Spring 2012

Questions and Answers

Secondary School Mathematics

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Table of Contents

GENERAL QUESTIONS

1. *What is a register of semiotic representation?*

A register of semiotic representation is a representation (a system of recognizable traces) that consists of different rules. Registers of semiotic representation can be divided into the following categories: verbal, figural, graphical, symbolic, etc.

A mathematical message (in a newspaper or magazine article, for example) often includes at least two registers (e.g. words and symbols; words and graphs; words, tables and graphs). To interpret a message, students can take different steps:

- identify the purpose of the message;
- associate images, objects or concepts with mathematical terms and symbols;
- express information using a different register of representation;
- use the appropriate concepts and processes;
- consult other people or sources of information;
- synthesize information;
- reformulate the message, etc.

References: Québec Education Program (QEP), Cycle Two, p. 2 (footnote) and p. 120 (Appendix D)

2. *There are often several constraints in the situational problems associated with the competency* Solves a situational problem*. Should these problems involve many different constraints? Won't the problems be less realistic if we keep adding constraints?*

The number of constraints in a situational problem does not necessarily indicate its level of complexity. Be it a situational problem, a situation involving applications or a situation involving communication, a complex task carried out over one or two class periods is often sufficient for achieving the main goal of competency development: namely the ability to act effectively in a particular context. In the case of a situational problem, the ability to act effectively mainly involves the capacity to deal with new situations and devise a solution for one or more aspects of a given complex of problems. However, the situation must remain mathematical in that it requires drawing on mathematical concepts and processes in order to analyze the situation and suggest solutions for the given complex of problems.

References: QEP, Cycle One, pp. 198-199 and Cycle Two, pp. 18-25

3. *What exactly is a mathematical model?*

As defined in the mathematics program (see the footnote under the heading Making Connections: Mathematics and the Other Dimensions of the Québec Education Program), a model is a concrete, "conceptual" or "operational" "representation" of a fragment or aspect of reality. In other words, "representation" includes diagrams, drawings and types of representation; "conceptual" pertains to mathematical concepts; and "operational" refers to processes.

Students will choose a model according to the branch of mathematics involved: the model can be algebraic, geometric, probabilistic or statistical. Proportions are models. A table, drawing or graph showing the relationship between data values, a polynomial function of degree x, a metric relation, a formula for area, the algorithm for calculating the mean or the process governing a statistical study can all be regarded as models, depending on the situation.

Reference: QEP, Cycle Two, p. 8 (footnote)

<u>Part A</u>: Secondary Cycle One

Arithmetic

4. *Is the concept of factoring covered in the program?*

   "Factoring" means to decompose into factors. Students will have to factor numbers, notably when producing equivalent expressions, including the decomposition of a number into prime factors. They will also learn to factor out the common factor in numerical expressions through the distributive property of multiplication over addition or subtraction.

   References: Mathematics program, p. 208

   Progression of Learning, p. 7, nos. 1 c and 3 d; p. 9, no. 5; p. 10, no. 4; p. 11, no. 13; p. 14 A, nos. 7 and 8; p. 14 B, nos. 2 and 3; p. 15 C, no. 3; p. 16 C, nos. 7and 9

5. *Are the concepts of common divisors (GCD) and common multiples (LCM) covered in Cycle One?*

   The concepts of common divisor (GCD) and common multiple (LCM) are properties used in different contexts to look for or produce equivalent expressions and to perform operations on numbers.

   References: Mathematics program, p. 208

   Progression of Learning, p. 7, nos. 1 c and 2 c; p. 8, no. 15; p. 9, no. 5; p. 10, no. 4 a and b; p. 11, no. 13

6. *Do secondary school students continue to build on what they learned about numerical and arithmetic sequences in elementary school?*

Yes. This learning is outlined under the heading Number Sense With Regard to Decimal Notation and Operation Sense and is acquired by observing and analyzing patterns. Students continue to build on this in algebra by studying the concepts of variable, dependency relationship and generalization by means of a rule.

References: Mathematics program, pp. 208-212

Progression of Learning, p. 13; p. 14, nos. 1, 2, 3 and 5

7. *In the Progression of Learning, why are only arrows indicated from Elementary 6 to Secondary II next to the statement* Estimates the order of magnitude of a number in different contexts *and why is a star indicated only as of Secondary III?*

This is because of the different numbers studied from Elementary 6 to Secondary III. Students are expected to know all the real numbers only by Secondary III.

References: Mathematics program, p. 208

Progression of Learning, p. 8, no. 13

8. *Do the different meanings of fractions have to be explained to students? Which of these meanings were studied in elementary school?*

Students do not have to know the names for the different meanings of fractions. The important thing is that they encounter the various meanings in the different situations examined. Factors such as the context, the question asked and the type of data involved will determine whether some meanings will be examined more than others. However, different meanings of fractions may have to be considered in the same problem.

Reference: Progression of Learning, p. 7, no. 2 b

The following tables and diagram illustrate the different meanings of a fraction developed in elementary school as well as those developed in secondary school:

The same symbolization can have several meanings.

Take, for example, the fraction $\frac{3}{4}$.

The fraction $\frac{3}{4}$ can mean a whole divided into 4, from which 3 parts are taken. For example, we can say “three quarters of a cake, of a collection of objects, of a distance . . .” ***Part-whole* meaning** The whole is the reference point	The fraction $\frac{3}{4}$ can mean a ratio of 3 to 4. We can say: “Every time we count 4, we colour in 3.” ●●●○ | ●●●○ | Or: “For every 3 black marbles, there are 4 white ones.” ●●●○○○○ | ●●●○○○○ | and so forth ***Ratio* meaning** The whole is not always the reference point.	The fraction $\frac{3}{4}$ can mean 3 units (or 3 wholes) divided into 4. Thus, $\frac{3}{4}$ means $3 \div 4$. This case involves the *sharing* meaning of division. ***Indicated division* meaning** If several units (or wholes) are shared, the answer is nevertheless a fraction of a single unit (or whole). (If 3 pizzas are divided among 4 people, each person receives $\frac{3}{4}$ of **ONE** pizza.)
In the case of a set of 16 marbles, $\frac{3}{4}$ can refer to 3 parts of the set divided into 4 as per the *part-whole* meaning, but $\frac{3}{4}$ can also be seen as an operator to be applied to the set: $\frac{3}{4} \times 16$. ***Operator* meaning**	Moreover, $\frac{3}{4}$ can also mean three times $\frac{1}{4}$, where the quarter is considered a unit of measure. This concept is especially useful when a fraction seen as a *part of a whole* is greater than 1. For example, $\frac{9}{4}$ cannot mean a whole divided into 4 from which 9 parts are taken, but $\frac{9}{4}$ can be better understood if the quarter is regarded as a unit of measure, or 9 times this unit. ***Measure* meaning**	

Some problems focus on one meaning rather than another.
Examples of problems involving the different meanings of fractions.

<table>
<tr>
<td>These beads represent one quarter of a bracelet. Find the total number of beads that make up the bracelet.

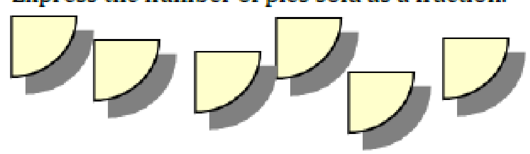

Part-whole meaning
This problem focuses on the part-whole meaning, since students must consider the whole in their reasoning.</td>
<td>Mary always uses the same ratio of black beads and white beads to make bracelets and necklaces. This ratio is 3 to 4 or $\frac{3}{4}$. Draw three different bracelets that Mary can make.

Ratio meaning
This problem focuses on the ratio meaning. Students can make the bracelets as long as they want, and they do not have to refer to the whole.</td>
<td>Four children share 3 pizzas. What fraction of a pizza will each child receive?

$3 \div 4$

Indicated division meaning
This type of problem also shows that $3 \div 4 = \frac{3}{4}$, thereby demonstrating that there are different ways of writing the same mathematical idea.</td>
</tr>
<tr>
<td>Secondary school problems that involve enlarging or reducing objects (dilatation) are good examples of how the operator meaning of a fraction comes into play.

Mary wants to give her brother $\frac{3}{4}$ of her set of marbles. If Mary has 16 marbles, how many marbles will she give her brother?

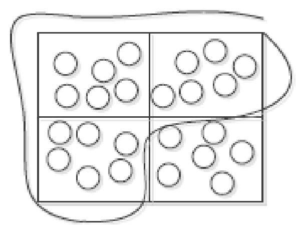
Operator meaning
This type of problem can develop the student's understanding of the operator meaning of the fraction. It involves multiplying a natural number by a fraction: $16 \times \frac{3}{4}$. However, this problem will probably be solved by using the part-whole meaning: $\frac{3}{4}$ of 16.</td>
<td>Mary sells pies in slices. Each slice represents $\frac{1}{4}$ of each pie. Mary sold all her slices of pie. Express the number of pies sold as a fraction.


Measure meaning
The fraction $\frac{1}{4}$ is a unit of measure used to determine the number of pies sold.
There are 6 slices each representing $\frac{1}{4}$ of a pie for a total of $\frac{6}{4}$.</td>
<td></td>
</tr>
</table>

Some interpretations of the *part-whole* and *ratio* meanings of fractions

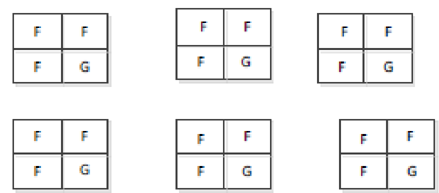
If a unit (or a fixed whole) is given, using a *part-whole* fraction model or a *ratio* model to represent a fraction will yield the same result.
For example: Ms. Miller has broken her class up into small work groups. Each group consists of 4 people, $\frac{3}{4}$ of whom are girls. How many girls are in this class of 24 students?

Fraction Model



There are 18 girls
in Ms. Miller's class.

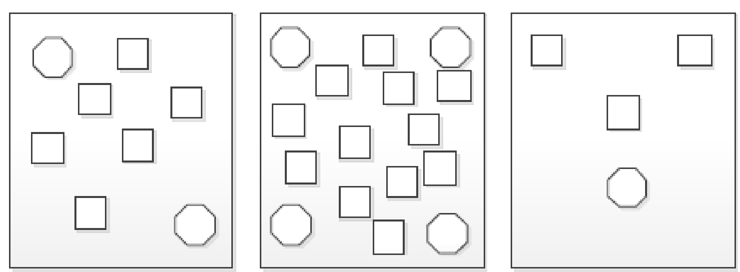
Ratio Model



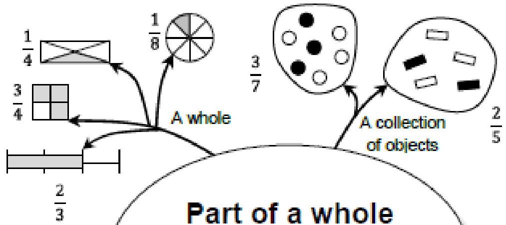
There are 18 girls
in Ms. Miller's class.

If students must illustrate a fraction without a fixed whole, they can proportionally increase the whole as much as they want. In this case, the different illustrations represent equivalent ratios, i.e. the surfaces occupied are proportional, but the quantities are not equal. The focus is on the *ratio* meaning in proportional situations where the number of total parts is not equal to the denominator.

For example: In art class, Lisa made a series of drawings consisting of squares and octagons. She always used the same ratio of squares and octagons, and $\frac{3}{4}$ of the figures were squares. Make 3 different sketches that Lisa could have drawn.



Appendix 6



Meanings of a fraction

Meanings covered in elementary school

Part of a whole

« Quantification of a relationship between a whole and a designated number of parts »

The fraction ¾ can mean 3 parts of a unit that will be divided into 4. We can say three quarters of a cake, of a collection of objects, of a distance . . .

The whole is the reference point.

Ratio

« Relationship between two quantities »

The fraction 3/4 can mean a ratio of 3 to 4.
We can say: Every time we count 4, we colour in 3.
●●●○ ●●●○
Or: For every 3 black marbles, there are 4 white ones.
●●●○○○○ ●●●○○○○
The whole is not always the reference point.

Quotient

« a/b represents the result of dividing a by b »

Result of a division:

- There are 4 cookies for 3 children 4÷3 . Each child will have 4/3 of a cookie.
- There are 3 cookies for 4 children 3÷4. Each child will have 3/4 of a cookie.

Meanings covered in secondary school

Operator

« Application of a fraction a/b to an initial quantity to obtain a larger or smaller quantity (increase or reduction) »

To construct a geometric figure 4/3 times larger than a given figure, we must multiply each dimension of the figure by the fraction 4/3.
(dilatation with a scale factor of 4/3)

Measure

« Repetition of a unit fraction »

When making chocolate milk for one person, Julie pours ¼ of a cup of chocolate powder into her glass. She wants to make this recipe for 3 people. She will then have to pour 3 times ¼ of a cup of chocolate powder into a container or prepare 3 glasses, each containing ¼ of a cup of chocolate powder.
$\frac{3}{4} = 3 \times \frac{1}{4} = \frac{1}{4} + \frac{1}{4} + \frac{1}{4}$

Note: Factors such as the context, the question asked and the type of data involved will determine whether some meanings will be used more than others. However, different meanings of fractions may have to be considered in the same problem.

Sources : BLOUIN, P. Dessine-moi un bateau : la multiplication par un et demi, Éditions Bande Didactique, Montréal, 2002,
Mary, C. Université de Sherbrooke

Mathematics Program Team Harmonization Between Elementary and Secondary School December 2011

9. *When the International System of Units is studied in Cycle One, do only powers of 10 have to be represented and written with a positive integral exponent?*

No. In Cycle One, students use exponential notation with integral exponents.

References: Mathematics program, p. 208

Progression of Learning, p. 8, no. 11 c

10. *In the Progression of Learning, why is an arrow indicated under Elementary 6 next to the statement* Calculates a certain percentage of a number*? Does this mean that students are introduced to the concept of proportionality in elementary school?*

In elementary school, student must develop an understanding of the concept of percentage. When they begin using fractional notation and make connections with what they have learned about fractions, students will then be able to start calculating the percentage of a number. The concept of proportionality will be developed in Secondary Cycle One.

References: Mathematics program, p. 210

Progression of Learning, p. 12, no. 1

Algebra

11. *The Progression of Learning indicates that the concept of an unknown was introduced in elementary school. How were elementary school students introduced to this algebraic concept?*

The concept of an unknown was introduced in elementary school without being named as such when students were asked to find a missing term. The missing term was represented by a symbol, a drawing or an empty box. A letter used to represent an unknown is introduced only in secondary school.

References: Mathematics program, p. 211

Progression of Learning, p. 14 A, no. 4 a

Statistics

12. *Can we say that a* table of values *and a* table *are the same thing?*

No. A table of values is a tool that helps you visualize the dependency relationship between two elements, whereas a table is used to organize data where a dependency relationship is not necessarily involved.

Geometry

13. *In Cycle One, do students have to draw a circle that passes through three points?*

The statements listed in the program are examples of principles that can be used to get students to reason in a geometric context. Although the properties studied do not necessarily have to be proven by the students, they should represent conclusions that students will draw during exploration activities that require them to use their spatial sense and their knowledge of the properties of geometric transformations, among other things. These statements help them justify their procedure when solving a situational problem or using mathematical reasoning.

When students are introduced to deductive reasoning, they learn how they can deduce properties using rigorous reasoning based on previously established definitions or properties.

References: Mathematics program, pp. 218-219

(See principles 17, 19, 24 and 25)

Progression of Learning, p. 27; p. 32 G, no. 1

14. *When "geometric constructions" are mentioned in the Cycle One program, what are students expected to construct?*

Students must learn to construct geometric figures rather than draw them. Geometric constructions carried out using geometry sets or technological tools (e.g. dynamic geometry software) highlight the properties of figures. There are no specific constructions required in the program. However, in studying plane, congruent and similar figures, students must construct figures in a variety of situations. They may be required to do this in developing or applying any one of the competencies.

References: Mathematics program, p. 217 (note)-219

Progression of Learning, p. 28 A, nos. 8 and 9

15. *In elementary school, students describe and name convex polygons. In this regard, what more do they learn in secondary school?*

In elementary school, students develop their understanding of the concepts of polygons with 3, 4, 5, 6, 8 and 10 sides, whereas the concept of a regular polygon is introduced in secondary school. In addition, there are no restrictions regarding the number of sides in the polygons studied: the polygons chosen are determined by the nature of the activities and the learning situations.

References: Mathematics program, p. 216

Progression of Learning, p. 28 A, no. 5

16. *Should we teach how to find the measures of the interior and exterior angles of a convex polygon?*

In Secondary Cycle One, students must determine the measures of angles in different situations. Although these properties do not appear in the list of principles of Euclidean geometry, students could be asked to discover them by analyzing patterns, making conjectures, establishing connections and applying definitions or others properties such as those outlined below:

- The sum of the measures of the interior angles of a triangle is 180°.
- Adjacent angles whose external sides are in a straight line are supplementary.
- In a circle, the degree measure of the central angle is equal to the degree measure of its intercepted arc.

References: Mathematics program, p. 216

Progression of Learning, p. 28 A, no. 9; p. 30 C, nos. 4 and 5

17. *Is the construction of an angle introduced in elementary or secondary school?*

In elementary school, students encounter different situations in which they must estimate the measure of a given angle and measure it using a protractor. Only in secondary school will they be required to construct angles with a protractor.

Reference: Mathematics program, p. 216

18. *Is it important to teach students how to carry out geometric transformations using geometry sets or should we focus only on properties (e.g. congruent corresponding angles, congruent corresponding sides, parallel corresponding sides, etc.)?*

In the Cycle One program, constructions and transformations are indicated as part of the compulsory processes. The processes related to geometric transformations and constructions are used to build concepts and identify invariants and properties that can be applied in different situations and for the development of the students' spatial sense. These transformations and constructions can be carried out using geometry sets or softwares in the Euclidean plane.

References: Mathematics program, pp. 216-218

Progression of Learning, p. 29 C, nos. 1-6

19. *Students learned Euler's theorem in elementary school. Will this concept be covered in secondary school?*

This concept will be reinvested in Secondary I, II and III, and in Secondary V for students in the *Cultural, Social and Technical* Option.

References: Elementary School Mathematics program, p. 152; Secondary Cycle Two Mathematics program, p. 124

Progression of Learning, p. 28 B, no. 5

20. *In the Progression of Learning next to the statements regarding the location of numbers on an axis and in a Cartesian plane, why is a star indicated under Elementary 6, an arrow under Secondary I and a star under Secondary II?*

This is because of the different numbers studied from Elementary 6 to Secondary II. Students are expected to know all the rational numbers only by Secondary II and the set of real numbers only by Secondary III.

References: Mathematics program, p. 208

Progression of Learning, p. 34 A, nos. 1 and 2

<u>Part B</u>: First Year of Secondary Cycle Two

Arithmetic

21. *Should set-builder notation be used and taught along with interval and roster notation?*

In Secondary Cycle One, students did not systematically study sets of numbers. The program focused mainly on numbers written in decimal or fractional notation. In the first year of Secondary Cycle Two, students learn to distinguish between rational and irrational numbers and to represent various subsets of real numbers: in interval and roster notation and on the number line. If necessary, set-builder notation can be introduced in the *Technical and Scientific* Option or the *Science* Option

References: Mathematics program, p. 53 (footnote)

Progression of Learning, p. 8, no. 9

22. *One of the processes listed in the program reads as follows:* Performing context-related calculations with integral exponents (rational base) and fractional exponents*. What exactly does this entail? Do we have to work with fractional exponents other than 1/2 and 1/3, which are indicated in the footnote? Should students also be taught how to simplify the bases?*

The program also specifies the following aim: to ensure that students can manipulate expressions containing fractional exponents and make connections with radical expressions, mainly (but not exclusively) with respect to the exponents 1/2 and 1/3 because they can be linked to geometric contexts. The exponents 1/2 and 1/3 are essential in this regard.

References: Mathematics program, p. 53

Progression of Learning, p. 11, no. 14 a

23. With regard to scientific notation, do we only have to cover the notation and the relevant contexts or must student also learn how to perform operations on numbers in scientific notation?

Students must be able to understand this notation, interpret it correctly, mentally assign it an order of magnitude and express values using this notation, in accordance with the related standards and conventions. Scientific notation makes it easier to read and write both small and large numbers, and to understand prefixes such as nano, micro, mega and giga. In addition, it can be used to indicate the number of significant digits in a given number when necessary.

Student may perform such calculations, but the program calls for scientific notation to be used in appropriate situations.

References: Mathematics program, pp. 53-54

Progression of Learning, p. 8, no. 11 d

Algebra

24. *With regard to systems of equations, do we have to teach students how to manipulate and algebraically transform equations of the form $y = ax + b$?*

In Secondary III, students learn to solve systems of equations in studying the concepts of function, relation and inverse (i.e. dependency relationship between the variables studied). Thus, the equations students manipulate are in "functional" form, that is, $f(x) = ax + b$, which leads directly to the comparison method when a system must be solved algebraically. In Secondary IV, students are introduced to situations that can be represented by other forms of linear equations and that involve learning about other methods and manipulating expressions using the method of their choice.

References: Mathematics program, p. 53

Progression of Learning, p. 16 D, no. 1 a; p. 17 D, nos. 2 a and 3 a

25. *Do we have to define terms such as* domain*,* range*,* increasing interval*,* decreasing interval *and* extrema*?*

The following additional observation appears in the table outlining the concepts and processes:

"Students learn to describe the properties of a function (domain, range, intervals within which the function is increasing or decreasing, extrema, sign and *x*- and *y*-intercepts). They identify them informally, always in relation with the context."

References: Mathematics program, p. 53

Progression of Learning, p. 18 B, no. 5

<u>Part C</u>: Second Year of Secondary Cycle Two

Cultural, Social and Technical Option (CST)

Algebra

26. *How can students go about finding the value of the exponent in the inverse of an exponential function if logarithms are not covered in the CST option?*

    In the CST option, students use a graph, table of values or technology to determine the value of the exponent.

    Reference: Mathematics program, pp. 67-68

Probability

27. *Could you clarify the meaning of "subjective probability?"*

    There are several types of probability: theoretical probability; experimental probability, which is based on the frequency with which past events have actually occurred; and subjective probability, which is based on judgment, perception or experience (whether or not we know the frequency with which an event has actually occurred). Subjective probability is an opinion about the probability of an event occurring. It is used when it is impossible to calculate the theoretical or experimental probability. Such cases call for judgment, perceptiveness or experience. For example, weather reports involve the subjective evaluation of probabilities.

    References: Mathematics program, p. 70-71

    Progression of Learning, p. 22 A, no. 17; p. 23 B, no. 6

Statistics

28. What formula should be used to calculate percentiles?

There are several definitions of a percentile. It is up to you to choose the one you feel is most appropriate. In our opinion, however, the definition in the *Lexique mathématique – Enseignement secondaire*[1] will make this concept meaningful to students. It would also be useful to have students compare different definitions with the one used by Statistics Canada, for example, and to have them examine the distinctions among the formulas. How does each formula affect a given situation? In what types of situations could one formula be more appropriate than another?

References: Mathematics program, p. 72

Progression of Learning, p. 25 A, no. 11 c ii

Geometry

29. Should previously studied concepts be reviewed (e.g. corresponding, alternate interior and alternate exterior angles)?

Previously acquired knowledge is used whenever necessary. A previously studied concept can be reinvested or examined in greater detail.

References: Cycle One Mathematics program, p. 216

Progression of Learning, p. 30 C nos. 3 and 4

1. Source: D. de Champlain et al., *Lexique mathématique – Enseignement secondaire* (Montréal: Modulo, 1996), p. R-12.

Technical and Scientific **Option (TS)**

Arithmetic

30. *Is the rationalization of the denominator studied in the TS option in Secondary IV?*

Yes, in the TS option in Secondary IV and V, but also in the *Science* Option in Secondary V.

References: Mathematics program, p. 85 and p.102

Progression of Learning, p. 11, no. 14 b

Algebra

31. *Should we teach students how to change the base of logarithms in the TS option in Secondary IV?*

Students manipulate numerical and algebraic expressions. More specially, they write numbers using radicals or in exponential form with rational exponents. They learn to write numbers with the same base and numbers with different bases, in particular by constructing and interpreting tables of values consisting of positive rational numbers written in bases 2 and 10. They also solve exponential and second-degree equations and inequalities. In situations where they must determine the approximate value of the exponent (logarithm), they use a graph, a table of values (base 2 or 10) or a calculator. In calculating this value, they convert these expressions to the same base (e.g. base 10) so as to make the exponents comparable. They can also use the following equivalences: $a^b = c \Leftrightarrow \log_a c = b$, $\log_a c = \frac{\log c}{\log a}$

References: Mathematics program, p. 85-87

Progression of Learning, p. 16, no. 11 b; p. 19, B nos. 1- 9 e, ii

32. *What is the purpose of graphing the inverse of greatest integer functions?*

This is to emphasize the idea that the inverse of a function is not always a function.

References: Mathematics program, p. 85

Progression of Learning, p. 19 B, no. 3 j

Statistics

33. *How can you go about drawing up statistical reports based on probabilities?*

In a statistical report that divides buyers into age groups with respect to certain types of cars, we can calculate the probability that a man will buy a sports car based on the data in the statistical report (table). However, we can also determine the missing data values in a table (or even draw up an entire table) based on known probabilities.

Reference: Mathematics program, p. 89

Geometry

34. *If the sine and cosine laws are not included in the Secondary IV program, how should we go about teaching students to calculate the area of a triangle based on the measurement of one angle and two sides or two angles and one side?*

The concept to be developed is the concept of measurement, in particular metric and trigonometric relations (sine, cosine and tangent) in a right triangle. Students looking for the area of a triangle given the measurement of one angle and two sides or two angles and one side must apply metric and trigonometric relations in a right triangle. In this situation, they must determine one or more appropriate strategies. They can split these triangles into right triangles.

The sine and cosine laws are included in the Secondary V program.

References: Mathematics program, p. 93

Progression of Learning, p. 32 G, no. 2 a, i, ii, iii

***Science* Option (S)**

Analytic Geometry

35. *What about the distance between a point and a line and the distance between two parallel lines?*

In analytic geometry, students develop and investigate the concepts of line and distance between two points. They must also find unknown measurements, in particular using the concept of distance. Their study of lines is concurrent with that of systems of first-degree equations in two variables. Finding the distance from a point to a line or between two parallel lines enables students to make connections between different learning. The formula for calculating the distance from a point to a line is not a compulsory part of the program, but students have all the knowledge needed to calculate this distance (concepts of distance, parallelism, perpendicularity and methods for solving systems of equations).

References: Mathematics program, p. 105-106

Progression of Learning, p. 34 B, nos. 1 and 2

<u>Part D</u>: Third Year of Secondary Cycle Two

***Cultural, Social and Technical* Option (CST)**

Geometry

36. Should we cover dilatations with a negative scale factor?

In Secondary Cycle One, students studied only dilatations with a positive scale factor. In Cycle Two, there are no restrictions regarding scale factors. The situations used can also involve negative scale factors.

References: Mathematics program, p. 74

Progression of Learning, p. 35 C, no. 1

***Technical and Scientific* Option (TS) and *Science* Option (S)**

Algebra

37. *Can you explain the difference between the following statements in the Progression of Learning?*

Solves the following types of equations or inequalities in one variable:

- *first-degree trigonometric involving a sine, cosine or tangent expression*
- *trigonometric that can be expressed as a sine, cosine or tangent*

The first statement means that students are using an expression containing **either** a sine, a cosine or a tangent (e.g. when solving an equation such as $2sinx + 1 = 0$).

The second statement concerns equations and inequalities that can be manipulated through the use of trigonometric identities, for example, to yield a sine, cosine or tangent. This is the case, for instance, when students solve an equation such as $3sinx = 2cos^2x$. The equation can be of degree 1, 2 or more, provided it can be solved using the different techniques associated with trigonometric identities or the factorization of polynomials.

References: Mathematics program, p. 86 and p. 102

Progression of Learning, p. 16, no. 11 e, f