the relation of parallelism of two lines - apply the theorems relating to perpendicularity - measure the distance from two points - measure the distance between two parallel lines - draw an inner circle with the given radius - distinguish the circle from the disc - draw two concentric circles - solve problems related to the circle, disc and circular ring	- Perpendicular lines, mediator of a line segment, perpendicular axiom, theorems relating to the perpendicular on two parallel lines, perpendicular directions, and distance from a point on a line, distance from two parallel lines. <u>3.2 Circle and disc</u> Distance from two points, circles, disc (cord, diameter, the angular sector in the center, arc of circle, circular sector); concentric circles, circular ring, circumference, disc surface	while in groups and on individual basis - the teacher must always possess suitable geometrical instruments and to require the students to have them too. - the teacher must give problems related to the drawing of geometrical figures such as: the circle, disc and ring

- determine the length of a line segment - apply the concept of scale to measure the length - determine the position of a point considering its geographical direction - use the angle of elevation or depression compared to the horizontal one to determine the position of a point - recognize various types of polygons and identify their elements - calculate the sum of the interior angles of a polygon - draw remarkable lines of a triangle	<u>3.3 Bearings</u> - Regular graduations of a line by whole numbers , by decimal numbers with only one decimal point - Concepts of scales applied to measure the length. - Concepts of geographical directions - Angles of elevation and depression with reference to a horizontal line. <u>3.4 Polygons</u> - General information: definition, elements (sides, angles in the center, interior angles, exterior angles, tops, diagonals), names of the polygons according to number of sides, convex polygon. - Triangles: definition, sum of measurements of the angular sectors, drawing triangles, heights, medians, mediator, bisecting angles of triangle; right-angled triangle, isosceles triangle, equilateral triangle; perimeter and surface.	- make use of the geographical instrument - make a revision on the concepts of the cardinal points and the compass card already seen in geography in the primary school - discover the importance of the concept of scale for the representation of long distances - with the help of different exercises, lead the students to determine the angles of elevation and depression - invite the students to do exercises in drawing and paper cutting of various types of polygons individually or in groups - the teacher will have to choose varied problems using various concepts that have been already seen - given the sizes of a triangle, lead the students to apply the PYTHAGORAS theorem to recognize

- draw polygons of the given sizes and determine its surface and perimeter - use the properties of polygons in solving problems	- Quadrilaterals: definition, opposite elements (angular sides, angular sectors), cross quadrilateral; definition and properties of the particular quadrilaterals: trapezoid, parallelogram, rectangle, rhombus, square; perimeter and surface - perimeter and surface of a polygon with n sides, $5 \leq n \leq 12$ - Solving the problems.	a right-angled triangle - Using varied exercises, lead the pupils to calculate the perimeter and the surface of surface of a polygon

SPECIFIC OBJECTIVES	CONTENTS	METHODOLOGICAL REMARKS
- distinguish a plane figure from a solid - characterize solids according to their forms - representing solids in the figure and identify elements - solve problems on solids - draw an ordered and listed picture of a statistical series - make a histogram, a bar diagram , a pie-chart - make frequency diagrams or cumulative repetitions of statistical series	<u>3.5 Solids</u> - notion of space concept, of closed surface , definition of a solid; characteristics of solids according to their form (solids with plane faces and with non-plane faces), - Solids with plane faces: definition, elements, plane representation; surface and volume of a parallelepiped (unspecified, right-angled, cubes), of a prism, a pyramid; development. - Solids with non-plane faces: definition, plane representation; surface and volume of a cylinder, of a cone, of a ball. - solving of problems <u>4 Descriptive statistics.</u> - ordered Table, frequency table, bar diagram, pie-chart, histogram - cumulative frequency table on population, bar diagram of repeated or cumulative frequencies, polygon of frequency or cumulative repetition	- Usage of suitable material is necessary - always from real to the abstract - these concepts were already seen in primary and should not be delayed on - particularly, put more emphasis on solving varied problems - invite the students to make solids of various forms - exercises and examples will have to tackle the usually encountered problems (Examples: epidemic, AIDS, GENDER, school marks…) - Change exercises and make various types of diagrams

4.1.3. Proposition on the breakdown and precision of topics for the 1st year.

First Term

Weeks	Algebra	Geometry	Statistics
1	Concepts of sets		
2	Concepts of sets		
3	Exercises on the sets		
4	Exercises on the sets		
5		Points and set of points	
6		Points and set of points	
7		Circle and disc	
8	Relation		
9	Relation		
10	Relation		
11	Revision	Revision	Revision
12	Examinations	Examinations	Examinations

Second Term

Weeks	Algebra	Geometry	Statistics
1	Revision	Revision	
2	Set $\mathbb{N}$		
3	Operation in $\mathbb{N}$		
4	Operation in $\mathbb{N}$		
5	Numbering system		
6	Set $\mathbb{Z}$ and exercises in $\mathbb{Z}$		
7	Equations in $\mathbb{Z}$		
8	Solving simple problems in $\mathbb{Z}$		
9		Concept of guidelines	
10		Polygons	
11		Polygons	
12	Revision	Revision	Revision
13	Examinations	Examinations	Examinations

Third Term

weeks	Algebra	Geometry	Statistics
1	Revision	Revision	Revision
2	Set ID and operation in ID		
3	Set $\mathbb{Q}$ and operation in $\mathbb{Q}$		
4	Equations in $\mathbb{Q}$		
5	Solving problems in $\mathbb{Q}$		
6		Solids	
7		Solving of problems deriving from solids	
8			Ordered and listed manning table
9			Representation of data of a statistical series by: ❖ a bar diagram ❖ a pie-chart ❖ a histogram
10	Revision	Revision	Revision
11	Examinations	Examinations	Examinations

4.2. 2nd year Curriculum

4.2.1. General objectives

At the end of the Mathematics lesson programmed for the second year at ordinary level, the student will be able to:

1. Correctly use the simple language structures, vocabulary and the symbols found in the second year mathematics program;
2. Carry out quickly and correctly numerical and literal calculations;
3. Solve the equations and inequalities of the first degree of the unknown in $\mathbb{R}$
4. Demonstrate giving justifications at each stage;
5. Make an image point, a geometrical figure through transformation;
6. Identify a figure transformation and use its properties to solve problems in geometry;
7. Use methodical and coherent reasoning in solving problems;
8. Make simple charts.

4.2.2. Detailed program

SPECIFIC OBJECTIVES	CONTENTS	METHODOLOGICAL REMARKS
At the end of 2nd year the student must be able to: - demonstrate a strict inclusion chain $\mathbb{N} \subset \mathbb{Z} \subset ID \subset \mathbb{Q}$ - Carry out exercises in $\mathbb{R}$ and use different properties; - Use the properties of inequalities - Do exercises using frames and intervals;	1. Sets of numbers *1.1. Revision on set $\mathbb{Q}$ of rational numbers*: *ID set of* decimals and its subsets; Q set of rational and its subsets. 1 2. Set $\mathbb{R}$ of real numbers. - Frame a rational by decimals - Example of numbers of recurring decimal development, non-periodic, irrational numbers; set of the real numbers and its subsets: real numbers excluding zero, real positive numbers, real negative numbers - Order in $\mathbb{R}$ **:** • Inequality • Comparison of real numbers • Properties of inequalities • Frame (amplitude of a function) • Intervals in $\mathbb{R}$	- Make a quick revision sets $\mathbb{N}$, $\mathbb{Z}$, ID and $\mathbb{Q}$ - Put emphasis on scientific notation of the decimals - verify the requirement using wisely selected exercises with examples - Give properties of inequalities - Lead the students to frame numbers and to calculate the amplitude of this frame - Through varied exercises ask the students to determine the intersection and the union of set by means of a graph. - Use a reference mark to compare two numbers - Discover that the direction of an inequality changes when one multiplies or divides the two members by a strictly negative number

- Determine the square root of a positive number; - Use properties of square root in the exercises; - Make rational the denominator of a fraction.	- Exercise in $\mathbb{R}$ and properties. - Square Root in $\mathbb{R}$: inequality and square; definition of square root; square root of a product; of a quotient; simplification; passage to a rational denominator; calculation of the square root of a positive number.	- In finding the square root the students will limit themselves to four decimals without using a calculator

SPECIFIC OBJECTIVES	CONTENTS	METHODOLOGICAL REMARKS
- Give properties on addition and multiplication - Draw conclusion in relation to the algebraic structures of $\mathbb{R}$: and those of group, ring and field - On quite selected examples, to check the properties of the structures of group, ring and field.	1.3. Group, ring and field structures. Synthesis of the properties of addition and multiplication in $\mathbb{N}, \mathbb{Z}, \mathbb{Q}$ and $\mathbb{R}$ - Internal exercises always defined as commutative, associative; - Role of O for addition, role of 1 for multiplication in various sets; presence of elements symmetrical to addition, multiplication in various sets; application of distributive property in various sets. Examples of group ring and field.	- Give exercises using properties of addition and multiplication - Get the students used to recognize the algebraic structures of group, ring, body; - in case of a set provided within two laws, one must respect the order given by these laws. Examples of algebraic structures: $(\mathbb{R}^*, \bullet)$; $(\mathbb{R}^+, \cdot)$; $(\mathbb{R}, +)$; $(\mathbb{R}^+, \cdot \leq)$…
- Use the properties of the equalities in $\mathbb{R}$ - Solve in $\mathbb{R}$ an equation of 1st degree with one unknown.	1.4 Equations in $\mathbb{R}$ - Equality; properties of the equality: adding or subtracting same number from two equal members, multiplying or dividing two equal members by the same number different from zero;	- Always specify in which set one works - Require the students to specify a solving set and that of original equation - Propose to the students to solve equations of type: $ax+b=0$, in the three following cases: 1st case : a $\neq$ 0, b $\in IR$ $S=\left\{-\frac{b}{a}\right\}$ 2nd case : a= 0, b$\neq$ 0 $S=\{\}$ or $S=\phi$ 3rd case : a = 0, b= 0 $S=\mathbb{R}$

- Solve the problems in connection with an equation of the 1^{st} degree with one unknown	- General notion of simple equation with one unknown, principles of equivalence; rules of solving equations, application to solving problems of the first degree to unknown. Solution of an equation of type $ax+b=0$ according to values' of a and b.	- Take the following step in solving problems: • Choice of the unknown • Setting equation • Solving equation • Checking • Writing the solution of the problem

SPECIFIC OBJECTIVES	CONTENTS	METHODOLOGICAL REMARKS
	1 Proportions	
- Use fundamental properties of proportions - Recognize the outcome of proportions for the calculation of coefficient proportionality or by means of graph - Recognize sizes that are directly proportional and inversely proportional - To use sizes directly proportional and conversely proportional in the resolution of the problems	- Complement on equalities - Examples, definitions, properties, continuations proportional series, coefficient proportionality, average proportional, fourth proportional, proportional sizes (directly, conversely) - Solving problems on the proportions	- point out the notion of the non fractions - To lead the students to make new proportions starting from a given proportion - From varied examples drawn from everyday life aiming at various scientific fields, discover together with the students the concept of proportional outcome - Give varied exercises to calculate the proportional average, coefficient of proportionality, 4^{th} proportional - Make a graph of two proportional series.
	1.6 Inequalities of the first degree with the unknown in $\mathbb{R}$	
- Solve an inequality of the 1^{st} degree with unknown in $\mathbb{R}$	- Definition and examples - Solving and representation on an axis (notation of the solution using intervals), - Study of binomial sign $ax+b$, a and b being real numbers	- Make a revision on intervals - Prioritize the use of table signs for the products of inequalities or binomials quotient, compared to the method used in solving simultaneous inequalities - Ask the student each time to write the

- Solve the problems in connection to inequality of the 1st degree with one unknown - Reduce and order polynomials - Carry out the four operations on polynomials - Break up a polynomial into factors	- Solving simultaneous inequalities; Solving of inequalities of such form: $\frac{A}{B} \leq 0$ and $\frac{A}{B} < 0$; A.B ≤ 0 and A.B < 0 A.B≥ 0 and A.B>0 ; $\frac{A}{B} \geq 0$ and $\frac{A}{B} > 0$ - Solving problems <u>1.7 Numerical and literal calculation</u> - Monomial: general notation, monomial types, numeric values of monomial, sum and monomial product; - Polynomial: definition; reduced writing and ordinate of a polynomial; polynomial degree, sum and product of two polynomials, remarkable products - Division of monomial by monomial and polynomial to a variable by a monomial, - Division of a polynomial to a variable by a binomial of form X – a, divisible by X – a; remarkable quotients - Factorization: description, use of the remarkable products of the 2nd and 3rd remarkable degrees and quotient; groupings; application of divisibility by X –a (binomial divider method), factorization of trinomial of the 2nd degree; artifices of calculations	whole solution in the form of intervals and to represent it on the axis number. - Discover the concept and monomial notation and therefore define the polynomial - Carry out the various operations exercises by using practical provision and/or by applying the properties of operations in $\mathbb{R}$ - Introduce the students on how to determine the quotient and the remainder in dividing a polynomial by a binomial in form of : x-a (HORNER'rule) - Give varied exercises on remarkable products and quotients - While factorizing , apply discriminating method - Exploit the following artifices during factorization: • to add and subtract the same term • open out a term and group • calculate and group - Given that an equation of type P(x) = 0,

- Solve equations of degrees $n \geq 2$, n$\in \mathbb{N}$, by using remarkable products and the factorization of polynomials	- Solving equations of form A.B=0, $A^2 = B^2$; $A.B.C = 0$ Where A, B and C are Polynomials of the 1st degree.	where P(x) is a polynomial of degree ≥ 2, lead the students to break up P(x) into a product of polynomials of the 1st degree in order to determine the set solution of the equation.

SPECIFIC OBJECTIVES	CONTENTS	METHODOLOGICAL REMARKS
	2. Geometry 2.1 Lines and numbers	
- Measure a line regularly - Calculate algebraic measurements of the bipoints, abscissa of the mid-point of a bipoint - Apply Chasles' relation - Place a point of coordinates given in the plane	- Regular measurement of a line by integration, with same ratios of the denominator; bijection between a set of points on the line and a set of numbers, abcissa of a point, marking of the measurement ; - Bipoint and algebraic measurement: definition , Chasles'relation, mid-point ; - Coordinates of a point on the plane provided by Cartesian reference mark.	- Emphasis on the concept of bijection between a set of points of a line and a set of numbers - The use of the compass in making measurements is recommended for more precision - Through varied exercises involve students to calculate algebraic measurements and the abscissa of a point
	2.2 Parallel projections	- Give varied exercises of application of Chasles' relation; to locate points on the plane.
- Draw an image of a geometrical figure by a parallel projection	- Definition, image of a figure by parallel projection, properties, - Particular Case for orthogonal projection.	- Involve the students to carry out the placing of parallel projections
	2.3 Central symmetry and parallelogram	
- Draw an image of a geometrical figure by central symmetry - Give properties of central symmetry after drawing an image	- Central Symmetry: definition, drawing of an image point, line segment, line, half-line, figure provided by central symmetry; - Central symmetry as a bijection, reciprocal application.	- with varied examples, make the drawing of geometrical figures by means of central symmetry - Discover with the students that certain

- Discover the center of symmetry showing a geometrical figure	- Central symmetry of a set of points: effect of central symmetry on the coordinates of a point; - Parallelogram: definition, properties of diagonals (intersection of diagonals as a central symmetry), properties of opposite sides	figures have a Center of symmetry. Examples: parallelogram and circle

SPECIFIC OBJECTIVES	CONTENTS	METHODOLOGICAL REMARKS
- Draw an image of a geometrical figure by an orthogonal symmetry - Give the properties of orthogonal symmetry after drawing the image - Discover the possible axis of symmetry of a geometrical figure	2.4 Orthogonal symmetry: - Definition; image of a point; of a line segment; of a half-line; of a line; of a geometrical figure by an orthogonal symmetry - Properties: invariance points of symmetric axis, lengths maintaining , orthogonal symmetry as a bijection, reciprocal of a orthogonal symmetry, effect of orthogonal symmetry on the punctual coordinates; image of two secant lines, of two parallel straight lines, mid-point of a bipoint ; - Symmetry axis of a set of points, axiom of a bisecting line;	- Discover with the students properties of orthogonal symmetry by multiple and varied drawing exercises
- Identify the equipollent bipoints - release the properties of the equipollent relation - Define a vector of a plan as an equivalence class for the equipollent relation - Make a vector sum and vector difference	2.5 Vectors of the plane, translation -Equipollent Bipoints, equipollent relation; equipollent bipoints images by parallel projection, by central symmetry and orthogonal. - Vectors in a plane: definition, notations, representation, zero vector, writing vector of an equipollence of two Bipoints and application in the mid-point of a bipoint; set *V* of vectors, operations on the vectors - Multiplication of a vector by real number: definition; properties: multiplication of a vector by 1, by O, multiplication of a sum of	- Allow the students to define a vector - By varied exercises make the sum and the difference of vectors - Announce that a vector is a set of equipollent bipoints while saying that a segment provided with an arrow is representing a vector - Discover with the students the group structure

- Give the properties of adding vectors - Draw an image of a figure by a translation - Give the properties of a translation after drawing images.	two vectors by a real number, multiplication of a sum of two real numbers by a vector. - Group **(*V*, +).** - Translation: definition, image of a point, a line segment, a half-line, a straight lines, a geometrical figure by a translation, translation of zero vector; properties: translation as a bijection,	**(*V*, +)** - Draw an image of a geometrical figure by translation

SPECIFIC OBJECTIVES	CONTENTS	METHODOLOGICAL REMARKS
	2.6 Rotations	
- Draw an image of a figure per rotation - Give properties of rotations after drawing	Notion of oriented angles, definition of a given amplitude rotation, image of a point, of a segment line, of a straight line, of a geometrical figure.	- lead the students to make a rotational drawing so as to point out properties
	2.7 Composition of transformations of the plane	- Before introducing the composition of two rotations, it is necessary for the students to carry out exercises in addition and subtraction
- Make a composition of two or several transformation of a plane	- 2 central symmetries; - 2 translations - 2 orthogonal symmetries of parallel axis or orthogonal - - 2 rotations - 2 or several transformations of various nature.	- These constructions must be carried out by the students as individual home work, then in groups and later the teacher will lead them to synthesize it. - should give possible conclusions: Example: The composition of two orthogonal symmetries with parallel axis gives out a translation,…
	2.8 Thalès' Theorem and its applications	- Discover Thalès Theorem and apply it in various exercises
- **A**pply Thalès Theorem	- Terms of Thalès theorem, application in a particular case of parallel lines passing by the medium point of another side , reciprocal of the theorem in various forms, mid-point projection of a bipoint; division of a segment in several segments of the same lengths; the 4^{th} proportional graphic drawing.	

SPECIFIC OBJECTIVES	CONTENTS	METHODOLOGICAL REMARKS
- Determine the central parameters of statistical series	7.Descriptive Statistics Central parameters or characteristic of position: mode, median, mean	- From the frequency table, allow the students to calculate the average, the median and to determine the mode of a statistical series

4.2.3. Proposal of the distribution and precision of lessons in the 2nd year.

First Term

Weeks	Algebra	Geometry	Statistics
1	Revision	Revision	Revision
2	Sets of numbers I D and $\mathbb{Q}$		
3	Set of numbers $\mathbb{R}$		
4	Set of numbers $\mathbb{R}$		
5	Algebraic structure		
6	Equations in $\mathbb{R}$	Straight line and numbers	
7		Parallel projections	
8		Thalès' Theorems	
9		Thalès theorem Application	
10		Thalès theorem Application	
11	Revision	Revision	Revision
12	Examinations	Examinations	Examinations

Second Term

Weeks	Algebra	Geometry	Statistics
1	Revision	Revision	
2	Proportions		
3	Inequalities of the 1^{st} degree in $\mathbb{R}$		
4	Inequalities of the 1^{st} degree in $\mathbb{R}$		
5	Solving problems	Central symmetry and parallelogram	
6		Central symmetry and parallelogram	
7		Orthogonal symmetry	
8		Orthogonal symmetry	
9		Vectors in a plane	
10		Translation	
11		Translation	
12	Revision	Revision	Revision
13	Examinations	Examinations	Examinations

Third Term

Weeks	Algebra	Geometry	Statistics
1	Revision	Revision	Revision
2	Numerical and literal calculation		
3	Solving equations of type: $A.B = 0, A^2 = B^2$		
4	Solving equations of type: $A.B.C = 0$		
5		Rotation	
6		Composition of the plane transformations	
7		Composition of the plane transformations	
8			Central parameters of a statistical series: average, mode, median
9			
10	Revision	Revision	Revision
11	Examinations	Examinations	Examinations

4.3. 3 2nd year curriculum

4.3.1. General objectives

At the end of the Mathematics lesson intended for the Third year, at ordinary level, the student will be able to:

1. Apply the Mathematical principles learnt in the former years;

2. Correctly use the language structures, vocabulary and symbols found in the 3rd year curriculum
3. Carry out quickly and correctly numerical and literal calculations;
4. Graphically represent a function of the first degree; a function of the second degree point by point;
5. Establish the linear equation ;
6. Solve equations, inequalities and the systems of the first degree with two unknown ;
7. make a demonstration by providing justifications at each stage;
8. identify a transformation of the plane and apply its properties to solve problems in geometry;
9. Classify and represent graphically the statistical data;
10. Use a methodical and coherent reasoning in solving problems.

4.3.2. Detailed program

SPECIFIC OBJECTIVES	CONTENTS	METHODOLOGIAL REMARKS
At the end of the 3rd year the pupil will have to be able to: - plot the graphs with simple numerical functions - Determine the set of definition of a numerical function - Recognize a constant function, linear function and a closely connected function and to represent them graphically - Determine linear equation according to the conditions given - Determine linear equation parallel or perpendicular to a given line and passing by a given point. - Recognize a rational function - Determine the set of definition of a	1. Algebra 1.1. Numerical functions - Generalities: Examples of various functions: numerical relations resulting from varied fields, graphs, algebraic formulae; - Graphical representations: examples; Definitions: domain of a definition, real variable numeric functions ; - Particular cases of polynomial functions whose degree is equal to or higher than 1 : • Constant function, real function, monomial function ; • linear function: definition, domain of a definition, proportional series, graphical representation; • function closely connected: definition, whole definition, graphical representation, condition of two parallel lines - general linear equation	- It will be necessary to give examples of numerical functions resulting from the varied fields (physical sciences, biology, economic and social life) - Using the examples, distinguish a numerical function from a numerical function with variable number - The use of diagrams is necessary to visualize the various concepts Example: domain and image of a function - With the students make graphs starting from the varied exercises - Establish linear equation associated with each of the following cases: • straight line crossing two points • Straight line crossing one point given its coefficient. angle • Straight line crossing a point and is parallel or perpendicular to the given line

rational function - Carry out operations on the rational functions	- rational functions: definition, set of definition, rational fraction; simplification of the rational fractions, sum, difference, product, quotient of rational fractions,	- Limit oneself to expressions that can be broken up means of already seen methods in the 2nd year at the Ordinary Level - Put emphasis on the research of the defined domain and on the simplification of the rational fractions

SPECIFIC OBJECTIVES	CONTENTS	METHODOLOGICAL REMARKS
- Solve equations and system of two equations of the 1st degree with two unknown by using various already seen methods and providing a chart for the solution - Solve problems leading to a system of two equations of the 1st degree with two unknown - Solve inequalities of the 1st degree with two unknown and the systems of two inequalities of the 1st degree with two unknown	<u>1.2. Equations, inequalities, systems of the first degree with two unknown</u> - Equation of the first degree with two unknown , system of two simple equations with two unknown , solution of a system by substitution, linear combinations, comparison, the Cramer method, graphic interpretation of solutions - Solving of problems leading to a system of two equations of the 1st degree with two unknown. - Inequalities of the first degree with two unknown , system of two inequalities of the first degree with two unknown	- Give the students some couple-solutions in the solving of equation of the 1st degree with two unknown - Always insist on the notation of the solution-set - Practice with the students to use various methods in finding solution of equation systems - In solving problems, the following step is recommended: • choice of unknown • setting in equation • algebraic or graphic solving of an equation system • checking of the solution obtained - For the case of inequalities of the 1st degree and/or inequality systems; lead the students to represent the set solution graphically and check on some parts of the plane representing the set solution

SPECIFIC OBJECTIVES	CONTENTS	METHODOLOGICAL REMARKS
- Calculate the vector length - Apply median properties of a triangle - Determine vector components - Carry out operations in set ***V*** of vectors - Apply co-linear and orthogonal conditions of vectors	2. Geometry 2.1. Complements on vectors in a plan - Definition and property of the vector length ; - Median properties of triangle; - Bisection between $\mathbb{R}^2$ and the pointed plane π_0 and the set ***V*** *of* vectors. - Vector components, component of a sum of vectors, a vector product by a number and mid-bipoint. - Condition of co-linear or perpendicularity of two vectors	- Show the students various ways of writing a vector - Give properties of: • the length of a vector • the length of the opposite vectors • the length of a sum or of the difference of vectors • the length of a product of a vector by a number - By varied exercises, involve the students to calculate the length of a vector, component of the sum or difference of vectors, component of the product of a vector with a real number.

SPECIFIC OBJECTIVES	CONTENTS	METHODOLOGICAL REMARKS
- Differentiate of isometric types - Draw figures relative to the various isometric types	2.2. Isometric figures and Applications - Isometric: definition, properties, relation "… *is isometric with* … "in the set of figures of the plane - Identification of isometrics (displacements and reversal). Applications of isometrics: - Isometrics and segments of straight line : mediator theorem and reciprocal theorem; - *Isometrics and angle sectors ; image of an angle directed by an orthogonal symmetry; image of a half-line by a translation, a central symmetry; angle sectors at parallel sides; theorems relating to vertical angles, opposite angles of a parallelogram, the sum of the angles of one triangle; theorem of bisecting an angle sector and reciprocal, bisecting theorem of the four angle sectors formed by two secant lines, bisecting property of an angle sector*;	- Practice with the students to draw figures to allowing good fixing of the properties - Make the students understand that the transformations below are isometrics : • an orthogonal symmetry • a central symmetry • a translation • a rotation, or made up of these transformations - Make a distinction among the following types of isometrics below: • displacements: a central symmetry , a translation, a rotation, an identical application • reversal: orthogonal symmetry - Identify the invariant isometric points if there is. - Using varied exercises discover with the students that one of the two drawn isometrics is an isometric

	- Isometrics and triangles: case of isometric of unspecified triangles and rectangle triangles; properties of mediating, bisecting, heights of a triangle; properties of the isosceles triangle, the equilateral triangle; - Quadrilaterals: properties of parallelogram, rectangle, rhombus, and square.	- From isometric triangles allow the students show certain properties

SPECIFIC OBJECTIVES	CONTENTS	METHODOLOGICAL REMARKS
- Draw the image of a circle by an unspecified isometric - Calculate the values of angles while basing on various learnt theorems - Apply theorems in relation to inscribed convex quadrilaterals	2.3. Circle and disc - Definition of a circle, a disc, figures which are referred to (cord, diameter, tangent, central angular sector , registered *angular* sector, *tangential angular sector*, arc of circle, circular sector, *inscribed quadrilateral)* - Image of a circle by an isometric, symmetrical center , axis of symmetry; - Diameter perpendicular to a cord, a tangent; - Theorems relating to the angular sectors in the center, registered angular sectors, and tangential angular sectors; - Theorems relating to the inscribed convex quadrilaterals.	- Lead the students to differentiate a registered angular sector, an angular sector in the center, and a tangential angular sector - only the concepts in italic are new - From the figures differentiate a circle of the disc; then discover that a diameter of the circle is in a particular case of a cord and that a tangent in a point of the circle is a limiting position of a cord in translation - From drawing exercises, a study of theorems will be supported by the demonstrations.

SPECIFIC OBJECTIVES	CONTENTS	METHODOLOGICAL REMARKS
- get the image of a geometrical figure and that of a circle by a Homothety - make the composition of homotheties	2. 4. Homothety and similarity - Homothety: definition, image of a line, image of a half-line, image of a geometrical figure, image of a circle by a Homothety and properties. - composition of two homotheties; reciprocal to a Homothety	- Let the students discover the resemblance between a given figure and its image by a Homothety of center; given ratio " K" - by a Homothety of center and given ratio "K", allow the students to note that if: • k = 1, one has identical transformation • k = -1, one has a central symmetry • $\|k\| < 1$, one has a reduction of the image • $\|k\| > 1$, one has an enlargement of the image - Put emphasis on the properties of Homothety for a good drawing of the image. Examples: of two homothetic figures, one characterizes the equality of the homologous angles and the proportionality with the homologous dimensions

- Identify similar figures by applying properties of similarities	- Similitude: definition of the ratio of similarities, properties of the similarities, similar figures, case of similarity of triangles.	- By drawing exercises allow the students to exploit the properties of similarities. Example: if two triangles have two angles of the same amplitude respectively, then they are similar.
	<u>2.5. Metric relations in a right-angled triangle and applications.</u>	
- Apply the theorems relating to the metric relations in a right-angled triangle.	Determination: - of a side of the right angle according to hypotenuse and from projected orthogonal on that side ; - of height relating to the hypotenuse according to the two segments whose base is determined by the hypotenuse; - of product on the two sides of the right angle sector according to the hypotenuse and height relating to hypotenuse - of hypotenuse according to the two sides of the right angle sector (PYTHAGORUS theorem);	- Through varied exercises allow the students to apply theorems relating to the metric relations in a triangle
- Determine the elements of a regular polygon	- of elements of a regular polygon: case of an equilateral triangle, a square, a pentagon, a hexagon, an octagon, a decagon and a dodecagon	- In the case of the determining elements of a regular polygon, it is necessary to carry out demonstrations

SPECIFIC OBJECTIVES	CONTENTS	METHODOLOGICAL REMARKS
	3. Descriptive Statistics 3.1. Statistical description of population	
- Determine the central parameters of a statistical series - Draw charts of the various diagrams	population, individual, statistical character; qualitative character, quantitative character; discrete character, continuous character; population number, frequencies, cumulative frequencies, representations: bar diagrams (number or frequency), histogram, diagrams of cumulative frequencies, bands, pie-charts	- The teacher must make revision with the help of many and varied exercises drawn from the everyday life of the student - lead the student to distinguish a continued character from a discrete nature with concrete examples
	3.2. Study of grouped table	- Allow the students to properly choose reference marks and insist on a better graph interpretation
- Calculate the central parameters of a grouped table: class modal, average, quartiles	Characteristics of position: mode, median, quartiles, mean, grouped data; middle class, modal class and average class.	Through varied exercises allow the students to: • distinguish various types of intervals • determine the centers of classes • calculate the central parameters • draw the histogram

4.3.3. Proposition on the breakdown and precision of topics for the 3rd year

First term

Weeks	Algebra	Geometry	Statistics
1	Revision	Revision	Revision
2	Numerical functions		
3	Numerical functions		
4	Idem		
5	Idem		
6	General linear equation		
7	General linear equation		
8		Complement on the vectors of the plane	Revision on the central parameters of a statistical series: mode, median, average.
9			Grouped table
10			Grouped table
11	Revision	Revision	Revision
12	Examinations	Examinations	Examinations

Second Term

Weeks	Algebra	Geometry	Statistics
1	Revision	Revision	
2	Equations of the 1st degree with 2 unknown		
3	Systems of 2 equations of the 1st degree with 2 unknown		
4	Inequalities of the 1st degree with 2 unknown		
5		Isometric	
6		Isometric applications	
7		Idem	
8		Idem	
9		Idem	
10		Idem	
11		Idem	
12	Revision	Revision	Revision
13	Examinations	Examinations	Examinations

Third Term

Weeks	Algebra	Geometry	Statistics
1	Revision	Revision	Revision
2	Systems of 2 inequalities from the 1st degree with 2 unknown	Circle and disc	
3		Circle and disc	
4		Homothety	
5		Homothety	
6		Similarity	
7		Similarity	
8		Metric relations in a right-angled triangle	
9		Application of the theorems relating to the metric relations in a right-angled triangle	
10	Revision	Revision	Revision
11	Examinations	Examinations	Examinations

5. EVALUATION APPROACH

In order to verify for the level of expectations of the pre- planned objectives within this curriculum, one applies formative and survey evaluations. Formative evaluation is used in verifying the level of expectation of specific objectives attained during the lesson in form of impromptu interrogations. While survey evaluation is used to verify the level of expectation of the general objectives achieved in form of general interrogations, quarterly and annual examinations, and national examinations at the end of ordinary level.

The approach of evaluation relates to:

1. Questions to be asked in class;
2. Exercises to be done in class;
3. Home-work exercises ;
4. Written interrogations;
5. Written examinations.

5.1. Questions put in class

- These questions must be well formulated and addressed to the whole class;
- The teacher must avoid collective answers given by the student;
- He must give the student sufficient time to think in order to get an answer to the question;
- He must avoid victimizing a student who gives poor answers;

5.2. Exercises to be done in class

- The teacher must alternate activities in groups and individually;
- He must think of going round the class to check whether the students work as expected;
- He must find out difficulties encountered by the students and emphasizes on it during corrections;

5.3. Home-work exercises

- The teacher must initially prove that the questions given are well understood by the students in order to avoid ambiguity in the given answers;
- He must, as far as possible, give the students exercises that are selected and listed on ascending order in terms of difficulty ;
- Before correcting these exercises, the teacher must ensure that all the student have written them in their home-work exercise books;
- These assignments must be corrected; and if necessary be marked if the individual student work is assured.

5.4. Interrogations

It is recommended that the teachers must prepare two types of interrogations:

1. Short impromptu interrogations in relation to the preceding lesson; these interrogations must be frequent;
2. General interrogations noticed in advance, covering lesson learnt for one week or several weeks.

5.5. Written examinations

These examinations must be prepared with a scrutiny and must cover lessons learnt in a term or through out the whole academic year.

6. PARTICULAR FACTORS

- The mathematics teacher must make efforts to show the student its importance and the existing relations between the subject its self and the problems in the real life;
- All the teachers must choose the notations to be used without inter changing. For example the representation of a point by a small letter and that of a line by a capital letter and vice – versa;
- Taking into account of particular difficulties that the teachers of mathematics meet, it is recommended that certain regular concentration of teachers is required either by teachers in the same school or combined with those in the neighboring ones;
- For proper harmonization of this curriculum , it is recommended that seminars be organized to ensure the flow of information among teachers and to avail required means to draft the adapted handbooks;
- The teacher must instill some motivation in the student which will lead him to like mathematics with an aim of breaking the myth that considers mathematics as a very difficult subject;
- The six planned mathematics periods to be taught at all levels in Ordinary Level, should be allocated to 3 days with 2 successive periods per day.

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8. LIST OF SYMBOLS AND ABREVIATIONS USED

$\mathbb{N}$: Set of natural numbers

$\mathbb{Z}$ ***: Set of relative numbers***

ID: Set of decimal numbers

$\mathbb{Q}$ ***:*** Set of rational numbers

$\mathbb{R}$: Set of real numbers

V: set of vectors of the plane

$\in$: Membership

$\notin$: Non membership

$\subset$: Inclusion

$\not\subset$: Non inclusion

Δ: Symmetrical difference

\: Difference

LCM: Lowest common multiple

GCM: Greatest common factor

U: Union of set

$\bigcap$: Intersection of sets

$\pi_{0:}$ Plane pointed at original

9. APPENDICES

9. 1. Profile of a school leaving student at the completion of Ordinary Level

At the end of Ordinary level, the student must have acquired the knowledge and the basic practical know how to allow him:

- To reason scientifically and logically;
- To be able to reflect objectively and of not always too much trusting the judgements of the others;
- To understand and use correctly the official languages: the French, the English and Kinyarwanda;
- To have elementary concepts of Mathematics, Science and Technology;
- To acquire adequate moral; religious and civic values as well as physical and sporting abilities;
- To show a direction of curiosity and creativity;
- To acquire ability of adaptation to the external world;
- To show sensitivity and artistic skill;
- To demonstrate a sense of health awareness; more particularly against HIV/ AIDS;
- To acquire and exploit the elementary concepts of Trade, Accountancy and Agriculture.

9. 2. Timetable – Schedule for Ordinary Level

CONNECT	1st year	2nd Year	3rd Year
1. Religion or Morals	1	1	1
2. Kinyarwanda	2	2	2
3. French	6	6	6
4. English	6	6	6
5. Mathematics	6	6	6
6. Physics	2	2	2
7. Chemistry	2	2	2
8. Biology	2	2	2
9. Geography	2	2	2
10. History	2	2	2
11. Artistic initiation (Music, Drawing)	1	1	1
12. Introduction to Economics	2	2	2
13. Political Education	2	2	2
14. E.P.S.	1	1	1
TOTAL: 14 BRANCHES	37	37	37