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?
   \[
   \frac{x \, \Box \, x^6}{x^2} = x^{12}
   \]
   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 \(4(3x - 8) - 3(2x - 7)\)?
   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

   \[
   144 = \frac{bh}{2}
   \]

   \[
   144 = \frac{8n(18)}{2}
   \]

   \[
   144 = \frac{144n}{2}
   \]

   \[
   144 = 72n
   \]

   \[
   n = 2
   \]
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

\[ \frac{2}{5} \times \frac{x}{350} = \frac{700}{5} \]

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

\[ x = 140 \]

\[ \text{140 drops needed} \]

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

\[ = 3.5 \]

\[ \circ 3.5 \text{ capfuls needed} \]
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.

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

---

**Diagram:**

- A graph showing a linear relationship with points plotted at (1, 80), (2, 60), and (3, 40).
- A slope line labeled as "Partial."
For which scatter plot could the line \( y = 5 \) be the line of best fit?

- **A**
  ![Graph A](image)

- **B**
  ![Graph B](image)

- **C**
  ![Graph C](image)

- **D**
  ![Graph D](image)
11 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

\[
182 = -0.5t + 300 \\
182 - 300 = -0.5t \\
-118 = -0.5t \\
\frac{-118}{-0.5} = t \\
t = 236
\]

12 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. ✗
- b Line 1 has a larger initial cost. ✗
- c Line 2 has a greater rate of change. ✗
- d Line 1 has a greater rate of change.
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, \( n \).

\[
E = 55 + 0.15n
\]

\[
C = 55 + 0.15(100) = 55 + 15 = 70
\]

\[
C = 55 + 0.15(200) = 55 + 30 = 85
\]
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, \( t \).

![Amount of Water vs. Time graph]

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

\[
\text{ratio} = \frac{\text{rise}}{\text{run}} = \frac{45000}{50} = 900 \text{L/min}
\]

Or, 900L/10min
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 belong 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 
\[ y = 3x - 5 \]?

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

\[ \begin{align*}
\text{a} & \quad y = 3x + \frac{1}{5} \\
\text{b} & \quad y = -3x - \frac{1}{5} \\
\text{c} & \quad y = \frac{1}{3}x + 7 \\
\text{d} & \quad y = \frac{1}{3}x - 7
\end{align*} \]
Which of the following is the graph of the equation $y = -2x + 6$?

- **a**
  - Initial value = $+6$
  - $y$-intercept
  - $x$-intercept:
  - Slope $= -\frac{2}{1}$

- **b**
  - Corrected graph

- **c**
  - Incorrect graph

- **d**
  - Incorrect graph
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

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.
22 Growing Rates

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.

<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>

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

Paul's Plant

Height vs. Day

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

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.

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

\[
3 \times \text{Slope above Line 1} = \frac{3}{1} \times \left(-\frac{1}{2}\right)
\]

\[
= -\frac{3}{2}
\]
Marcus is building a rectangular dog pen along the side of his house as shown below.

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

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

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

- a 185 cm²
- b 167 cm²
- c 135 cm²
- d 126 cm²

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

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

- a 2 cm²
- b 16 cm²
- c 21 cm²
- d 36 cm²

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

What number completes this equation?

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

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

a) 30°
b) 53°
c) 60°
d) 83°

29 Consider the regular octagon below.

What is the value of \( x \)?

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

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

Determine the volume of this figure.

Show your work.

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

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

\[ = \frac{3.14(9)^2(12)}{3} - \frac{3.14(3)^2(12)}{3} \]

\[ = 200.96 - 113.04 \]

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

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

\[ \text{Sum interior} = 180(8) \]
\[ \text{Decagon} = 1440 \]
\[ \text{One interior angle} = \frac{1440}{10} = 144^\circ \]

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) [ \frac{1440}{10} = 144^\circ ]</td>
</tr>
<tr>
<td>( y = 83^\circ )</td>
<td>( 2z + 14 = 180^\circ ) (sum interior triangle) [ 2z = 166 ] [ z = 83 ] [ y = 83 ]</td>
</tr>
</tbody>
</table>

\( z \) - Pattern
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.

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

\[
\text{25\% Off} \\
= 75(0.25) \\
= 18.75 \\
\text{New Price} = 75 - 18.75 \\
= \$56.25 \\
\text{Scratch} = 56.25 \times 0.11 \\
= 6.225 \\
\text{New} = 56.25 - 6.225 \\
= \$50.03 \\
\text{Total with Tax} = 50.63 \times 1.13 \\
= 58.64
\]
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
\[
\begin{array}{|c|c|}
\hline
n & S \\
\hline
1 & 4 \\
2 & 20 \\
3 & 36 \\
\hline
\end{array}
\]

b
\[
\begin{array}{|c|c|}
\hline
n & S \\
\hline
4 & 40 \\
5 & 52 \\
6 & 64 \\
\hline
\end{array}
\]

c
\[
\begin{array}{|c|c|}
\hline
n & S \\
\hline
3 & 12 \\
4 & 16 \\
5 & 20 \\
\hline
\end{array}
\]

d
\[
\begin{array}{|c|c|}
\hline
n & S \\
\hline
5 & 17 \\
6 & 21 \\
7 & 25 \\
\hline
\end{array}
\]
9 Which of the following represents a non-linear relation?

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

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>10</td>
<td>25</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.

\[
\begin{align*}
\text{Total Cost vs. Number of Visits} \\
\text{Total cost ($)} \\
100 & \quad 90 \\
80 & \quad 70 \\
60 & \quad 50 \\
40 & \quad 30 \\
20 & \quad 10 \\
10 & \\
\text{Number of visits} \\
1 & \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8 \quad 9 \quad 10
\end{align*}
\]

\[
\frac{\text{rise}}{\text{run}} = \frac{40}{10} = 4
\]

Determine the equation for your graph.

\[
C = 10 + 4n
\]

Explain how you know your equation represents a partial variation.
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.

\[ M = 50 + 2.5p \]

\[ 185 = 50 + 2.5p \]

\[ 185 - 50 = 2.5p \]

\[ 135 = 2.5p \]

\[ \frac{135}{2.5} = 54 \]

\[ p = 54 \]

 donc 54 pennies weigh 185 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
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

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

\[
60 \rightarrow 1560
\]
22. 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>
</table>
| Direction from left to right         | \( A \rightarrow \text{Decreases Left to Right} \quad \text{Slope} = \frac{-3}{2} \quad \text{rise} \quad \text{run} \)  
\( B \rightarrow \text{Increases} \quad \text{Slope} = \frac{2}{3} \quad \text{rise} \quad \text{run} \) |
| Steepness                            | \( A \) is steeper than \( B \)  
\( \text{Slope} = \frac{-3}{2} \quad \text{Slope} = \frac{2}{3} \)  
\( A \) has greater magnitude |
| Parallel, perpendicular or neither   | \( m_A = -\frac{3}{2} \quad m_B = \frac{2}{3} \)  
\( \Rightarrow \text{Negative reciprocal} \Rightarrow \text{perpendicular} \) |
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.

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

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)

- $49 \times 576 = 625$ cm²
- $49 + 576 = 625$

b)

- $25 + 144 = 169$ cm²
- $25 \times 144 = 169$

- $169 \text{ cm}^2$

- $25 \text{ cm}^2$

- $144 \text{ cm}^2$

- $576 \text{ cm}^2$

- $49 \text{ cm}^2$

- $625 \text{ cm}^2$

d)

- $11 \times 60 = 66$
- $11 + 60 \neq 66$

- $61 \text{ cm}^2$

- $11 \text{ cm}^2$

- $60 \text{ cm}^2$

- $36 \text{ cm}^2$

- $64 \text{ cm}^2$

- $100 \text{ cm}^2$
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 $4284 \text{ cm}^2$
- b $4713 \text{ cm}^2$
- c $5105 \text{ cm}^2$
- d $5350 \text{ cm}^2$

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

The decoration has a volume of 651 cm\(^3\).

Approximately how much empty space remains in the box?

- a $128 \text{ cm}^3$
- b $143 \text{ cm}^3$
- c $623 \text{ cm}^3$
- d $779 \text{ cm}^3$
27 Two different cylindrical containers are shown below.

Container 1

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

\[ \frac{169.5}{141.3} = 1.2 \]

Container 2

\[ V = 3.14(4)^2(15) \]
\[ = 471.2 \]

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.

\[ 167^\circ \]
\[ 43^\circ \]

What is the value of \( y \)?

a 43°
b 60°
c 137°
d 150°

20 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.

\[ a^2 + b^2 = c^2 \]
\[ 3.2^2 + b^2 = 6.4^2 \]
\[ 4.84 + b^2 = 40.96 \]
\[ b^2 = 40.96 - 4.84 \]
\[ b^2 = 36.12 \]
\[ b = 6.01 \]

\[ a^2 + 3^2 = x^2 \]
\[ 2.2^2 + 3^2 = x^2 \]
\[ 4.84 + 9 = x^2 \]
\[ 13.84 = x^2 \]
\[ x = 3.72 \text{ cm} \]
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.

\[ \text{Determine the value of } h \text{ in the diagram.} \]

\[ \text{Show your work.} \]

\[ a^2 + b^2 = c^2 \]
\[ 80^2 + h^2 = 128^2 \]
\[ 6400 + h^2 = 16384 \]
\[ h^2 = 16384 - 6400 \]
\[ h^2 = 9984 \]
\[ h = \sqrt{9984} \]
\[ h = 99.9 \text{ cm} \]
Grade 9 Assessment of Mathematics
2011

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 $x^3$?
   - 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 $\frac{5(-18 + 12)}{-4 + 1} = \frac{5(-6)}{-3}$?
   - 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.

   The area $A = \frac{1}{2}bh$.

   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.

If the square and the triangle have the same perimeter, what is the value of $x$?

a 2
b 4
c 9
d 15

$P_{sq} = P_{tr}$

$4(5x+3) = 3(7x-1)$

$20x + 12 = 21x - 3$

$20x - 20x + 12 + 3 = 21x - 3 - 20x + 3$

$15 = x$
How High Is It?

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

Use the following formula to determine the height of the cylinder:
Surface area = $2\pi r^2 + 2\pi rh$

Show your work.

\[
660 = 2\pi (7)^2 + 2\pi (7)h
\]
\[
660 = 307.72 + 43.96h
\]
\[
660 - 307.72 = 43.96h
\]
\[
352.28 = 43.96h
\]
\[
\frac{352.28}{43.96} = h
\]
\[
h = 8.01\text{ cm}
\]

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.

![Graph showing total number of candies produced vs. day]

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) $P = 14n + 10.05$

$215 = 14 + \sqrt{20}$

$215 = 14 + m \sqrt{20}$

$215 - 14 = 20m$

$\frac{201}{20} = \frac{20m}{20}$

$10.05 = m$

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

- **a**
  
  \[
  \begin{array}{c|c}
  n & C \\
  \hline
  0 & 0 \\
  1 & 2 \\
  2 & 4 \\
  3 & 8 \\
  \end{array}
  \]

- **b**
  
  \[
  \begin{array}{c|c}
  n & C \\
  \hline
  0 & 0 \\
  1 & 1 \\
  2 & 4 \\
  3 & 9 \\
  \end{array}
  \]

- **c**
  
  \[
  \begin{array}{c|c}
  n & C \\
  \hline
  0 & 0 \\
  1 & 4 \\
  2 & 11 \\
  3 & 15 \\
  \end{array}
  \]

- **d**
  
  \[
  \begin{array}{c|c}
  n & C \\
  \hline
  0 & 0 \\
  1 & 3 \\
  2 & 6 \\
  3 & 9 \\
  \end{array}
  \]

10. Which relation does **not** have an initial value of 50?

- **a** \( y = 50 \)  
- **b** \( y = 50 + 8x \)  
- **c** \( y = 50x + 0 \)  
- **d** \( y = 50 - x \)

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.

\[
\begin{array}{c|c}
\text{Time, } t & \text{Distance, } D \\
\hline
0 & 5 \\
1 & 15 \\
2 & 25 \\
3 & 35 \\
4 & 45 \\
\end{array}
\]

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.

![Graph showing rebound height vs. drop height]

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.

\[ R = 0.56D \]

Rebound and drop

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>

\[ \text{Rate} = \frac{\text{rise}}{\text{run}} = \frac{525}{10 500} = \frac{12.5}{2500} = 0.05 = 0.05 \]

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

Show your work.

\[ P = \text{Initial} + 0.05 \times \]

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

\[ 1700 = b + 750 \]

\[ b = 950 \]

\[ y = 0.05x + 950 \]

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

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

\[ y = 3300 \]

\[ \therefore \text{Her pay is } $3300 \]
15 Which of the following cannot be an equation of a line?
   a \( x = 2 \) \( \Rightarrow \) vertical
   b \( y = 7 \) \( \Rightarrow \) horizontal
   c \( y = 2x^2 + 7 \)
   d \( 2x + y + 7 = 0 \) \( \Rightarrow \) \( y = -2x - 7 \)

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]

Which statement below is true?
   a Juan swims back up at a rate of 0.5 m/min. ×
   b Nevenka swims back up at a rate of 4.5 m/min. √
   c Nevenka swims down faster than she swims back up. ×
   d Juan swims down and back up at the same rate. ×
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 $2x - 4y = 8$?
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

System + tax = $300 \times 1.13 = 339$

Each game + tax = $60 \times 1.13 = 67.80$

Total to spend = $850 - 339$

For games = 511

\[ \frac{511}{67.80} \approx 7.54 \]
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></td>
<td></td>
</tr>
<tr>
<td>$5x - 2y = 4$</td>
<td></td>
</tr>
</tbody>
</table>

Determine the slope of the line representing each relation.
Show your work.

1. $5x - 2y = 4$
   
   $\frac{2y}{2} = \frac{5x - 4}{2}$
   
   $y = \frac{5}{2}x - 2$
   
   $m_1 = \frac{5}{2} = 2.5$

2. slope = $\frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0 - (-1)}{1.5 - 0} = \frac{1}{1.5}$
   
   $m_2 = 0.67$

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?

L1

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 ________ to ________.

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

The possible values for $C$ are $335$ to $600$.

\[
\begin{align*}
\text{min} & \quad \text{max} \\
C &= 20(15) + 35 \\
&= 335 \\
& \quad \$600
\end{align*}
\]
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.

\[ \frac{3.5 \text{ cm}}{16 \text{ cm}} \]

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

- a) \( 16^2 - 3.5^2 \)
- b) \( 16^2 + 3.5^2 \)
- c) \( \sqrt{16 + 3.5} \)
- d) \( \sqrt{16 - 3.5} \)

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\( \pi \) cm\(^3\) and a diameter of 20 cm. \( r = 10 \) 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

\[ V = \pi r^2 h \]

\[ 400\pi = \pi (10)^2 h \]

\[ \frac{400\pi}{100\pi} = \frac{100\pi h}{100\pi} \]

\[ 4 = h \]
28. 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) \( 64^\circ \)


**Building an Ice Rink**

Jake builds an ice rink as shown below.

Determine the perimeter of the rink.

Show your work.

\[
\begin{align*}
P &= 25 + 25 + \frac{2\pi r}{2} + \frac{2\pi r}{2} \\
&= 25 + 25 + 2\pi r \\
&= 50 + 2\pi (5) \\
&= 81.4 \text{ m}
\end{align*}
\]
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>
<tbody>
<tr>
<td>[ y = \frac{111}{^\circ} ]</td>
<td>[ 66 + 72 + y + y = 360 ] Int. angles of quad. [ 2y = 360 - 138 ] [ \frac{2y}{2} = \frac{222}{2} ] [ y = 111 ]</td>
</tr>
<tr>
<td>[ x = \frac{93}{^\circ} ]</td>
<td>[ z = 180 - 69 - 65 ] Int. angles of tri [ = 46 ] [ x = 180 - 46 ] S.A.T. [ = 93 ]</td>
</tr>
</tbody>
</table>