Middle Level Mathematics Assessment June, 2006

Information Bulletin

Evaluation Branch
Department of Education
New Brunswick

New Brunswick

Middle Level Mathematics Assessment, June 2006

The Department of Education administers a comprehensive Provincial Evaluation Program to monitor overall student achievement at particular points in the system. This provides important feedback at provincial and local levels about students' knowledge and skills. The Middle Level Mathematics Assessment is an important component of this program. It focuses on student performance over the middle school years.

Administration

The Middle Level Mathematics Assessment consists of two sections that will be administered over a two-day period.

Day/Date	Section	Time Allotment
Monday	**Section A**	
June 12, 2006	Selected-Response Items	90 minutes
Tuesday	**Section B**	
June 13, 2006	Part 1: Mental Mathematics	2 minutes
	Part 2: Non-calculator Mathematics	20 minutes
	Part 3: Constructed-Response Items	60 minutes

If required, students may have up to 20 minutes additional time to complete Section A or the constructed-response questions in Section B. Up to 10 minutes of additional time may be given to complete the Non-calculator questions in Section B.

Make-up Date: Wednesday, June 14, 2006

Types of Items

Section A of the assessment will consist of selected-response items. Students will be required to select the correct answer from a number of response choices.

Section B is divided into three parts. The first part, Mental Mathematics, consists of 12 questions to be answered during a two-minute time frame. Part 2, Non-calculator Mathematics, consists of a combination of selected-response and constructed-response questions. Students are to determine their own response for the constructed-response questions. Part 3 consists of constructed-response questions. The use of calculators is permitted for this part of the assessment. Sample items are provided in *Appendix A*.

Distribution of Topics

The following Distribution of Topics reflects the approximate percentage emphasis allotted to each strand. A listing of strands and outcomes is presented in *Appendix B*.

Distribution of Topics	
Strands	**Percent Emphasis**
Number	**50%**
Number Concepts (15%)	
Operations (35%)	
Patterns and Relations	**15%**
Measurement and Geometry	**20%**
Measurement (15%)	
Geometry (5%)	
Data Management and Probability	**15%**
Data Management (10%)	
Probability (5%)	

Testing Procedures

The principal of each middle school is responsible for the security of the Middle Level Mathematics Assessment materials sent to his/her school and for ensuring that there is no unauthorized reproduction of these materials.

Approximately two weeks before the assessment, the *Administrative Guidelines* will be sent to each school. Teachers administering the assessment should read these guidelines carefully prior to the administration date. These guidelines clarify how the assessment is to be administered.

Following completion of the assessment, a checklist is provided on the Packing / Return-Packing Slip to assist the principal in preparing materials for return to the Department of Education.

Exemptions

The Middle Level Mathematics Assessment is compulsory for all students presently enrolled in the eighth grade in New Brunswick schools. The assessment is meant to be as inclusive as possible. However, the school principal may request an exemption for a student who is unable to respond with any degree of success to the assessment instrument or if participation would be harmful to the student.

A recommendation for exempting an individual student should be provided using the appropriate form and bearing the required signature(s). Please refer to the document *Guidelines for Exemptions and Modifications* for more specific information.

Bilingual Version of the Assessment

A bilingual version of the assessment will be produced for French Immersion students. French Immersion students will be able to respond to any item in French or English so that language does not interfere with their ability to demonstrate proficiency in mathematics.

Formula Sheet

A Formula Sheet will be provided for students when writing the assessment. Refer to *Appendix C* for the list of formulas that will be provided for students.

Student Use of Calculators

The use of calculators is encouraged for Section A and for the constructed-response questions in Part 3 of Section B. Students should have a calculator that performs addition, subtraction, multiplication, and division as well as having memory, percent, square root, exponent, reciprocal, and +/– keys.

Reporting of Results

All parts of the assessment will be scored by the Department of Education. Provincial, district, school and individual results will be generated.

Looking Back: Middle Level Mathematics Assessment, June 2005

Background

In June of their grade 8 year, students write the Middle Level Mathematics Assessment. Although the assessment is based on the grade 8 provincial mathematics curriculum, it is designed to reflect students' achievement over the middle school years.

The assessment included items of varying difficulty levels and addressed the seven strands: Number Concepts, Operations, Patterns and Relations, Measurement, Geometry, Data Management, and Probability.

Student results were reported in terms of three standards: Strong Performance, Appropriate Performance, and Experiencing Difficulty. These standards were linked, in turn, to the percentages of test items answered correctly.

Findings

Six thousand, one hundred and forty-three students wrote the Middle Level Mathematics Assessment. The exemption rate was 4.0%.

Sixty-one percent of those who wrote the assessment met the provincial standard, the same percentage as last year. Sixty-four percent of males and 58% of females met the standard as compared to 63% and 58% in 2004.

Students enrolled in French Immersion programs achieved at higher levels than those in the English program. In 2005, 78% of Early French Immersion students and 80% of Late French Immersion students met the standard, compared to 51% of those in the English program. In 2004, 73% of Early Immersion students, 78% of Late Immersion students and 53% of English program students met the standard.

Appendix A: Sample Items
Section A, Selected Response

1. The population of New Brunswick is about 760 000 and the population of Canada is about 32 000 000. About what percent of the population of Canada is New Brunswick's population?

A. 40%
B. 25%
C. 4%
D. **2.5%**

GCO*: B3	**A.** 21%	**B.** 16%	**C.** 23%	**D.** **40%**

2. Jeff's salary increased from $8.00 an hour to $10.00 an hour. What was the percent increase?

A. 30%
B. **25%**
C. 20%
D. 15%

GCO: B4	**A.** 2%	**B.** **47%**	**C.** 41%	**D.** 10%

* GCO – General Curriculum Outcome

3. Find the missing fraction to make the following sentence true:

$$\frac{\mathbf{1}}{\mathbf{2}} + \frac{\square}{\square} = \frac{\mathbf{10}}{\mathbf{12}}$$

A. $\frac{9}{10}$

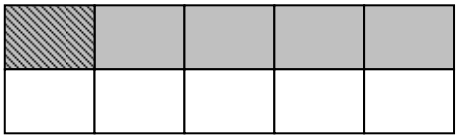
B. $\frac{5}{12}$

C. $\frac{2}{3}$

D. $\mathbf{\frac{1}{3}}$

GCO: B5	**A.** 33%	**B.** 12%	**C.** 8%	**D.** **47%**

4. Which of the following operations is described by the diagram?



A. $\frac{1}{10}$ of $\frac{1}{2}$

B. $\frac{1}{5}$ of $\frac{4}{5}$

C. $\mathbf{\frac{1}{5}}$ **of** $\mathbf{\frac{1}{2}}$

D. $\frac{1}{10}$ of $\frac{4}{5}$

GCO: B7	**A.** 37%	**B.** 11%	**C.** **33%**	**D.** 18%

5. **In a theatre, $\frac{4}{12}$ of the people present are men, $\frac{2}{5}$ are women and the rest are children. There are 450 people in the theatre. How many children are in the theatre?**

A. **120**
B. 150
C. 180
D. 330

GCO: B11	**A.** **49%**	**B.** 17%	**C.** 21%	**D.** 13%

6. **Which of the following is equivalent to $x + 2x + 4$?**

A. $4(x + 2x)$
B. $2x^2 + 4$
C. $7x$
D. $\mathbf{3x + 4}$

GCO: B14	**A.** 17%	**B.** 20%	**C.** 5%	**D.** **58%**

7. **Two less than triple a number can be written as**

A. $2 - 3x$
B. $2x - 3$
C. $3 - 2x$
D. $\mathbf{3x - 2}$

GCO: C6	**A.** 39%	**B.** 4%	**C.** 3%	**D.** **54%**

8. Only one value of *x* will make the following equation true:

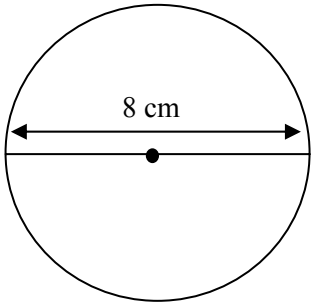
$$3x + 1 = 19$$

Which of these equations will be true for the same value of *x*?

A. $2x = 18$
B. $3x = 12$
C. $5x = 20$
D. $\mathbf{4x + 6 = 30}$

GCO: C6	**A.** 24%	**B.** 10%	**C. 7%**	**D. 59%**

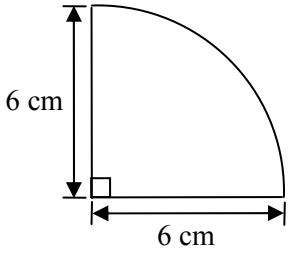
9. The area of the circle is about



A. 201.1 cm^2
B. 64.0 cm^2
C. **50.3 cm^2**
D. 25.1 cm^2

GCO: D4	**A.** 5%	**B.** 15%	**C. 60%**	**D.** 20%

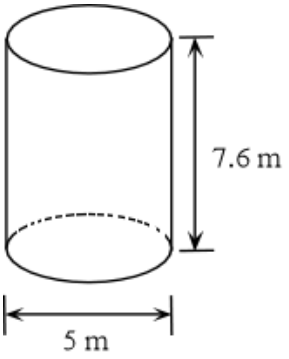
10. The area of the shape is about



A. 9 cm^2
B. **28 cm^2**
C. 38 cm^2
D. 110 cm^2

GCO: D4	**A.** 9%	**B. 46%**	**C.** 39%	**D.** 6%

11. What is the volume of this container?



A. about 40 m^3
B. **about 150 m^3**
C. about 200 m^3
D. about 600 m^3

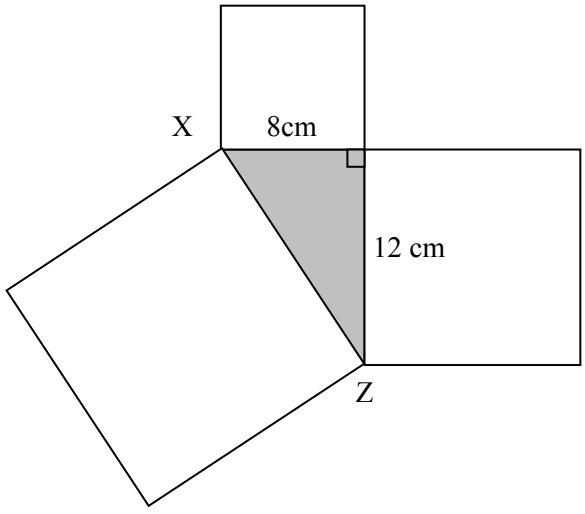
GCO: D7	A. 33%	B. **53%**	C. 9%	D. 5%

12. How much more is the surface area of a 4 cm × 4 cm × 4 cm cube than a 3 cm × 3 cm × 3 cm cube?

A. 28 cm^2
B. **42 cm^2**
C. 54 cm^2
D. 96 cm^2

GCO: D8	A. 78%	B. **15%**	C. 4%	D. 3%

13. Squares are drawn on each side of this right triangle. What is the area of the square on XZ?



A. 20 cm^2
B. 40 cm^2
C. 96 cm^2
D. **208 cm^2**

GCO: D9	A. 17%	B. 8%	C. 24%	D. **51%**

14. The average (mean) temperature over four consecutive days was $2^o C$. The temperatures for the first three days were:

$$10^o C \qquad -4^o C \qquad -1^o C$$

The temperature on the fourth day was

A. −5
B. 5
C. **3**
D. −3

GCO: F7	**A.** 9%	**B.** 19%	**C.** **48%**	**D.** 24%

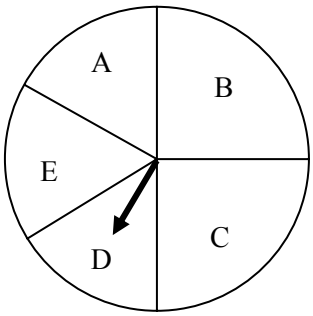
15. What is the probability that the spinner will land on D?

A. $\frac{1}{3}$

B. $\frac{1}{4}$

C. $\frac{1}{5}$

D. $\mathbf{\frac{1}{6}}$



GCO: G2	**A.** 3%	**B.** 5%	**C.** 43%	**D.** **49%**

Section B, Part 1: Mental Mathematics

Part 1: Mental Mathematics (12 questions)

		Answer	Mean Score
1.	$(2 + 6)^2$ = _____	64	56%
2.	21×30 = _____	630	69%
3.	$4 \times 17 \times 25$ = _____	1700	71%
4.	$\frac{1}{3}$ of 9 = _____	3	68%
5.	$1 - \frac{3}{8}$ = _____	$\frac{5}{8}$	51%
6.	$\frac{2}{5} + \frac{3}{10}$ = _____	$\frac{7}{10}$	59%
7.	\$7.00 – \$3.96 = _____	\$3.04	60%
8.	How many halves are in 14? _____	28	36%
9.	$\frac{1}{6} \times \frac{5}{7}$ = _____	$\frac{5}{42}$	56%
10.	$21.9 \div 10$ = _____	2.19	57%
11.	0.5×28 = _____	14	46%
12.	$33\frac{1}{3}$% of 27 = _____	9	22%

Section B, Part 2: Non-calculator Mathematics

1. **If $\frac{8}{15} + \frac{7}{30} = \frac{x}{30}$ then x equals**

A. 10
B. 15
C. 22
D. **23**

GCO: B5	**Mean Score:** 64%

2. **Which of the following has the least value?**

A. $-3 + (-2)$
B. $-3 + 2$
C. 3×2
D. **$3 \times (-2)$**

GCO: B5	**Mean Score :** 63%

3. **How many $\frac{5}{6}$ litres are in $4\frac{1}{6}$ litres?** *5*

GCO: B8	**Mean Score:** 56%

4. Look at the pattern below.

4.5, 2.0, –0.5, –3.0, _____, _____, _____?

If the pattern were to continue, what would the 7th term be? *–10.5*

GCO: C1	**Mean Score:** 35%

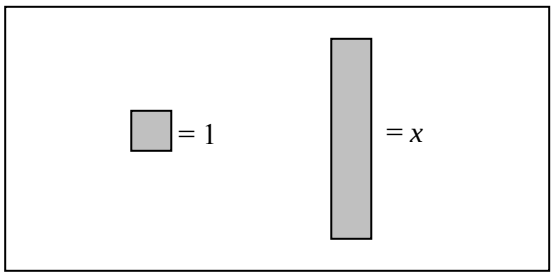
5. A rectangle has an area of 24 cm^2.
Its perimeter is 20 cm.
What are its dimensions? *4 cm × 6 cm*

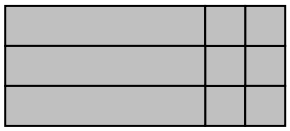
GCO: D2	**Mean Score:** 50%

Section B, Part 3: Constructed Response

Value: 3 points

1. Use the following key to answer the questions below.





a. What are the dimensions of this rectangle?

length = *x + 2 or 1x + 2*

GCO: B16	**Mean Score:** 53%

width = *3*

GCO: B16	**Mean Score:** 58%

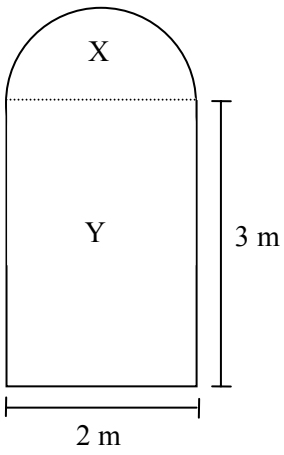
b. What is area of the rectangle?

area = *3x + 6 or 3(x + 2) or 3 × (x + 2)*

GCO: B16	**Mean Score:** 23%

Value: 3 points

2. The diagram shows an arched doorframe.



a. Find the area of X.

area = *Range: 1.57 – 1.58* m^2

GCO: D6	**Mean Score:** 38%

b. Find the area of Y.

area = *6* m^2

GCO: D6	**Mean Score:** 82%

c. Find the perimeter of the entire doorframe.

perimeter = *11.14* m

GCO: D5	**Mean Score:** 18%

Section A : Réponses choisies

1. La population du Nouveau-Brunswick s'élève environ à 760 000 personnes, et le Canada compte environ 32 000 000 d'habitants. Quel est le pourcentage approximatif de la population du Nouveau-Brunswick par rapport à la population du Canada ?

A. 40 %
B. 25 %
C. 4 %
D. **2,5 %**

RAP* : B3	**A.** 21 %	**B.** 16 %	**C.** 23 %	**D.** **40 %**

2. Le salaire de Jeff est passé de 8,00 $ à 10,00 $ l'heure. Quel est le pourcentage d'augmentation de son salaire ?

A. 30 %
B. **25 %**
C. 20 %
D. 15 %

RAP : B4	**A.** 2 %	**B.** **47 %**	**C.** 41 %	**D.** 10 %

* RAP – Résultats d'apprentissage du programme

3. Trouve la fraction manquante de façon à ce que la phrase suivante soit vraie :

$$\frac{\mathbf{1}}{\mathbf{2}} + \frac{\square}{\square} = \frac{\mathbf{10}}{\mathbf{12}}$$

A. $\frac{9}{10}$

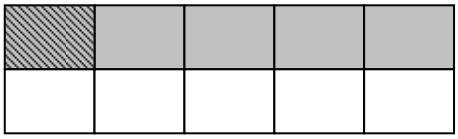
B. $\frac{5}{12}$

C. $\frac{2}{3}$

D. $\mathbf{\frac{1}{3}}$

RAP : B5	**A.** 33 %	**B.** 12 %	**C.** 8 %	**D.** **47 %**

4. Parmi les opérations suivantes, laquelle est représentée par ce schéma ?



A. $\frac{1}{10}$ de $\frac{1}{2}$

B. $\frac{1}{5}$ de $\frac{4}{5}$

C. $\mathbf{\frac{1}{5}}$ **de** $\mathbf{\frac{1}{2}}$

D. $\frac{1}{10}$ de $\frac{4}{5}$

RAP : B7	**A.** 37 %	**B.** 11 %	**C.** **33 %**	**D.** 18 %

5. **Dans un théâtre, $\frac{4}{12}$ des gens présents sont des hommes, $\frac{2}{5}$ sont des femmes et le reste sont des enfants. Il y a 450 personnes en tout dans le théâtre. Combien y a-t-il d'enfants ?**

A. **120**
B. 150
C. 180
D. 330

RAP : B11	**A.** **49 %**	**B.** 17 %	**C.** 21 %	**D.** 13 %

6. **Parmi les expressions suivantes, laquelle est équivalente à $x + 2x + 4$?**

A. $4(x + 2x)$
B. $2x^2 + 4$
C. $7x$
D. **$3x + 4$**

RAP : B14	**A.** 17 %	**B.** 20 %	**C.** 5 %	**D.** **58 %**

7. **Quelle expression correspond à deux de moins que le triple d'un nombre ?**

A. $2 - 3x$
B. $2x - 3$
C. $3 - 2x$
D. **$3x - 2$**

RAP : C6	**A.** 39 %	**B.** 4 %	**C.** 3 %	**D.** **54 %**

8. Une seule valeur de *x* rendra l'équation suivante vraie :

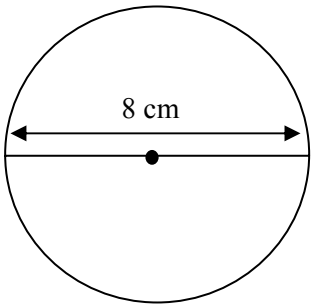
$$3x + 1 = 19$$

Parmi les équations suivantes, laquelle est vraie pour la même valeur de *x* ?

A. $2x = 18$
B. $3x = 12$
C. $5x = 20$
D. $\mathbf{4x + 6 = 30}$

RAP : C6	**A.** 24 %	**B.** 10 %	**C. 7 %**	**D. 59 %**

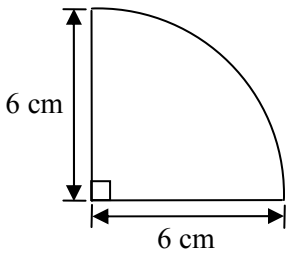
9. L'aire de ce cercle mesure environ



A. 201,1 cm^2
B. 64,0 cm^2
C. **50,3 cm^2**
D. 25,1 cm^2

RAP : D4	**A.** 5 %	**B.** 15 %	**C. 60 %**	**D.** 20 %

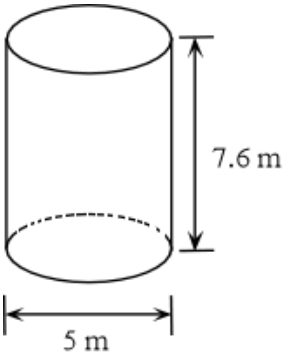
10. L'aire de cette figure mesure environ



A. 9 cm^2
B. **28 cm^2**
C. 38 cm^2
D. 110 cm^2

RAP : D4	**A.** 9 %	**B. 46 %**	**C.** 39 %	**D.** 6 %

11. Quel est le volume de ce récipient ?



A. environ 40 m^3
B. **environ 150 m^3**
C. environ 200 m^3
D. environ 600 m^3

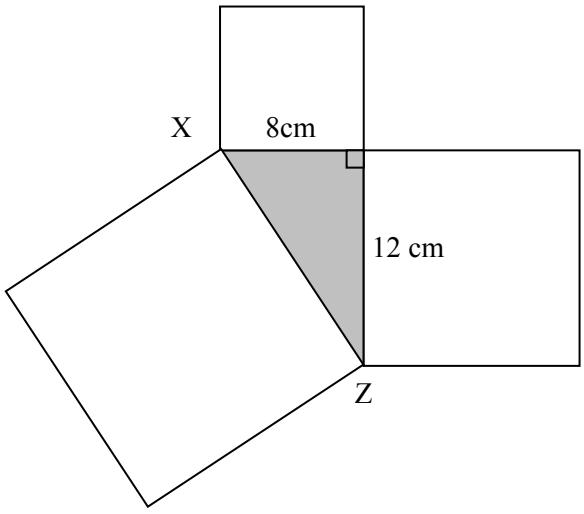
RAP : D7	**A.** 33 %	**B.** **53 %**	**C.** 9 %	**D.** 5 %

12. De combien l'aire d'un cube mesurant 4 cm × 4 cm × 4 cm est-elle plus grande que l'aire d'un autre cube mesurant 3 cm × 3 cm × 3 cm ?

A. 28 cm^2
B. **42 cm^2**
C. 54 cm^2
D. 96 cm^2

RAP : D8	**A.** 78 %	**B.** **15 %**	**C.** 4 %	**D.** 3 %

13. Des carrés sont construits sur chacun des côtés de ce triangle rectangle. Quelle est l'aire du carré construit sur le côté XZ ?



A. 20 cm^2
B. 40 cm^2
C. 96 cm^2
D. **208 cm^2**

RAP : D9	**A.** 17 %	**B.** 8 %	**C.** 24 %	**D.** **51 %**

14. La température moyenne de quatre jours consécutifs est de 2° C. Les trois premiers jours, on a enregistré les températures suivantes :

$$10^{o}C \qquad -4^{o}C \qquad -1^{o}C$$

Le quatrième jour, la température a été de

A. −5
B. 5
C. **3**
D. −3

RAP : F7	**A.** 9 %	**B.** 19 %	**C.** **48 %**	**D.** 24 %

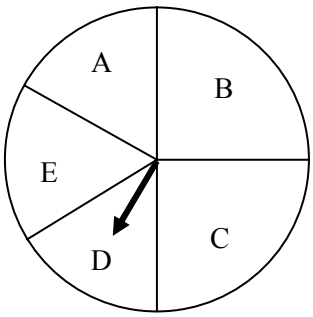
15. Quelle est la probabilité que la flèche s'arrête sur la lettre D ?

A. $\frac{1}{3}$

B. $\frac{1}{4}$

C. $\frac{1}{5}$

D. $\mathbf{\frac{1}{6}}$



RAP : G2	**A.** 3 %	**B.** 5 %	**C.** 43 %	**D.** **49 %**

Section B, partie 1 : Calcul mental

		Réponse	Moyenne
1.	$(2 + 6)^2$ = _____	64	56 %
2.	21 × 30 = _____	630	69 %
3.	4 × 17 × 25 = _____	1 700	71 %
4.	$\frac{1}{3}$ de 9 = _____	3	68 %
5.	$1 - \frac{3}{8}$ = _____	$\frac{5}{8}$	51 %
6.	$\frac{2}{5} + \frac{3}{10}$ = _____	$\frac{7}{10}$	59 %
7.	7,00 $ – 3,96 $ = _____	3,04 $	60 %
8.	Combien y a-t-il de demies dans 14 ? _____	28	36 %
9.	$\frac{1}{6} \times \frac{5}{7}$ = _____	$\frac{5}{42}$	56 %
10.	21,9 ÷ 10 = _____	2,19	57 %
11.	0,5 × 28 = _____	14	46 %
12.	$33\frac{1}{3}$ % de 27 = _____	9	22 %

Section B, partie 2 : À faire sans calculatrice

1. **Si $\frac{8}{15} + \frac{7}{30} = \frac{x}{30}$, alors x est égal à**

A. 10
B. 15
C. 22
D. **23**

RAP: B5	**Moyenne :** 64 %

2. **Parmi les expressions suivantes, laquelle a la plus petite valeur ?**

A. $-3 + (-2)$
B. $-3 + 2$
C. 3×2
D. **$3 \times (-2)$**

RAP: B12	**Moyenne :** 63 %

3. **Combien de fois $\frac{5}{6}$ litre entre-t-il dans $4\frac{1}{6}$ litres ?** *5*

RAP: B8	**Moyenne :** 56 %

4. Observe la suite ci-dessous.

4,5 , 2,0 , –0,5 , –3,0 , _____, _____, ?

Si cette régularité est maintenue, quel sera le 7e terme ? *–10,5*

RAP: C1	**Moyenne :** 35 %

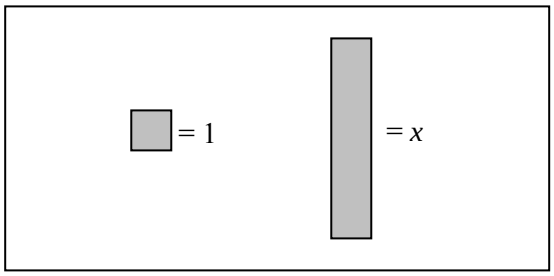
5. Un rectangle a une aire de 24 cm^2.
Son périmètre mesure 20 cm.
Quelles sont ses dimensions ? *4 cm × 6 cm*

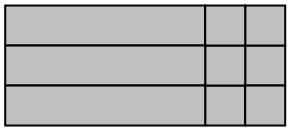
RAP: D2	**Moyenne :** 50 %

Section B, partie 3 : Réponses construites

Valeur : 3 points

1. Utilise la légende ci-dessous pour répondre aux questions suivantes.





a. Quelles sont les dimensions de ce rectangle ?

Longueur = *x + 2 ou 1x + 2*

RAP : B16	**Moyenne :**	53 %

Largeur = *3*

RAP : B16	**Moyenne :**	58 %

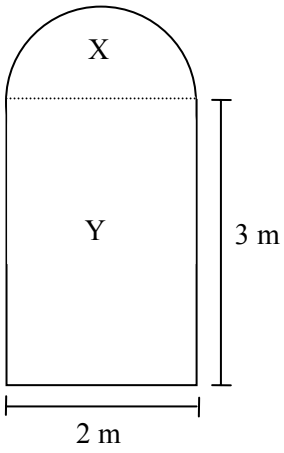
b. Quelle est l'aire de ce rectangle ?

Aire = *3x + 6 ou 3(x + 2) ou 3 × (x + 2)*

RAP : B16	**Moyenne :**	23 %

Valeur : 3 points

2. Le schéma ci-dessous précise certaines dimensions d'un encadrement de porte en forme d'arche.



a. Trouve l'aire de X.

Aire = *Étendue: 1,57 – 1,58* m^2

RAP : D6	**Moyenne :**	38 %

b. Trouve l'aire de Y.

Aire = *6* m^2

RAP : D6	**Moyenne :**	82 %

c. Trouve le périmètre de l'encadrement total de la porte.

Périmètre = *11.14* m

RAP : D5	**Moyenne :**	18 %

Appendix B: Grade 8 Mathematics Outcomes

Number Concepts

A1 model and link various representations of square root of a number

A2 recognize perfect squares between 1 and 144 and apply patterns related to them

A3 distinguish between an exact square root of a number and its decimal approximation

A4 find the square root of any number, using an appropriate method

A5 demonstrate and explain the meaning of negative exponents for base ten

A6 represent any number written in scientific notation in standard form, and vice versa

A7 compare and order integers and positive and negative rational numbers (in decimal and fractional forms)

A8 represent and apply fractional percents, and percents greater than 100, in fraction or decimal form, and vice versa

A9 solve proportion problems that involve equivalent ratios and rates

Operations

B1 demonstrate an understanding of the properties of operations with integers and positive and negative rational numbers (in decimal and fractional forms)

B2 solve problems involving proportions, using a variety of methods

B3 create and solve problems which involve finding a, b, or c in the relationship a% of b = c, using estimation and calculation

B4 apply percentage increase and decrease in problem situations

B5 add and subtract fractions concretely, pictorially, and symbolically

B6 add and subtract fractions mentally, when appropriate

B7 multiply fractions concretely, pictorially, and symbolically

B8 divide fractions concretely, pictorially, and symbolically

B9 estimate and mentally compute products and quotients involving fractions

B10 apply the order of operations to fraction computations, using both pencil and paper and the calculator

B11 model, solve, and create problems involving fractions in meaningful contexts

B12 add, subtract, multiply, and divide positive and negative decimal numbers with and without the calculator

B13 solve and create problems involving addition, subtraction, multiplication, and division of positive and negative decimal numbers

B14 add and subtract algebraic terms concretely, pictorially, and symbolically to solve simple algebraic problems

B15 explore addition and subtraction of polynomial expressions, concretely and pictorially

B16 demonstrate an understanding of multiplication of a polynomial by a scalar, concretely, pictorially, and symbolically

Patterns and Relations

C1 represent patterns and relationships in a variety of formats and use these representations to predict unknown values

C2 interpret graphs that represent linear and non-linear data

C3 construct and analyse tables and graphs to describe how change in one quantity affects a related quantity

C4 link visual characteristics of slope with its numerical value by comparing vertical change with horizontal change

C5 solve problems involving the intersection of two lines on a graph

C6 solve and verify simple linear equations algebraically

C7 create and solve problems, using linear equations

Measurement

D1 solve indirect measurement problems, using proportions

D2 solve measurement problems, using appropriate SI units

D3 estimate areas of circles

D4 develop and use the formula for the area of a circle

D5 describe patterns and generalize the relationships between areas and perimeters of quadrilaterals, and areas and circumferences of circles

D6 calculate the areas of composite figures

D7 estimate and calculate volumes and surface areas of right prisms and cylinders

D8 measure and calculate volumes and surface areas of composite 3-D shapes

D9 demonstrate an understanding of the Pythagorean relationship, using models

D10 apply the Pythagorean relationship in problem situations

Geometry

E1 demonstrate whether a set of orthographic views, a mat plan, and an isometric drawing can represent more than one 3-D shape

E2 examine and draw representations of 3-D shapes to determine what is necessary to produce unique shapes

E3 draw, describe, and apply transformations of 3-D shapes

E4 analyse polygons to determine their properties and interrelationships

E5 represent, analyse, describe, and apply dilatations

Data Management

F1 demonstrate an understanding of the variability of repeated samples of the same population

F2 develop and apply the concept of randomness

F3 construct and interpret circle graphs

F4 construct and interpret scatter plots and determine a line of best fit by inspection

F5 construct and interpret box- and whisker-plots

F6 extrapolate and interpolate information from graphs

F7 determine the effect of variations in data on the mean, median, and mode

F8 develop and conduct statistics projects to solve problems

F9 evaluate data interpretations that are based on graphs and tables

Probability

G1 conduct experiments and simulations to find probabilities of single and complementary events

G2 determine theoretical probabilities of single and complementary events

G3 compare experimental and theoretical probabilities

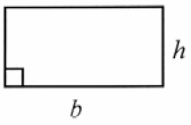
G4 demonstrate an understanding of how data is used to establish broad probability patterns

Appendix C: Formula Sheet

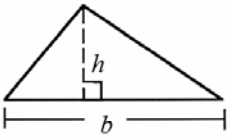
Middle Level Mathematics

Formula Sheet

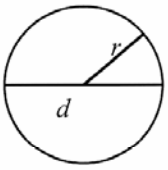
(The value for π is 3.14159...)



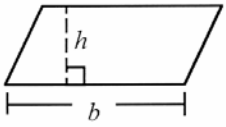
Area $A = bh$
Perimeter $P = 2b + 2h$



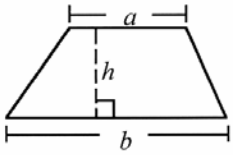
Area $A = \frac{1}{2}bh$ or $\frac{bh}{2}$



Area $A = \pi r^2$
Circumference
$C = \pi d$
$C = 2\pi r$

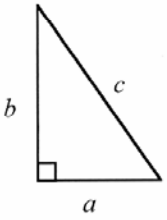


Area $A = bh$

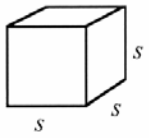


Area $A = \frac{1}{2}(a + b)h$
or $A = \frac{(a + b)h}{2}$

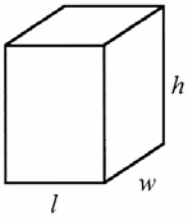
Pythagorean Theorem



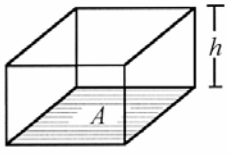
$c^2 = a^2 + b^2$



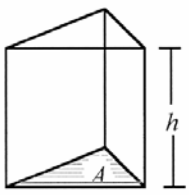
Volume $V = s^3$
Surface Area $= 6s^2$



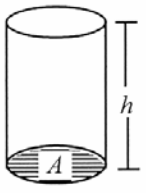
Volume $V = lwh$
Surface Area $= 2lw + 2wh + 2lh$



Volume $V = Ah$



Volume $V = Ah$

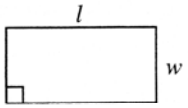


Volume $V = Ah$

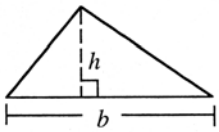
Mathématiques du niveau intermédiaire

Feuille-formules

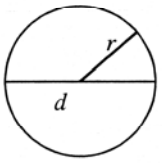
(La valeur de π est 3,14159...)



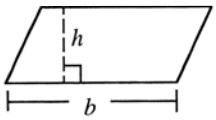
Aire $A = lw$
Périmètre $P = 2l + 2w$



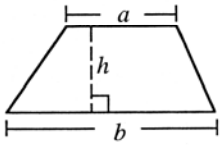
Aire $A = \frac{1}{2}bh$



Aire $A = \pi r^2$
Circonférence
$C = \pi d$
$C = 2\pi r$

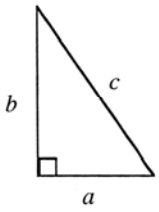


Aire $A = bh$

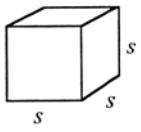


Aire $A = \frac{1}{2}(a + b)h$

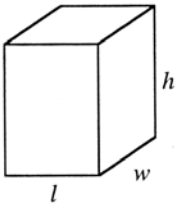
Théorème de Pythagore



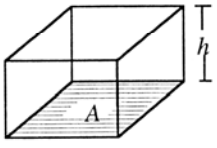
$c^2 = a^2 + b^2$



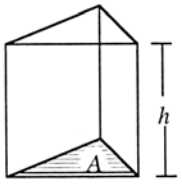
Volume $V = s^3$
Surface totale $= 6s^2$



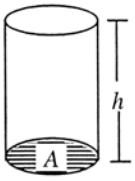
Volume $V = lwh$
Surface totale $= 2lw + 2wh + 2lh$



Volume $V = Ah$



Volume $V = Ah$



Volume $V = Ah$