Key Words
Throughout the assessment, key words are used to identify the type of response required from you. The Key words are explained below. Refer to this sheet to make sure you are responding fully to each question.

**Compare:**
Tell what is the same and what is different.

**Describe:**
Use words to create a mental picture for the reader.

**Determine:**
Use mathematics to find a solution to the problem.

**List:**
Use point form.

**Explain:**
Use words and symbols to make your solution clear.

**Justify:**
Give reasons and evidence to show your answer is correct.

**Show your work:**
Record all calculations and all the steps you went through to get your answer. You may use words, numbers, graphs, diagrams, symbols and/or charts.
Tools you should have access to:
- Pencil, ruler and eraser
- Scientific or Graphing calculator (You may not share with another student)
- Manipulatives (examples: fraction pieces, algebra tiles, linking cubes, integer counters, 3D solids, 2D shapes...)

Strategies for Multiple Choice Questions:
1. Cover the question choices and read the question stem carefully and highlight key words with a highlighter, especially the key words on the previous page.
2. Look at the choices and eliminate any of the responses that are not possible.
3. There is only one answer per question. Choose the best possible answer and shade your choice on the answer sheet.
4. Answer every question; there are no penalties for guessing.
5. Questions that have a graph are drawn to scale. Questions that have a diagram are usually not drawn to scale.

Strategies for Open Response Questions:
1. These questions are asking you to show what you know and what you can do. Complete solutions including any rough work are expected for these questions. Give as much information as you can.
2. Read the question carefully and highlight any key words or information with a highlighter.
3. Write your solution in the space provided. Try to give a clear well organized solution to illustrate your complete understanding and ability to communicate. Write your solutions so they can be understood by someone who does not know your work.
4. Don’t erase any of your calculations, drawing or reasoning. Scorers want to see all your work.
5. Use the list of key words on the previous page to help you decide what is expected in your answer. For example, “show your work” means, record all calculations and all the steps you went through to get your answer. You may use words, numbers, graphs, diagrams, symbols and/or charts.
6. The problems in these questions often have more than one way of being solved. Be sure to clearly explain your solution using graphs, tables, pictures numbers or words.
7. When using a calculator, write down all the numbers you use and the operations you carry out. For example, to find the area of a circle with diameter 7cm you need to write $A = \pi (3.5)^2 \approx 38.485cm^2$. 
### Open Response Rubric

<table>
<thead>
<tr>
<th>Code</th>
<th>Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>blank: nothing written or drawn in response to the question</td>
</tr>
<tr>
<td>I</td>
<td>illegible: cannot be read; completely crossed out/erased; not written in English</td>
</tr>
<tr>
<td></td>
<td>irrelevant content: does not attempt assigned question (e.g., comment on the task, drawings, “?”, “!”, “I don’t know”)</td>
</tr>
<tr>
<td></td>
<td>off topic: no relationship of written work to the question</td>
</tr>
<tr>
<td>10</td>
<td>demonstration of limited understanding of concepts and/or procedures</td>
</tr>
<tr>
<td></td>
<td>application of knowledge and skills shows limited effectiveness due to</td>
</tr>
<tr>
<td></td>
<td>o misunderstanding of concepts</td>
</tr>
<tr>
<td></td>
<td>o incorrect selection or misuse of procedures</td>
</tr>
<tr>
<td></td>
<td>problem-solving process shows limited effectiveness due to</td>
</tr>
<tr>
<td></td>
<td>o minimal evidence of a solution process</td>
</tr>
<tr>
<td></td>
<td>o limited identification of important elements of the problem</td>
</tr>
<tr>
<td></td>
<td>o too much emphasis on unimportant elements of the problem</td>
</tr>
<tr>
<td></td>
<td>o no conclusions presented</td>
</tr>
<tr>
<td></td>
<td>o conclusion presented without supporting evidence</td>
</tr>
<tr>
<td>20</td>
<td>demonstration of some understanding of concepts and/or procedures</td>
</tr>
<tr>
<td></td>
<td>application of knowledge and skills shows some effectiveness due to</td>
</tr>
<tr>
<td></td>
<td>o partial understanding of the concepts</td>
</tr>
<tr>
<td></td>
<td>o errors and/or omissions in the application of the procedures</td>
</tr>
<tr>
<td></td>
<td>problem-solving process shows some effectiveness due to</td>
</tr>
<tr>
<td></td>
<td>o an incomplete solution process</td>
</tr>
<tr>
<td></td>
<td>o identification of some of the important elements of the problem</td>
</tr>
<tr>
<td></td>
<td>o some understanding of the relationships between important elements of the problem</td>
</tr>
<tr>
<td></td>
<td>o simple conclusions with little supporting evidence</td>
</tr>
<tr>
<td>30</td>
<td>demonstration of considerable understanding of concepts and/or procedures</td>
</tr>
<tr>
<td></td>
<td>application of knowledge and skills shows considerable effectiveness due to</td>
</tr>
<tr>
<td></td>
<td>o an understanding of most of the concepts</td>
</tr>
<tr>
<td></td>
<td>o minor errors and/or omissions in the application of the procedures</td>
</tr>
<tr>
<td></td>
<td>problem-solving process shows considerable effectiveness due to</td>
</tr>
<tr>
<td></td>
<td>o a solution process that is nearly complete</td>
</tr>
<tr>
<td></td>
<td>o identification of most of the important elements of the problem</td>
</tr>
<tr>
<td></td>
<td>o a considerable understanding of the relationships between important elements of the problem</td>
</tr>
<tr>
<td></td>
<td>o appropriate conclusions with supporting evidence</td>
</tr>
<tr>
<td>40</td>
<td>demonstration of thorough understanding of concepts and/or procedures</td>
</tr>
<tr>
<td></td>
<td>application of knowledge and skills shows a high degree of effectiveness due to</td>
</tr>
<tr>
<td></td>
<td>o a thorough understanding of the concepts</td>
</tr>
<tr>
<td></td>
<td>o an accurate application of the procedures (any minor errors and/or omissions do not detract from the demonstration of a thorough understanding)</td>
</tr>
<tr>
<td></td>
<td>problem-solving process shows a high degree of effectiveness due to</td>
</tr>
<tr>
<td></td>
<td>o a complete solution process</td>
</tr>
<tr>
<td></td>
<td>o identification of all important elements of the problem</td>
</tr>
<tr>
<td></td>
<td>o a thorough understanding of the relationships between all of the important elements of the problem</td>
</tr>
<tr>
<td></td>
<td>o appropriate conclusions with thorough and insightful supporting evidence</td>
</tr>
</tbody>
</table>
# Formula Sheet

## Grade 9 Academic

<table>
<thead>
<tr>
<th>Geometric Figure</th>
<th>Perimeter</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rectangle</strong></td>
<td>$P = l + l + w + w$ or $P = 2(l + w)$</td>
<td>$A = lw$</td>
</tr>
<tr>
<td><img src="image" alt="Rectangle" /></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Parallelogram</strong></td>
<td>$P = b + b + c + c$ or $P = 2(b + c)$</td>
<td>$A = bh$</td>
</tr>
<tr>
<td><img src="image" alt="Parallelogram" /></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Triangle</strong></td>
<td>$P = a + b + c$</td>
<td>$A = \frac{bh}{2}$ or $A = \frac{1}{2}bh$</td>
</tr>
<tr>
<td><img src="image" alt="Triangle" /></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Trapezoid</strong></td>
<td>$P = a + b + c + d$</td>
<td>$A = \frac{(a + b)h}{2}$ or $A = \frac{1}{2}(a + b)h$</td>
</tr>
<tr>
<td><img src="image" alt="Trapezoid" /></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Circle</strong></td>
<td>$C = \pi d$ or $C = 2\pi r$</td>
<td>$A = \pi r^2$</td>
</tr>
<tr>
<td><img src="image" alt="Circle" /></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geometric Figure</td>
<td>Surface Area</td>
<td>Volume</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td><strong>Cylinder</strong></td>
<td>$A_{\text{base}} = \pi r^2$</td>
<td>$V = (A_{\text{base}})(\text{height})$</td>
</tr>
<tr>
<td></td>
<td>$A_{\text{lateral surface}} = 2\pi rh$</td>
<td>$V = \pi r^2 h$</td>
</tr>
<tr>
<td></td>
<td>$A_{\text{total}} = 2A_{\text{base}} + A_{\text{lateral surface}}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$= 2\pi r^2 + 2\pi rh$</td>
<td></td>
</tr>
<tr>
<td><strong>Sphere</strong></td>
<td>$A = 4\pi r^2$</td>
<td>$V = \frac{4}{3} \pi r^3$ or $V = \frac{4\pi r^3}{3}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cone</strong></td>
<td>$A_{\text{lateral surface}} = \pi rs$</td>
<td>$V = \frac{(A_{\text{base}})(\text{height})}{3}$</td>
</tr>
<tr>
<td></td>
<td>$A_{\text{base}} = \pi r^2$</td>
<td>$V = \frac{1}{3} \pi r^2 h$ or $V = \frac{\pi r^2 h}{3}$</td>
</tr>
<tr>
<td></td>
<td>$A_{\text{total}} = A_{\text{lateral surface}} + A_{\text{base}}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$= \pi rs + \pi r^2$</td>
<td></td>
</tr>
<tr>
<td><strong>Square-based pyramid</strong></td>
<td>$A_{\text{triangle}} = \frac{1}{2} bs$</td>
<td>$V = \frac{(A_{\text{base}})(\text{height})}{3}$</td>
</tr>
<tr>
<td></td>
<td>$A_{\text{base}} = b^2$</td>
<td>$V = \frac{1}{3} b^2 h$ or $V = \frac{b^2 h}{3}$</td>
</tr>
<tr>
<td></td>
<td>$A_{\text{total}} = 4A_{\text{triangle}} + A_{\text{base}}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$= 2bs + b^2$</td>
<td></td>
</tr>
<tr>
<td><strong>Rectangular prism</strong></td>
<td>$A = 2(wh + lw + lh)$</td>
<td>$V = (A_{\text{base}})(\text{height})$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V = lwh$</td>
</tr>
<tr>
<td><strong>Triangular prism</strong></td>
<td>$A_{\text{base}} = \frac{1}{2} bl$</td>
<td>$V = (A_{\text{base}})(\text{height})$</td>
</tr>
<tr>
<td></td>
<td>$A_{\text{rectangles}} = ah + bh + ch$</td>
<td>$V = \frac{1}{2} blh$ or $V = \frac{blh}{2}$</td>
</tr>
<tr>
<td></td>
<td>$A_{\text{total}} = A_{\text{rectangles}} + 2A_{\text{base}}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$= ah + bh + ch + bl$</td>
<td></td>
</tr>
</tbody>
</table>
Grade 9 Assessment of Mathematics
2014

Released Assessment Questions: Academic

Student Answer Sheet
Your multiple-choice answers must be entered on this sheet.
• To indicate your answer, use a pencil to fill in the circle completely.
  Like this: ● Not like this: ❌ ✗ ✗ ✗
• Do not fill in more than one answer to a question.
• Do not leave a question blank.
• Cleanly erase any answer you wish to change and fill in the circle for your new answer.

1. a b c d  9. a b c d  17. a b c d  25. a b c d
2. a b c d  10. a b c d  18. a b c d  26. a b c d
3. a b c d  11. a b c d  19. a b c d  27. a b c d
4. a b c d  12. a b c d  20. a b c d  28. a b c d
5. a b c d  13. Respond in booklet.
6. Respond in booklet.
7. a b c d  14. Respond in booklet.
8. a b c d  15. a b c d  16. a b c d
9. a b c d  17. a b c d  25. a b c d  30. Respond in booklet.
10. a b c d  18. a b c d  26. a b c d  31. Respond in booklet.
11. a b c d  19. a b c d  27. a b c d
12. a b c d  20. a b c d  28. a b c d
13. Respond in booklet.
15. a b c d  22. Respond in booklet.
16. a b c d  23. Respond in booklet.
21. a b c d  24. a b c d

End of Assessment

Print Student Name: ________________________

Student Signature: ________________________
Please note: The format of this booklet is different from that used for the assessment. The questions themselves remain the same.

Record your answers to the multiple-choice questions on the Student Answer Sheet (2014, Academic).
1. The following is the formula for the area of a circle:

\[ A = \pi r^2 \]

If the radius of a circle is 1.25 cm, which of the following is closest to its area?

a. 15.4 cm²  
b. 7.9 cm²  
c. 4.9 cm²  
d. 3.9 cm²

2. What goes in the blank to complete the equation below?

\[(8x^3 \text{ [ ] }) = 24x^{12}\]

a. 3x^9  
b. 3x^4  
c. 16x^9  
d. 16x^4

3. A cellphone company offers four choices for purchasing talk time.

Which of the following has the lowest cost per minute?

a. 200 minutes for $24.50  
b. 550 minutes for $68.00  
c. 700 minutes for $80.25  
d. 850 minutes for $99.50

4. Marc has a garden that is made up of three square sections. He builds a fence on one side of the garden as shown below.

Which of the following is closest to the length of the fence, l?

a. 19.7 m  
b. 10.6 m  
c. 9.9 m  
d. 6.3 m

5. What is the value of x in the equation

\[-4(2x - 1) = 36?\]

a. -4  
b. -\frac{35}{8}  
c. -\frac{37}{8}  
d. -5

-8x + 4 = 36

-8x = 32

x = -4
Share the Profits

Three partners, Luc, Deborah and Melanie, share the profits of a business in the ratio 2:3:7 respectively.

The profit for this year is $176,496.

Determine the share of the profit for each partner.

Show your work.

\[
\text{Total parts} = 12 \\
\text{Luc} = \frac{176,496}{12} = 14,708 \\
\text{Deb} = \frac{3}{7} \times 14,708 = 5,816 \\
\text{Mel} = \frac{2}{7} \times 14,708 = 4,232 \\
\]

\[12x = 176,496 \\
x = \frac{176,496}{12} = 14,708\]
7. Four stores hire people to deliver flyers. Each pays a different amount per flyer delivered. The points on the graph below show the total pay for a certain number of flyers delivered for each of the stores.

Which store will pay $45 for 450 flyers delivered?

- a. Store W
- b. Store X
- c. Store Y
- d. Store Z
8. The total yearly cost of a museum membership is made up of a fee of $25, plus $5 per visit.

Which graph best represents the relationship between total yearly cost, $C$, and number of visits, $n$?

a. 

b. 

c. 

d. 


Her total pay each week is made up of a base salary and a commission of 15% of her sales that week.

One week, her total pay is $167.50 and she has $850 in sales.

Which equation below represents the relationship between her total pay, $P$, each week and sales, $s$?

a. $P = 15s$

b. $P = 40 + 0.15s$

c. $P = 850 + 0.15s$

d. $P = 167.50 + 0.15s$

\[
P = B + 0.15s
\]

\[
167.50 = B + 0.15(850)
\]

\[
167.50 = B + 127.50
\]

\[
167.50 - 127.50 = B
\]

\[B = 40\]
10. Which of the following shows data from a non-linear relation?

<table>
<thead>
<tr>
<th>n</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>

11. What is the value of $P$ in the equation below when $r = -7$?

$P = 4 - 2r$

- a. $-14$
- b. $-10$
- c. $14$
- d. $18$
The table below shows information about the linear relationship between Ben’s total savings and the number of months he saves money.

<table>
<thead>
<tr>
<th>Number of months, $n$</th>
<th>Total savings, $S$ ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>345</td>
</tr>
<tr>
<td>6</td>
<td>540</td>
</tr>
<tr>
<td>9</td>
<td>735</td>
</tr>
<tr>
<td>12</td>
<td>930</td>
</tr>
</tbody>
</table>

Which of the following represents this relationship?

- **a** $S = 65n + 345$
- **b** $S = 195n - 150$
- **c** $S = 65n + 150$
- **d** $S = 65n + 180$
More Money, Please!

The graph below shows information about the amount of money, $A$, in Shreya’s bank account and the number of months, $n$, she has had the account.

![Graph showing the relationship between the amount of money in the account and the number of months.](image)

Draw the line of best fit for the data.

Determine the equation of your line of best fit.

Show your work.

$$A = 95 - 15.8n$$
Roll with It!

The total cost at an amusement park is made up of an admission fee and a cost per ride. Information about the total cost for \( n \) rides last year is shown below.

This year, the cost per ride is reduced from last year, but the total cost for 10 rides is the same. Determine a possible equation for the total cost, \( C \), for this year. Include an admission fee and a cost per ride.

Justify your answer.
15 The equation of a line is $5x - 2y + 10 = 0$.
Which of the following expresses this equation in the form $y = mx + b$?

a  $y = \frac{5}{2}x + 5$

b  $y = \frac{5}{2}x + 10$

c  $y = -\frac{5}{2}x + 5$

d  $y = -\frac{5}{2}x + 10$

16 A formula for determining the slope of a line is given below.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

What is the slope of the line that passes through the points $(2, 3)$ and $(5, -6)$?

a  $-11$

b  $-3$

c  $-\frac{1}{3}$

d  $-\frac{1}{11}$
Consider the line represented by the equation \( y = 3x + 2 \).

A new line is formed by decreasing the slope and increasing the \( y \)-intercept.

Which of the following could be the graph of the new line?

\[ m = 3 \]
\[ y - i n t = t 2 \]
18 Lee thinks of a line represented by the equation
\[ y = -4x + 6. \]
Which line on the graph below is
• steeper than Lee’s line and
• has a \( y \)-intercept that has half the value of
Lee’s line?

\[ \text{Graph showing lines p, q, r, and u.} \]

19 A line has a \( y \)-intercept of 4 and a slope of \(-3\).
Which equation represents this line?
\[ a \quad y = 4x + 3 \]
\[ b \quad y = 4x - 3 \]
\[ c \quad y = 4 + 3x \]
\[ d \quad y = 4 - 3x \]

20 The table below shows information about the total cost to rent a car and the
distance driven.

<table>
<thead>
<tr>
<th>Distance driven, ( d ) (km)</th>
<th>Total cost, ( C ) ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>65</td>
</tr>
<tr>
<td>200</td>
<td>80</td>
</tr>
<tr>
<td>300</td>
<td>95</td>
</tr>
<tr>
<td>400</td>
<td>110</td>
</tr>
</tbody>
</table>

What information would the \( C \)-intercept and slope of the graph of this linear
relationship give?

\[ a \quad \text{There is no fixed fee, and the cost per kilometre is 0.15.} \]
\[ b \quad \text{There is no fixed fee, and the cost per kilometre is 0.65.} \]
\[ c \quad \text{There is a 50 fixed fee, and the cost per kilometre is 0.15.} \]
\[ d \quad \text{There is a 50 fixed fee, and the cost per kilometre is 0.65.} \]

21 Jared uses the equation \( C = 30n \) to determine
the cost, \( C \), in dollars, for renting a car for \( n \)
days, where \( n \) is a whole number.

If Jared can spend a maximum of $200 on the
rental, which of the following describes the
possible values of \( n \)?

\[ a \quad 7, 8, 9, ... \]
\[ b \quad 6, 7, 8, 9, ... \]
\[ c \quad 0, 1, 2, 3, 4, 5, 6 \]
\[ d \quad 0, 1, 2, 3, 4, 5, 6, 7 \]
## Is It a Line?

Determine whether each of the relations in the chart below is linear or non-linear. Justify your answers. You may use the grid if you wish.

<table>
<thead>
<tr>
<th>Relation</th>
<th>Justification</th>
<th>Circle one:</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$-2x + 6y = 18$</td>
<td></td>
<td>Linear</td>
<td>Non-linear</td>
<td></td>
</tr>
<tr>
<td>$y = 4x^2 + 3$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Justification

![Graph](image_url)
Movie Night

There are two payment options for downloading movies from a Web site.

• Option A: Pay $30 for a membership and $2 per movie downloaded.
• Option B: Shown on the grid below.

Determine under which conditions a person should select Option A and under which conditions a person should select Option B.

Justify your answer.

• More than 10 movies, Option A is better
• At 10 movies, it does not matter
• At less than 10 movies, Option B is less expensive
24 The diagram below is made of a right triangle and three squares.

Which of the following is represented by this diagram?

a) \( p^2 = r^2 - m^2 \)
b) \( p^2 = m^2 - r^2 \)
c) \( r^2 = p^2 - m^2 \)
d) \( r^2 = m^2 - p^2 \)

25 The 5 km of highway between City X and City Y is closed. There are two possible detour routes: one through Town A and one through Town B, as shown in the diagram below.

How much shorter is the detour through Town B than the detour through Town A?

a) 7 km
b) 9 km
c) 16 km
d) 18 km
26 The sign below is made up of a rectangle and a semicircle.

\[ A_r = lw \]
\[ A_s = \frac{1}{2} \pi r^2 \]
\[ P = 30 \text{ cm} \]

Which of the following is closest to the area of the sign?

a. 347 cm²
b. 653 cm²
c. 1007 cm²
d. 1410 cm²

27 The container pictured below is made up of a cone and a cylinder. The cone and the cylinder have the same height.

\[ V = \frac{1}{3} \pi r^2 h \]

Which of the following is closest to the volume of the container?

a. 2261 cm³
b. 3016 cm³
c. 3393 cm³
d. 4524 cm³

28 What is the value of \( x \) in the diagram below?

\[ x + x + 38 = 160 \]
\[ 2x + 38 = 160 \]
\[ 2x = 122 \]
\[ x = 61 \]

The correct answer is b. 71°.
The sum of the interior angles of a polygon is 2700°.

How many sides does the polygon have?

a 19
b 17
c 15
d 13

\[
\text{Sum} = 180 \times \text{no. of sides}\\
2700 = \frac{180(n-2)}{180}\\
15 = n - 2\\
15 + 2 = n\\
n = 17
\]
Coated Cones

An ice cream store offers chocolate-coated cones as shown in the diagram below.

The cone is open topped, and the entire outside is coated in chocolate.

Determine the area of the surface that is coated in chocolate.

Show your work.

**Find Slant Height**

\[ a^2 + b^2 = c^2 \]
\[ 6^2 + 10^2 = c^2 \]
\[ 36 + 100 = c^2 \]
\[ 136 = c^2 \]
\[ \sqrt{136} = c \]
\[ 11.7 = c \]

**Find Surface Area**

\[ SA = \pi r s \]
\[ = (3.14)(6)(11.7) \]
\[ = 220 \text{ cm}^2 \]
### Daring Diagram

A diagram is shown below.

![Diagram](image)

Complete the table below with the values of $x$ and $y$. Justify your answers using geometric properties.

<table>
<thead>
<tr>
<th>Value</th>
<th>Justification using geometric properties</th>
</tr>
</thead>
</table>
| $x = \text{113.3}^\circ$ | \[
\begin{align*}
\text{sum internal of polygons} \\
3x + 100 + 100 &= 540 \\
3x &= 340 \\
\frac{3x}{3} &= \frac{340}{3} \\
x &= \text{113.3}^\circ
\end{align*}
\] |
| $y = \text{115}^\circ$ | \[
\begin{align*}
\text{sum internal polygon} \\
y + 70 + 90 + 85 &= 360 \\
y &= \text{115}^\circ
\end{align*}
\] |
Grade 9 Assessment of Mathematics
2013

RELEASED ASSESSMENT QUESTIONS

Record your answers to the multiple-choice questions on the Student Answer Sheet (2013, Academic).

Please note: The format of this booklet is different from that used for the assessment. The questions themselves remain the same.
1. What is the value of $5x^3y^2$ when $x = 2$ and $y = 4$?
   a. 240
   b. 320
   c. 480
   d. 640

2. What exponent goes in the box to make the following equation true?
   \[ \frac{x^{\bigcirc}x^6}{x^2} = x^{12} \]
   a. 9
   b. 8
   c. 4
   d. 3

3. Mario is making fruit punch by mixing orange juice and pineapple juice in a ratio of 1:3.
   How much pineapple juice should he use to make 3 L of fruit punch?
   a. 0.75 L
   b. 2 L
   c. 2.25 L
   d. 4 L

4. Which of the following is a simplified form of the expression $4(5x - 8) - 3(2x + 7)$?
   a. $14x - 11$
   b. $14x - 53$
   c. $26x - 11$
   d. $26x - 53$

5. The square and the triangle below have the same area.
   \[ A = s^2 \]
   \[ A = \frac{bh}{2} \]
   What is the value of $n$?
   a. 1
   b. 2
   c. 8
   d. 16
6 Healthy Fish

James adds vitamin drops to his fish tank to keep his fish healthy.

If James follows the instructions on the bottle of vitamins, how many capfuls should he add to his 350-litre fish tank?

Show your work.

- 2 drops per 5 litres of water
- 1 capful = 40 drops

\[ \frac{2}{5} \times \frac{x}{350} \]

\[ x = \frac{700}{5} = 140 \]

\[ \text{or} \quad \frac{2}{5} \times \frac{x}{350} \]

\[ x = 140 \]

\[ \# \text{ caps} = \frac{\text{Total}}{\text{1 cap}} = \frac{140}{40} = 3.5 \]

\[ \circ 3.5 \text{ capfuls needed} \]
A rain barrel full of water is drained at a constant rate. Data for the first few minutes of draining is shown on the grid below.

Volume Left in the Rain Barrel vs. Time

<table>
<thead>
<tr>
<th>Time (minutes)</th>
<th>Volume left in the barrel (L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>80</td>
</tr>
<tr>
<td>4</td>
<td>60</td>
</tr>
<tr>
<td>6</td>
<td>40</td>
</tr>
<tr>
<td>8</td>
<td>20</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
</tr>
</tbody>
</table>

After 6 minutes, the draining is stopped.

How much water is needed to refill the rain barrel?

a 90 L  
b 75 L  
c 25 L  
d 10 L

Luisa chooses a cellphone plan that charges a flat fee of $20 per month and $0.25 for each text message sent.

Which equation best represents the cost of Luisa's cellphone plan, C, in dollars, where n is the number of text messages sent?

a  \( C = 20.25n \)  
b  \( C = 20(0.25n) \)  
c  \( C = 20n + 0.25 \)  
d  \( C = 0.25n + 20 \)

There is a linear relationship between the total cost of renting a costume and the number of hours the costume is rented.

- For 3 hours, the total cost is $60.
- For 5 hours, the total cost is $80.

What type of variation is this relationship, and what is its initial value?

a a partial variation with an initial value of $30  
b a partial variation with an initial value of $20  
c a direct variation with an initial value of $30  
d a direct variation with an initial value of $20
For which scatter plot could the line $y = 5$ be the line of best fit?

(a) 

(b) 

(c) 

(d)
Alex’s distance from home is represented by the equation \( D = -0.5t + 300 \), where \( D \) represents his distance from home, in kilometres, and \( t \) represents time, in minutes.

How long will it take Alex to reach a distance of 182 km from home?

- (a) 236 minutes
- (b) 209 minutes
- (c) 64 minutes
- (d) 59 minutes

Two lines are shown below.

Which of the following describes a difference between Line 1 and Line 2?

- (a) Line 2 has a larger initial cost. \( \times \)
- (b) Line 1 has a larger initial cost. \( \times \)
- (c) Line 2 has a greater rate of change. \( \times \)
- (d) Line 1 has a greater rate of change.
18 Planting More Trees

Rachel plants trees in Northern Ontario. She is paid $55 a day plus 15¢ for each tree she plants.

On the grid provided, draw the graph of the relationship between Rachel’s total earnings for a single day, \( E \), in dollars, and the number of trees she plants that day, \( n \).

Include a scale on the vertical axis.

Write an equation to represent the relationship between Rachel’s earnings for a single day, \( E \), and the number of trees she plants, \( n \).

\[
E = 55 + 0.15n
\]
14 Water in a Pool

The graph below represents the relationship between the amount of water, \( A \), in a pool as it drains and time, \( t \).

![Graph showing the relationship between amount of water and time](image)

- Time (min) vs. Amount of Water (L)
- Points: (0, 45000), (10, 49000), (20, 45000), (30, 45000), (40, 45000), (50, 45000), (60, 45000), (70, 45000)
- Slope: \( \text{slope} = \frac{\text{rise}}{\text{run}} = \frac{45000}{50} = 900 \text{ L/min} \)

Determine the initial amount of water in the pool and the rate of change of this relation.

Show your work.
15 Which of the following equations is equivalent to $3x - 5y = 45$?

a. $y = \frac{3}{5}x - 9$

b. $y = -\frac{3}{5}x + 9$

c. $y = 3x - 45$

d. $y = -3x + 45$

16 The point on the grid below belongs to a linear relation that has $-\frac{3}{2}$ as its rate of change.

Which of the following points also belongs to this relation?

a. (2, 6)

b. (2, 10)

C. (3, 11)

d. (7, 11)
17 Which of the following lines has the same slope as the line represented by \( y = -3x + 4 \)?

\[ \text{Slope} = -\frac{3}{1} \]

18 Which equation below represents a line that is perpendicular to the line represented by \( y = 3x - 5 \)?

\[ m = \frac{3}{1}, \quad m_{\perp} = -\frac{1}{3} \]

- a \( y = 3x + \frac{1}{5} \)
- b \( y = -3x - \frac{1}{5} \)
- c \( y = \frac{1}{3}x + 7 \)
- d \( y = \frac{1}{3}x - 7 \)
19 Which of the following is the graph of the equation \( y = -2x + 6 \)?
20 The equations below represent the relationship between the total cost, \( C \), in dollars, to repair a computer and the amount of time, \( t \), in hours, at two computer repair stores.

- Compu-Fix: \( C = 10 + 15t \)
- Data Repair: \( C = 30 + 12t \)

It will take between 1 and 5 hours to repair Maria’s computer.

What are the smallest and largest possible amounts Maria could pay?

- a \( $10, $85 \)
- b \( $10, $90 \)
- c \( $25, $85 \)
- d \( $25, $90 \)

\[ C_{\text{Compu-Fix}} = 10 + 15(t) \]
\[ C_{\text{Compu-Fix}} = 25 \text{ min} \]
\[ C = 25 + 15(1) \]
\[ C = 40 \]

\[ C_{\text{Data Repair}} = 30 + 12(t) \]
\[ C_{\text{Data Repair}} = 75 \text{ min} \]
\[ C = 10 + 6(5) \]
\[ C = 10 + 30 \]
\[ C = 40 \]

21 Tony and Mike decide to keep track of their reading. The graph below represents the relationship between the number of pages of a novel each has read and the time spent reading since they started tracking.

Number of Pages Read vs. Amount of Time Spent Reading

<table>
<thead>
<tr>
<th>Amount of time spent reading (h)</th>
<th>Number of pages read</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>200</td>
</tr>
<tr>
<td>6</td>
<td>300</td>
</tr>
<tr>
<td>8</td>
<td>400</td>
</tr>
</tbody>
</table>

![Graph showing Tony and Mike's reading progress]

Which of the following statements is true?

- a At 5 hours, Mike has read 100 pages more than Tony.
- b Before 5 hours, Tony has read fewer pages than Mike.
- c At 250 minutes, Mike has read the same number of pages as Tony.
- d It takes 250 minutes for Tony to catch up to the number of pages that Mike has read.
Lucia and Paul each have a plant. Both plants grow at a constant rate.

Lucia records information about the height of her plant in a table, and Paul graphs his results as shown below.

**Lucia's Plant**

<table>
<thead>
<tr>
<th>Day</th>
<th>Height (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>13</td>
<td>14</td>
</tr>
</tbody>
</table>

\[ \text{rate} = \frac{2}{3} = 0.67 \]

\[ \text{rise} = 2 \]

**Paul's Plant**

\[ \text{rise} = \frac{4}{2} = 2 \]

\[ \text{run} = 2 \]

Whose plant is growing faster?

Circle one: Lucia’s  Paul’s

Justify your answer.

Paul's plant grows 2 cm/day whereas Lucia's plant grows 0.67 cm/day.
**Lovely Lines**

Line 1 is shown on the grid below.

Graph Line 2 on the same grid so that it passes through \( A(-10, 8) \) and has a slope that is three times the slope of Line 1.

Justify your answer.

\[
\text{Slope of line } 1 = \frac{-1}{2}
\]

\[
3 \text{ times slope above line } 1 = \frac{3}{1} \left( -\frac{1}{2} \right) = -\frac{3}{2}
\]
24 Marcus is building a rectangular dog pen along the side of his house as shown below.

![Diagram of dog pen and house](image)

Marcus has 20 m of fencing for the 3 sides of the dog pen.

What is the length of the dog pen with the maximum area?

- a 4 m
- b 5 m
- c 10 m
- d 12 m

25 An open-topped paper drinking cup in the shape of a cone is pictured below.

![Diagram of cone](image)

Which is closest to the amount of paper required to make the cup?

- a 185 cm$^2$
- b 167 cm$^2$
- c 135 cm$^2$
- d 126 cm$^2$

![Calculation of surface area](image)

26 The diagram below is made of a trapezoid and a semicircle.

![Diagram of shape](image)

Which is closest to the area of the shaded part of the diagram?

- a 2 cm$^2$
- b 16 cm$^2$
- c 21 cm$^2$
- d 36 cm$^2$

27 The cylinder and the cone shown below have the same height and radius.

![Diagram of cylinder and cone](image)

What number completes this equation?

- a 3
- b 2
- c 1/2
- d 1/3
28 Consider the diagram below.

\[
\begin{align*}
37 + 90 + 90 + z &= 360 \\
\text{Sum interior quadrilateral} &= z + 217 = 360 \\
z &= 143 \\
y &= 180 - 30 - 90 \\
&= 60 \\
x &= z - y = 143 - 60 \\
&= 83
\end{align*}
\]

What is the value of \( x \) in the diagram?

- a 30°
- b 53°
- c 60°
- d 83°

29 Consider the regular octagon below.

\[
\text{Sum interior} = 180(8-2) = 1080
each\ angle = \frac{1080}{8} = 135
\]

What is the value of \( x \)?

- a 15°
- b 30°
- c 45°
- d 60°
Cutting Cones

The figure pictured below is a cone with its top portion removed.

Determine the volume of this figure.

Show your work.

\[
V_{\text{cut}} = V_{\text{large}} - V_{\text{small}}
\]

\[
= \frac{\pi r^2 h}{3} - \frac{\pi r'^2 h}{3}
\]

\[
= \frac{3.14(4)^2(12)}{3} - \frac{3.14(3)^2(12)}{3}
\]

\[
= 200.96 - 113.04
\]

\[
= 87.92 \text{ cm}^3
\]
**31 Diamond Cut**

The diagram below shows a regular decagon and three isosceles triangles.

Determine the values of $x$ and $y$. Justify your answers using geometric properties.

<table>
<thead>
<tr>
<th>Value</th>
<th>Justification using geometric properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>$x = 144^\circ$</td>
<td>Sum interior = $180(10-2)$ [\text{decagon} = 180(8)] [= 1440] [x = \frac{1440}{10} = 144^\circ]</td>
</tr>
<tr>
<td>$y = 83^\circ$</td>
<td>$z + z + 14 = 180^\circ$ (sum interior triangle) [2z = 166] [z = 83] [y = 83 \text{ Z-pattern}]</td>
</tr>
</tbody>
</table>
Grade 9 Assessment of Mathematics

2012

Released Assessment Questions: Academic

Student Answer Sheet

Your multiple-choice answers must be entered on this sheet.

- To indicate your answer, use a pencil to fill in the circle completely.
  
  Like this: ■ Not like this: ◯

- Do not fill in more than one answer to a question.
- Do not leave a question blank.
- Cleanly erase any answer you wish to change and fill in the circle for your new answer.

1. a b c d
2. a b c d
3. a b c d
4. a b c d
5. a b c d
6. Respond in booklet.
7. a b c d
8. a b c d
9. a b c d
10. a b c d
11. a b c d
12. a b c d
13. Respond in booklet.
15. a b c d
16. a b c d
17. a b c d
18. a b c d
19. a b c d
20. a b c d
21. a b c d
22. Respond in booklet.
23. Respond in booklet.
24. a b c d
25. a b c d
26. a b c d
27. a b c d
28. a b c d
29. a b c d
30. Respond in booklet.
31. Respond in booklet.

End of Assessment

Print Student Name: ___________________________

Student Signature: ___________________________
Grade 9 Assessment of Mathematics

2012

RELEASED ASSESSMENT QUESTIONS

Record your answers to the multiple-choice questions on the Student Answer Sheet (2012, Academic).

Please note: The format of this booklet is different from that used for the assessment. The questions themselves remain the same.
1. What is the value of the expression $x^2$ when $x = \frac{4}{5}$?

   a. $\frac{8}{5}$
   b. $\frac{8}{10}$
   c. $\frac{16}{5}$
   d. $\frac{16}{25}$

2. The volume of a rectangular prism is represented by $12x^3$. The height is represented by $3x$.

   Which of the following represents the area of the base?

   **Hint:**
   $V = \text{(area of base)} \times \text{(height)}$

   a. $4x^2$
   b. $4x^3$
   c. $9x^2$
   d. $9x^3$

3. A basketball player scores 28 points in a game. She scores 35% of the total team points.

   How many points does her team score in total?

   a. 63
   b. 65
   c. 72
   d. 80

4. Which of the expressions below is equivalent to $3(4x - 5) - 7(9x - 2)$?

   a. $-51x - 1$
   b. $-51x - 3$
   c. $-51x - 7$
   d. $-51x - 29$

5. Liam sells sandwiches at an arena. He earns $10.50 per hour plus $0.40 for each sandwich he sells.

   How many sandwiches does he need to sell during a 6-hour shift to earn $125?

   a. 158
   b. 155
   c. 62
   d. 12
What a Bargain!

Susan buys a tennis racket from a store.

- The tennis racket's original price is $75.
- All tennis rackets are on sale for 25% off the original price.
- The tennis racket has a scratch, so she receives an additional 10% off the sale price.

How much does Susan pay for her tennis racket, including 13% tax?

Show your work.

\[
\text{Total Off} = 35% \\
\text{Total Cost Off} = \$75 \left( \frac{35}{100} \right) = \$26.25 \\
\text{Cost Before Tax} = 75 - 26.25 = \$48.75 \\
\text{Cost with Tax} = 48.75 \times 1.13 = \$55.09
\]

\[
\text{25% Off} \\
= 75 \times (0.25) \\
= 18.75 \\
\text{New Price} = 75 - 18.75 = \$56.25 \\
\text{Scratch} = 56.25 \times (0.1) = 5.625 \\
\text{New} = 56.25 - 5.625 = \$50.63 \\
\text{Total with Tax} = 50.63 \times 1.13 = \$58.14
\]
7. Consider the graph below.

Which relationship is most likely to be represented by this graph?

a. height vs. weight
b. pay vs. number of hours worked
c. gas remaining vs. distance travelled
d. volume of water in a bucket vs. its mass

8. The figures below are made with sticks of equal length. Figure 1 is made with 4 sticks.

Figure 1

Figure 2

Figure 3

The pattern continues in the same way. Which table shows the relationship between the number of sticks, S, and the figure number, n?

a

<table>
<thead>
<tr>
<th>n</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>36</td>
</tr>
</tbody>
</table>

b

<table>
<thead>
<tr>
<th>n</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>40</td>
</tr>
<tr>
<td>5</td>
<td>52</td>
</tr>
<tr>
<td>6</td>
<td>64</td>
</tr>
</tbody>
</table>

c

<table>
<thead>
<tr>
<th>n</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>5</td>
<td>20</td>
</tr>
</tbody>
</table>

d

<table>
<thead>
<tr>
<th>n</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>17</td>
</tr>
<tr>
<td>6</td>
<td>21</td>
</tr>
<tr>
<td>7</td>
<td>25</td>
</tr>
</tbody>
</table>
9. Which of the following represents a non-linear relation?

\[ \begin{array}{c|c}
   x & y \\
   \hline
   1 & 1 \\
   2 & 4 \\
   3 & 9 \\
   4 & 16 \\
\end{array} \]

b. \[ y = mx + b \]

c. \[ y = 2x + 3 \]

d. \[ \begin{array}{c|c}
   x & y \\
   \hline
   4 & 8 \\
   3 & 5 \\
   2 & 2 \\
   1 & -1 \\
\end{array} \]

10. A line of best fit is drawn on the scatter plot below.

The slope of the line is \(-2\).
Which equation represents the line?

a. \( y = 6x - 2 \)

b. \( y = 3x - 2 \)

c. \( y = -2x + 3 \)

d. \( y = -2x + 6 \)
Bruno leaves home and goes for a run along a straight path. He runs to the park, stops for a rest and returns home.

Which graph best represents his run?
Abigail buys a prepaid card for her cellphone. When she talks on her phone, a fee per minute is deducted from the value of the prepaid card.

The table below shows information about the remaining value of the card.

<table>
<thead>
<tr>
<th>Total number of minutes used, t</th>
<th>Remaining value, V ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>25</td>
</tr>
<tr>
<td>10</td>
<td>22.00</td>
</tr>
<tr>
<td>20</td>
<td>19.00</td>
</tr>
</tbody>
</table>

Which equation represents the relationship between the remaining value and total number of minutes used?

a) \( V = 22 - 3t \)

b) \( V = 22 - 0.30t \)

c) \( V = 25 - 3t \)

d) \( V = 25 - 0.30t \)
**Which Is Which?**

A relationship between the total cost to use a gym for a month, \( C \), and the number of visits, \( n \), is a partial variation. The total cost for 10 visits during one month is $50.

Draw a graph that could represent this relationship. Label each axis with an appropriate scale.

![Graph showing total cost vs. number of visits]

Determine the equation for your graph.

\[
C = 10 + 4n
\]

Explain how you know your equation represents a partial variation.
**Counting Pennies**

Identical pennies are placed in a container and the total mass is recorded.

The table below gives information about the total mass of different numbers of pennies in the container.

<table>
<thead>
<tr>
<th>Number of pennies</th>
<th>Total mass (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>60</td>
</tr>
<tr>
<td>6</td>
<td>65</td>
</tr>
<tr>
<td>10</td>
<td>75</td>
</tr>
</tbody>
</table>

Use the data to determine the number of pennies in the container when the total mass is 185 g.

Justify your answer. You may use the grid if you wish.

\[ M = 50 + 2.5P \]

\[ 185 = 50 + 2.5P \]

\[ 185 - 50 = 2.5P \]

\[ 135 = 2.5P \]

\[ \frac{135}{2.5} = P \]

\[ 54 = P \]

\[ \therefore 54 \text{ pennies weigh } 185 \text{ g} \]
Multiple-Choice

15. Which of the following equations does not represent a line?
   a. \( x = 5 \) ✓
   b. \( y = 10 \) ✓
   c. \( xy = 10 \) ×
   d. \( 5x - y + 10 = 0 \) ✓

16. Which of the following is the equation \( 4x - 5y + 12 = 0 \) in the form \( y = mx + b \)?
   a. \( y = \frac{4}{5}x + \frac{12}{5} \)✓
   b. \( y = \frac{5}{4}x - 3 \)
   c. \( y = 4x - 7 \)
   d. \( y = 5x + 16 \)

17. Consider the equation \( y = mx + 5 \).
   If \((7, 3)\) is a point on the line represented by this equation, which of the following is true?
   a. The rise is 8 when the run is 7.
   b. The rise is 7 when the run is 8.
   c. The rise is -2 when the run is 7.
   d. The rise is 7 when the run is -2.

18. Consider the relation \( y = -3x + 5 \).
   Which of the following statements about the graph of this relation is not true?
   a. The slope is 3.
   b. The \( y \)-intercept is 5.
   c. For a rise of 3, the run is -1.
   d. The graph crosses the \( y \)-axis at (0,5).

19. The total cost of swimming at a community swimming pool is made up of a membership fee and a cost per swim.

   At this community centre, Jake pays a total of $100 and swims 40 times. Paula pays a total of $70 and swims 25 times.

   Which of the following statements is true?
   a. The membership fee is $20.
   b. The membership fee is $30.
   c. The cost per swim is $2.50.
   d. The cost per swim is $2.80.

20. A local fair charges a $15 entry fee and $1.75 per ride. Dustin has $35 to spend.

   What is the maximum number of rides Dustin can go on?
   a. 8
   b. 11
   c. 12
   d. 20
21. In the relation \( C = 60 + 15n \), \( C \) represents the total cost of holding an event at a hall, and \( n \) represents the number of guests.

The maximum number of guests allowed in the hall is 100.

What are the minimum and maximum possible values for \( C \)?

- **a** $0, $1500
- **b** $0, $1560
- **c** $60, $1500
- **d** $60, $1560

\[
\begin{align*}
C &= 60 + 15(100) \\
&= 60 + 1500 \\
&= 1560
\end{align*}
\]

\( 60 \rightarrow 1560 \)
Know Your Lines

Consider the equations of the two lines below.

Line A: \( y = -\frac{3}{2}x - 7 \)

Line B: \( y = \frac{2}{3}x - 4 \)

Compare Line A and Line B. You may use the grid if you wish.
Justify your answers.
Complete the table below.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Comparison of Line A and Line B, with justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direction from left to right</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( A \to \text{Decreases Left to Right} ) Slope = -\frac{3}{2} \text{ rise} )</td>
</tr>
<tr>
<td></td>
<td>( B \to \text{Increased Slope} = m = \frac{2}{3} \text{ run} )</td>
</tr>
<tr>
<td>Steepness</td>
<td></td>
</tr>
</tbody>
</table>
|                                       | \( A \text{ is Steeper than } B \) \[
|                                       | \text{slope} = \frac{-3}{2} \quad \text{slope} = \frac{2}{3} \]
|                                       | \( A \) \( B \) \text{ greater magnitude} |
| Parallel, perpendicular or neither    |                                                     |
|                                       | \( m_A = \frac{-3}{2} \quad m_B = \frac{2}{3} \) |
|                                       | \( \text{negative reciprocal} \) \( \circ \) perpendicular |
28  Reduce, Reuse and Recycle

A high school is starting a recycling program.

The relationship between the total cost of the program, \( C \), and the number of recycling bins, \( n \), is represented by the equation \( C = 48n + 75 \).

The school must install a minimum of 12 recycling bins and has a maximum of $1000 to spend on the program.

What are the possible values of \( C \) and \( n \) in this situation?

Justify your answer.

\[
\begin{align*}
\text{min} \quad C &= 48(12) + 75 \\
&= 651 \\
\text{max} \quad 1000 &= 48n + 75 \\
1000 - 75 &= 48n \\
925 &= 48n \\
\frac{925}{48} &= n \\
&= 19.22 \\
\end{align*}
\]

The possible values of \( n \) are \( 12 \) to \( 19 \).

The possible values of \( C \) are \$651 \) to \$1000 \).
Each of the diagrams below shows a right triangle and a square constructed on each of its sides.

According to the Pythagorean theorem, which diagram is not correct?

a

\[
\begin{align*}
625 \text{ cm}^2 \\
49 \text{ cm}^2 \\
+ \\
576 \text{ cm}^2
\end{align*}
\]

b

\[
\begin{align*}
169 \text{ cm}^2 \\
25 \text{ cm}^2 \\
+ \\
144 \text{ cm}^2
\end{align*}
\]

c

\[
\begin{align*}
100 \text{ cm}^2 \\
36 \text{ cm}^2 \\
64 \text{ cm}^2
\end{align*}
\]

d

\[
\begin{align*}
61 \text{ cm}^2 \\
11 \text{ cm}^2 \\
60 \text{ cm}^2
\end{align*}
\]
25. A pylon in the shape of a cone is shown below.

The outside surface of the cone is to be painted, but the bottom will not be painted.

Which of the following is closest to the total surface area to be painted?

a. 4284 cm²
b. 4713 cm²
c. 5105 cm²
d. 5350 cm²

26. A decoration is packed in a box shaped like a cube as shown below.

The decoration has a volume of 651 cm³.

Approximately how much empty space remains in the box?

a. 128 cm³
b. 143 cm³
c. 623 cm³
d. 779 cm³
27. Two different cylindrical containers are shown below.

Container 1

\[
V = \pi r^2 h = 3.14(3)^2(5) = 141.3 \text{ cm}^3
\]

Container 2

\[
V = 3.14(6)^2(15) = 1495.6 \text{ cm}^3
\]

\[
\frac{1695.6}{141.3} = 12\]

When the containers are full of milk, what is the ratio of the amount in Container 1 to the amount in Container 2?

a) 1:2
b) 1:3
c) 1:6
d) 1:12

28. Consider the diagram below.

\[
\angle y = 43^\circ + 167^\circ + 50^\circ + y = 360^\circ
\]

What is the value of \(y\)?

a) 43°

b) 60°

C) 137°

d) 150°

29. Consider the right triangle below.

Line segment XY connects the midpoint of PQ to the midpoint of PR.

What is the length of XY?

a) 5.2 m
b) 7.8 m
c) 10.4 m
d) 13.0 m
All the Right Stuff

The diagram below shows a small right triangle inside a large right triangle.

Determine the value of \( x \).

Show your work.

\[
\begin{align*}
\alpha^2 + b^2 &= c^2 \\
2.2^2 + b^2 &= 6.4^2 \\
4.84 + b^2 &= 40.96 \\
b^2 &= 40.96 - 4.84 \\
b^2 &= 36.12 \\
b &= 6.01
\end{align*}
\]

\[
\begin{align*}
\alpha^2 + 3^2 &= x^2 \\
2.2^2 + 3^2 &= x^2 \\
4.84 + 9 &= x^2 \\
13.84 &= x^2 \\
x &= 3.72 \text{ cm}
\end{align*}
\]
Tricky Triangle

Line segment AB joins the midpoints of two sides of the triangle below. The length of AB is half the length of the base of the triangle.

Determine the value of $h$ in the diagram.

Show your work.

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

$$80^2 + h^2 = 128^2$$

$$6400 + h^2 = 16384$$

$$h^2 = 16384 - 6400$$

$$h^2 = 9984$$

$$h = \sqrt{9984}$$

$$h = 99.9\text{ cm}$$
Sample Assessment Questions: Academic

Student Answer Sheet

Your multiple-choice answers must be entered on this sheet.

- To indicate your answer, use a pencil to fill in the circle completely.
  Like this: ● Not like this: × ✓ ☐ ☐
- Do not fill in more than one answer to a question.
- Do not leave a question blank.
- Cleanly erase any answer you wish to change and fill in the circle for your new answer.

1. a b c d
2. a b c d
3. a b c d
4. a b c d
5. a b c d
6. Respond in booklet.
7. a b c d
8. a b c d
9. a b c d
10. a b c d
11. a b c d
12. a b c d
13. Respond in booklet.
15. a b c d
16. a b c d
17. a b c d
18. a b c d
19. a b c d
20. a b c d
21. a b c d
22. Respond in booklet.
23. Respond in booklet.
24. a b c d
25. a b c d
26. a b c d
27. a b c d
28. a b c d
29. a b c d
30. Respond in booklet.
31. Respond in booklet.

End of Assessment

Print Student Name: ____________________________

Student Signature: ____________________________
Grade 9 Assessment of Mathematics

2011

SAMPLE ASSESSMENT QUESTIONS

Record your answers to the multiple-choice questions on the Student Answer Sheet (2011, Academic).

Please note: The format of this booklet is different from that used for the assessment. The questions themselves remain the same.
1. Which of the following has a volume that can be represented by $s^3$?
   
   a. 
   
   b. 
   
   c. 
   
   d. 

2. What value of $m$ makes the equation $\frac{6a^m}{2a^3} = 3a^5$ true?
   
   a. 2
   
   b. 8
   
   c. 15
   
   d. 18

3. What is the value of the expression $\frac{5(-18 + 12)}{-4 + 1}$?
   
   a. 10
   
   b. 6
   
   c. -6
   
   d. -10

4. Luke designs a garden in the shape of a right triangle as shown below.

   The total area of the garden is 96 m².

   **Hint:**
   
   \[ A = \frac{1}{2}bh \]

   Which is closest to the value of $x$ in the diagram?
   
   a. 6 m
   
   b. 8 m
   
   c. 32 m
   
   d. 64 m
A square and an equilateral triangle are pictured below.

\[ (5x + 3) \quad (7x - 1) \]

If the square and the triangle have the same perimeter, what is the value of \( x \)?

a) 2  
b) 4  
c) 9  
d) 15

\[
\begin{align*}
P_{\text{sq}} &= P_{\text{tr}} \\
4(5x+3) &= 3(7x-1) \\
20x + 12 &= 21x - 3 \\
20x - 20x + 12 &= 21x - 3 - 20x + 3 \\
15 &= x
\end{align*}
\]
6 How High Is It?

The cylinder pictured below has a surface area of 660 cm².

![Diagram of a cylinder with radius 7 cm and height h]

Use the following formula to determine the height of the cylinder:

\[ \text{Surface area} = 2\pi r^2 + 2\pi rh \]

Show your work.

\[
\begin{align*}
660 &= 2\pi (7)^2 + 2\pi (7)h \\
660 &= 307.72 + 43.96 h \\
660 - 307.72 &= 43.96 h \\
352.28 &= 43.96 h \\
\frac{352.28}{43.96} &= \frac{43.96 h}{43.96} \\
8.01 &= h \\
\end{align*}
\]

The height is 8.01 cm.
7. Dechen has a candy-making business. The graph below shows the total number of candies his business has produced by the end of each day for the first four days.

If this trend continues, which of the following points represents a day with more candies produced than expected?

a. (5, 500)  
b. (9, 850)  
c. (10, 1300)  
d. (14, 1400)

8. Karina has a job at a video store. The total she is paid each week is made up of an hourly rate plus $14 for transportation.

One week, she works 20 hours and is paid $215.

Which equation represents the relationship between Karina’s total pay, P, in dollars, and the number of hours she works, n?

a. $P = 10.75n + 14$  
b. $P = 14n + 10.75$  
c. $P = 10.05n + 14$  
d. $P = 14n + 10.05$

$$215 = 14 + 10.05m$$

$$\frac{215 - 14}{20} = m$$

$$10.05 = m$$

$$P = 10.05n + 14$$
9. Which table of values shows a linear relation between $C$ and $n$?

a. 

<table>
<thead>
<tr>
<th>$n$</th>
<th>$C$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
</tr>
</tbody>
</table>

b. 

<table>
<thead>
<tr>
<th>$n$</th>
<th>$C$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>9</td>
</tr>
</tbody>
</table>

c. 

<table>
<thead>
<tr>
<th>$n$</th>
<th>$C$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>15</td>
</tr>
</tbody>
</table>

d. 

<table>
<thead>
<tr>
<th>$n$</th>
<th>$C$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>9</td>
</tr>
</tbody>
</table>

11. The graph below represents the relationship between Rena's distance from home and time.

During which section of the graph does Rena travel the fastest?

a. $p$

b. $q$

c. $r$

d. $w$

12. The table below represents a linear relation.

<table>
<thead>
<tr>
<th>Time, $t$</th>
<th>Distance, $D$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td>3</td>
<td>35</td>
</tr>
<tr>
<td>4</td>
<td>45</td>
</tr>
</tbody>
</table>

Which equation represents this relation?

a. $D = 5t$

b. $D = 10t$

c. $D = 10t + 5$

d. $D = 5t + 10$
Follow the Bouncing Ball

This scatter plot shows the relationship between the rebound height of a ball and the height from which the ball is dropped.

Draw a line of best fit for the data on the grid above.

Determine an equation for your line of best fit.

Show your work.

Equation of line of best fit: $y = 0.56x$
## Getting Paid

Hannah’s total pay includes a base salary and a percent of her sales.

The following table shows her total pay for three different sales levels.

<table>
<thead>
<tr>
<th>Sales ($)</th>
<th>Total pay ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 000</td>
<td>1700</td>
</tr>
<tr>
<td>17 500</td>
<td>1825</td>
</tr>
<tr>
<td>28 000</td>
<td>2350</td>
</tr>
</tbody>
</table>

\[
\text{Rate} = \frac{\text{rise}}{\text{run}} = \frac{525}{10500} = \frac{12.5}{2500} = 0.05 = 0.05
\]

Determine Hannah’s total pay when her sales are $47 000.

Show your work.

\[
P = \text{Initial} + 0.058
\]

\[
1700 = b + 0.05(15000)
\]

\[
1700 = b + 750
\]

\[
b = 950
\]

\[
y = 0.05x + 950
\]

Find \( y \) when \( x = 47000 \)

\[
y = 0.05(47000) + 950
\]

\[
y = 3300
\]

\[\therefore \text{Her pay is } $3300\]
Multiple-Choice

15 Which of the following **cannot** be an equation of a line?

a  \( x = 2 \)  **vertical**

b  \( y = 7 \)  **horizontal**

c  \( y = 2x^2 + 7 \)

d  \( 2x + y + 7 = 0 \) \( \Leftrightarrow \) \( y = -2x - 7 \)

16 Which of the following is the equation of the line \( 6x - 2y - 12 = 0 \) in the form \( y = mx + b \)?

a  \( y = -3x + 6 \)

b  \( y = 3x - 6 \)

c  \( y = \frac{1}{3}x + 12 \)

d  \( y = \frac{1}{3}x - 12 \)

17 Nevenka and Juan scuba dive. The graph below represents the relationship between the distance from the surface, in metres, and time, in minutes, for both divers as they swim down from the surface and then swim back up.

**Distance from Surface vs. Time**

[Graph showing two lines with labeled points and equations.]

Which statement below is true?

a  Juan swims back up at a rate of 0.5 m/min.  \( \times \)

b  Nevenka swims back up at a rate of 4.5 m/min.  \( \bigcirc \)

c  Nevenka swims down faster than she swims back up.  \( \times \)

d  Juan swims down and back up at the same rate.  \( \bigcirc \)
18. Alex has $150. She spends the same amount each week. After 6 weeks, she has $30 remaining.

The relationship between the amount of money Alex has and the number of weeks is represented by a line. What is the slope of this line?

a. -25  
b. -20  
c. 20  
d. 25

19. Which of the following represents the graph of the equation $2x - 4y = 8$?

- [a] Graph A
- [b] Graph B
- [c] Graph C
- [d] Graph D

- [a] Graph A
- [b] Graph B
- [c] Graph C
- [d] Graph D
20. Which equation represents a line that has the same y-intercept as $2x + 3y - 6 = 0$?

- a. $y = \frac{1}{2}x + 2$
- b. $y = 2x - 2$
- c. $y = -\frac{1}{2}x + 6$
- d. $y = -2x - 6$

21. Nate buys a video-game system.
- The system costs $300.
- Games cost $60 each.
- He pays 13% tax on the system and on each game.
- He has $850 in total to spend.

After he pays for the system, how many games is Nate able to buy?

- a. exactly 12
- b. exactly 9
- c. no more than 7
- d. no more than 3

**Calculation:**

Total to spend = $850 - 339
For games = $511

Cost for each game = $67.80

Number of games = $\frac{511}{67.8} = 7.54$
**Hit the Slopes**

Consider the two relations represented below.

<table>
<thead>
<tr>
<th>Relation 1</th>
<th>Relation 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>5x - 2y = 4</td>
<td></td>
</tr>
</tbody>
</table>

Determine the slope of the line representing each relation.

Show your work.

1. \[ \frac{5x - 2y}{2} = \frac{5x - 4}{2} \]

\[ y = \frac{5}{2} x - 2 \]

\[ m_1 = \frac{5}{2} = 2.5 \]

2. \[ \text{slope} = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0 - (-1)}{1.5 - 0} = \frac{1}{1.5} = \frac{2}{3} \]

\[ m_2 = 0.67 \]

Slope of line representing Relation 1: \( \frac{5}{2} = 2.5 \)

Slope of line representing Relation 2: \( 0.67 \)

Which of these relations is represented by the steeper line?

**LINE 1**

Justify your answer.

Magnitude of slope is larger

\[ 2.5 > 0.67 \]
How Many Uniforms?

The equation $C = 20n + 35$ represents the relationship between the cost of school volleyball uniforms, $C$, in dollars, and the number of uniforms ordered, $n$.

- The uniform company requires that the school order a minimum of 15 uniforms.
- The school has a maximum of $600 to spend on the uniforms.

Determine the possible values for $n$ and $C$ in this situation.

Show your work.

The possible values for $n$ are $15 \text{ to } 28$.

\[
\begin{align*}
\text{min} & \quad 15 \\
\text{max} & \quad 600 = 20n + 35 \\
& \quad n = 28.25
\end{align*}
\]

The possible values for $C$ are $335 \text{ to } 600$.

\[
\begin{align*}
\text{min} & \quad C = 20(15) + 35 \\
& \quad = 335 \\
\text{max} & \quad $600
\end{align*}
\]
24. Tom uses fencing to create a rectangular horse enclosure. He uses the side of a barn as one of the sides of the enclosure.

Tom has 48 metres of fencing to use for the three sides of the rectangular enclosure.

Which set of dimensions will use the entire 48 m of fencing?

a. width is 8 m, length is 6 m
b. width is 12 m, length is 12 m
c. width is 24 m, length is 12 m
d. width is 12 m, length is 24 m

25. Consider the following triangle.

Which expression can be used in the process of determining the length of the base?

a. $16^2 - 3.5^2$

26. Pablo is designing a rectangular flag that consists of three coloured triangles.

The picture below shows the colours of the triangles and the cost of each colour of material.

What is the total cost of the material?

a. $75.00
b. $87.50
c. $150.00
d. $175.00

27. A cylinder has a volume of $400\pi \text{ cm}^3$ and a diameter of 20 cm.

Which of the following is closest to the height of the cylinder?

a. 1 cm
b. 4 cm
c. 20 cm
d. 40 cm
Multiple-Choice

20. Consider the diagram below.
Which of the following equations is always true?

\[ a + b = x \]

a. \( x = a + b \)

b. \( x = b + c \)

c. \( x = a - b \)

d. \( x = b - c \)

29. A rectangular sign is built as shown below.
The four supports for the back of the sign form four congruent triangles.

What is the value of \( x \)?

a. \( 26^\circ \)

b. \( 32^\circ \)

c. \( 58^\circ \)

d. \( 64^\circ \)
30  Building an Ice Rink

Jake builds an ice rink as shown below.

Determine the perimeter of the rink.

Show your work.

\[ P = 25 + 25 + \frac{2\pi r}{2} + \frac{2\pi r}{2} \]

\[ P = 25 + 25 + 2\pi r \]

\[ = 50 + 2\pi (5) \]

\[ = 50 + 10\pi \]

\[ = 81.4 \text{ m} \]
Pravin designs a lightning bolt using two quadrilaterals and one triangle as shown below.

Complete the table below.

Justify your answers using geometric properties.

<table>
<thead>
<tr>
<th>Angle measure</th>
<th>Justification</th>
</tr>
</thead>
</table>
| \( y = 111^\circ \) | \[
66 + 72 + y + y = 360 \quad \text{Int. angles of quad.} \\
2y = 360 - 138 \\
\frac{2y}{2} = \frac{222}{2} \\
y = 111
\] |
| \( x = 93^\circ \) | \[
2 = 180 - 69 - 65 \quad \text{Int. angles of tri} \\
= 87 \\
x = (180 - 87) \quad \text{S.A.T.} \\
= 93
\] |