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>
</tbody>
</table>
| I    | - illegible: cannot be read; completely crossed out/erased; not written in English  
- irrelevant content: does not attempt assigned question (e.g., comment on the task, drawings, “?” “!” “I don’t know”)  
- off topic: no relationship of written work to the question |
| 10   | - demonstration of limited understanding of concepts and/or procedures  
- application of knowledge and skills shows limited effectiveness due to  
  - misunderstanding of concepts  
  - incorrect selection or misuse of procedures  
- problem-solving process shows limited effectiveness due to  
  - minimal evidence of a solution process  
  - limited identification of important elements of the problem  
  - too much emphasis on unimportant elements of the problem  
  - no conclusions presented  
  - conclusion presented without supporting evidence |
| 20   | - demonstration of some understanding of concepts and/or procedures  
- application of knowledge and skills shows some effectiveness due to  
  - partial understanding of the concepts  
  - errors and/or omissions in the application of the procedures  
- problem-solving process shows some effectiveness due to  
  - an incomplete solution process  
  - identification of some of the important elements of the problem  
  - some understanding of the relationships between important elements of the problem  
  - simple conclusions with little supporting evidence |
| 30   | - demonstration of considerable understanding of concepts and/or procedures  
- application of knowledge and skills shows considerable effectiveness due to  
  - an understanding of most of the concepts  
  - minor errors and/or omissions in the application of the procedures  
- problem-solving process shows considerable effectiveness due to  
  - a solution process that is nearly complete  
  - identification of most of the important elements of the problem  
  - a considerable understanding of the relationships between important elements of the problem  
  - appropriate conclusions with supporting evidence |
| 40   | - demonstration of thorough understanding of concepts and/or procedures  
- application of knowledge and skills shows a high degree of effectiveness due to  
  - a thorough understanding of the concepts  
  - an accurate application of the procedures (any minor errors and/or omissions do not detract from the demonstration of a thorough understanding)  
- problem-solving process shows a high degree of effectiveness due to  
  - a complete solution process  
  - identification of all important elements of the problem  
  - a thorough understanding of the relationships between all of the important elements of the problem  
  - appropriate conclusions with thorough and insightful supporting evidence |
## Formula Sheet
### Grade 9 Academic

<table>
<thead>
<tr>
<th>Geometric Figure</th>
<th>Perimeter</th>
<th>Area</th>
</tr>
</thead>
</table>
| **Rectangle**    | \( P = l + l + w + w \)  
\| or \| \( P = 2(l + w) \)  
\|   |   | \( A = lw \)  |
| **Parallelogram**| \( P = b + b + c + c \)  
\| or \| \( P = 2(b + c) \)  
\|   |   | \( A = bh \)  |
| **Triangle**     | \( P = a + b + c \)  
\|   |   | \( A = \frac{bh}{2} \)  
\| or \| \( A = \frac{1}{2}bh \)  |
| **Trapezoid**    | \( P = a + b + c + d \)  
\|   |   | \( A = \frac{(a + b)h}{2} \)  
\| or \| \( A = \frac{1}{2}(a + b)h \)  |
| **Circle**       | \( C = \pi d \)  
\| or \| \( C = 2\pi r \)  
\|   |   | \( A = \pi r^2 \)  |
<table>
<thead>
<tr>
<th>Geometric Figure</th>
<th>Surface Area</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<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>$V = \frac{4}{3} \pi r^3$ or $V = \frac{4\pi r^3}{3}$</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><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>$V = \frac{1}{3} b^2 h$ or $V = \frac{b^2 h}{3}$</td>
</tr>
<tr>
<td><strong>Square-based pyramid</strong></td>
<td>$A_{\text{triangle}} = \frac{1}{2} bs$</td>
<td>$V = (A_{\text{base}})(\text{height})$</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>$V = \frac{1}{3} b^2 h$ or $V = \frac{b^2 h}{3}$</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>$V = \frac{1}{2} bh l$ or $V = \frac{bh l}{2}$</td>
</tr>
<tr>
<td></td>
<td>$A_{\text{total}} = A_{\text{rectangles}} + 2A_{\text{base}}$</td>
<td>$V = \frac{1}{2} bh l$ or $V = \frac{bh l}{2}$</td>
</tr>
</tbody>
</table>
DIRECTIONS

Answering Multiple-Choice Questions
Answer all multiple-choice questions. If you fill in more than one answer to a question, or leave a question blank, the question will be scored zero. Incorrect answers will also be scored zero.

Answering Open-Response Questions
Do all of your work for each question in the space provided for the question only.
Write your solutions, including all calculations, clearly and completely.

ATTENTION:
There are more open-response questions in this booklet than a regular booklet.

Record ALL your answers to multiple-choice and open-response questions in this booklet.

You are now ready to start.
Please read the questions in the Question Booklet; then fill in your answers below.

To indicate your answer, use a pencil to fill in the appropriate circle below completely.

Like this: ●
Not like this: ✗ ☑ ☐

Cleanly erase your answer if you wish to change it and fill in the circle for your new answer.

Fill in only one circle for each question.

1  ○ ○ ○ ○  ○
2  ○ ○ ○ ○  ○
3  ○ ○ ○ ○  ○
4  ○ ○ ○ ○  ○
5  ○ ○ ○ ○  ○
6  ○ ○ ○ ○  ○
7  ○ ○ ○ ○  ○
8  ○ ○ ○ ○  ○
9  ○ ○ ○ ○  ○
10 ○ ○ ○ ○  ○
11 ○ ○ ○ ○  ○
More Snacks, Please!

Raisins and sunflower seeds are sold together in packages of 250 g. The ratio of the mass of raisins to the mass of sunflower seeds is 3 to 5.

Determine the mass of raisins in a package.

Show your work.
Getting Fit

Maddie enrolls in a fitness program. Her total cost is made up of a sign-up fee and a cost per class. The table below shows information about her total cost, $C$, in dollars, when she attends $n$ classes.

<table>
<thead>
<tr>
<th>Number of classes, $n$</th>
<th>Total cost, $C$ ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>67</td>
</tr>
<tr>
<td>14</td>
<td>74</td>
</tr>
</tbody>
</table>

What is the sign-up fee?

Sign-up fee: _________________________

Show your work.

Is the relationship between the number of classes Maddie attends and her total cost a partial variation or direct variation?

Circle one: Partial variation     Direct variation

Justify your answer.
Kenny’s Big Adventure

The following graph represents the relationship between Kenny’s distance from home on a bike ride and time.

Describe the 3 segments of Kenny’s ride. Include information about distance travelled, time, direction and speed, in km/min, for each segment.

<table>
<thead>
<tr>
<th>Segment</th>
<th>Distance travelled</th>
<th>Time</th>
<th>Direction</th>
<th>Speed (km/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Comparing Relationships

Information about three linear relationships is given below.

<table>
<thead>
<tr>
<th>Relationship 1</th>
<th>Relationship 2</th>
<th>Relationship 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>3x + 6y + 1 = 0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Circle the relationships that have the same rate of change.

Justify your answer. Include information about all three relationships.
Making Equations!

Determine the equation of the line that has the same $y$-intercept as $2x + y + 6 = 0$ and is perpendicular to the line shown on the grid.

Show your work.
Skate On!

A diagram of a community ice rink is shown below.

The rink is being enclosed with fencing that costs $6.20/m.

Determine the total cost of fencing for the rink.

Show your work.
A Schoolyard

A schoolyard is in the shape of a regular decagon, as pictured below.

Complete the chart 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>
<tbody>
<tr>
<td>$x = \underline{\phantom{0}}$</td>
<td></td>
</tr>
<tr>
<td>$y = \underline{\phantom{0}}$</td>
<td></td>
</tr>
</tbody>
</table>
To indicate your answer, **use a pencil to fill in the appropriate circle below completely.**

Like this: ●

Not like this: × ✔ ☞ ○

Cleanly erase your answer if you wish to change it and fill in the circle for your new answer.

Fill in only **one** circle for each question.

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td></td>
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<td></td>
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<tr>
<td>20</td>
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<td>23</td>
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<td>24</td>
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<td>26</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>27</td>
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<td>29</td>
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<tr>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Read the instructions below.

Along with this booklet, make sure you have the Answer Booklet and the Formula Sheet.

You may use any space in this book for rough work for multiple-choice questions only.

The diagrams in these booklets are not all drawn to scale.

ATTENTION:

Unlike in the actual assessment booklet, the questions in this booklet are sorted by strand.

There are more multiple-choice questions in this booklet than in a regular booklet.

Continue to read the directions on the cover of the Answer Booklet.
1. A rectangle is divided into 5 equal sections as pictured below.

Which of the following represents the area of one section?

a. $8x$
b. $8x^2$
c. $15x$
d. $15x^2$

2. The table below contains five expressions.

<table>
<thead>
<tr>
<th>$p \times p \times p \times p \times p \times p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$p^2 \times p^2 \times p^2$</td>
</tr>
<tr>
<td>$p^2 \times p^3$</td>
</tr>
<tr>
<td>$p^5$</td>
</tr>
<tr>
<td>$p^6$</td>
</tr>
</tbody>
</table>

How many of these expressions are equivalent to $(p^2)^3$?

a. 1
b. 2
c. 3
d. 4

3. A rectangle is shown below with algebraic expressions for its length and width in centimetres.

Which expression represents the area of the rectangle in cm²?

a. $4x + 5$
b. $8x + 10$
c. $3x^2 + 5$
d. $3x^2 + 15x$
What is the solution to the equation below?

\[ \frac{2}{3}x - 4 = 20 \]

a. \( x = 12 \)

b. \( x = 16 \)

c. \( x = 24 \)

d. \( x = 36 \)

Mia sells T-shirts from a booth at a market. She pays $30 to rent the booth. Each T-shirt costs her $1.50, and she sells them for $7.50 each.

Her goal is to make $200 after she pays for the booth and the T-shirts.

What is the minimum number of T-shirts Mia must sell to reach her goal?

a. 27

b. 29

c. 34

d. 39

Joanne drives for 2.5 hours at a constant speed and travels 250 km. François drives at a constant speed exactly 10 km/h less than Joanne’s speed.

Which point on the graph below could represent the distance travelled and time spent travelling for François?

a. Z

b. Y

c. X

d. W
Which of the following shows information from 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>1</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

b

<table>
<thead>
<tr>
<th>$n$</th>
<th>$C$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-7</td>
</tr>
<tr>
<td>2</td>
<td>-5</td>
</tr>
<tr>
<td>4</td>
<td>-3</td>
</tr>
</tbody>
</table>

c

<table>
<thead>
<tr>
<th>$n$</th>
<th>$C$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-9</td>
</tr>
<tr>
<td>4</td>
<td>-6</td>
</tr>
<tr>
<td>16</td>
<td>-3</td>
</tr>
</tbody>
</table>

d

<table>
<thead>
<tr>
<th>$n$</th>
<th>$C$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>20</td>
<td>6</td>
</tr>
</tbody>
</table>

The total cost of yearbooks for a school is made up of a $375 set-up fee and $25 for each yearbook purchased.

There is a linear relationship between the total cost and the number of yearbooks purchased.

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

a  direct variation, $375

b  direct variation, $25

c  partial variation, $375

d  partial variation, $25
9 A company ships CDs in crates of equal size. The graph below shows the relationship between the total mass of a crate and the number of CDs it contains.

![Graph of Total Mass vs. Number of CDs]

Which of the following equations represents the relationship between the total mass of a crate, \( M \), and the number of CDs it contains, \( n \)?

a \( M = 0.25n + 100 \)  
b \( M = 4n + 100 \)  
c \( M = 0.25n + 125 \)  
d \( M = 4n + 125 \)

10 A relationship is represented by the following graph.

![Graph of Total Mass vs. Number of CDs]

Which equation represents this relationship?

a \( C = n + 2 \)  
b \( C = n + 1 \)  
c \( C = 2n + 2 \)  
d \( C = 2n + 1 \)

11 A local band pays $5000 to record its first album and $0.15 for each CD made.

The band pays $7000 to record its second album and $0.10 for each CD made.

How will the graph of the relationship between the total cost and the number of CDs made for the second album differ from the graph for the first album?

The graph of the line for the second album will start

a lower on the vertical axis and be steeper.  
b higher on the vertical axis and be steeper.  
c lower on the vertical axis and be less steep.  
d higher on the vertical axis and be less steep.
Go to the Answer Booklet and complete the seven open-response questions before continuing with question 19.

19. Which equation does not represent a linear relation?
   a. \( y = 0 \)
   b. \( x = 5 \)
   c. \( x^2 + y = 9 \)
   d. \( 2x + y - 5 = 0 \)

20. What is the slope of the line represented by the equation below?

\[
0 = 2x - 10y + 7
\]

   a. 5
   b. \( \frac{1}{5} \)
   c. \( -\frac{1}{5} \)
   d. -5
21. The end points of line segment AB are A(3, −12) and B(6, k).
What is the value of k if the slope of line segment AB is −2?

a. −18  
b. −6  
c. 6  
d. 18

22. Information about three different relationships between $C$, in dollars, and $t$, in hours, is shown below.

<table>
<thead>
<tr>
<th>$t$ (h)</th>
<th>$C$ ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>14</td>
</tr>
<tr>
<td>4</td>
<td>18</td>
</tr>
</tbody>
</table>

$C = 4 + 0.5t$

How many of the three relationships between $C$ and $t$ have a rate of change of $4$ per hour?

a. 0  
b. 1  
c. 2  
d. 3
A line passes through the point (6, 4) and has a slope of $-\frac{1}{2}$.

Which of the following graphs represents this line?

a) ![Graph a](image)

b) ![Graph b](image)

c) ![Graph c](image)

d) ![Graph d](image)
24  The maximum number of tickets that can be sold for a school play is 350.

The total profit earned, \( P \), can be determined using the equation \( P = 4.50n - 1080 \), where \( n \) is the total number of tickets sold.

Which of the following statements is true?

a  The maximum profit is $1080.
b  The maximum profit is $1575.
c  The total profit is $0 when 240 tickets are sold.
d  The total profit is $0 when 350 tickets are sold.

25  Two gyms offer fitness classes. The graph below shows the total cost for the first gym.

For 4 classes, both gyms have the same total cost.

Which of the following could represent the total cost for the second gym?

a  \( C = 60 + 4n \)
b  \( C = 40 + 15n \)
c  The total cost is made up of a membership fee of $60 and $10 per class.
d  The total cost is made up of a membership fee of $40 and $20 per class.
26 The table below lists the widths of four rectangles, each with an area of 72 cm².

<table>
<thead>
<tr>
<th>Width (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rectangle 1</td>
</tr>
<tr>
<td>Rectangle 2</td>
</tr>
<tr>
<td>Rectangle 3</td>
</tr>
<tr>
<td>Rectangle 4</td>
</tr>
</tbody>
</table>

Which rectangle has the smallest perimeter?

a Rectangle 1  
b Rectangle 2  
c Rectangle 3  
d Rectangle 4

27 Salt is sold in packages in the shape of a rectangular-based prism that is not a cube. A new package in the shape of a cube is designed to contain the same volume.

Which of the following is true about the new package?

a It holds less salt.  
b It holds more salt.  
c It requires less material.  
d It requires more material.

28 According to the Pythagorean theorem, what is the length of the third side of the triangle, \(x\)?

\[
\begin{align*}
&\text{15 cm} \\
&\text{17 cm} \\
x\end{align*}
\]

a 2 cm  
b 4 cm  
c 6 cm  
d 8 cm

29 The figure pictured below is made up of a cone on top of a cylinder.

The cylinder has a volume of 96 cm³. What is the volume of the figure?

a 120 cm³  
b 128 cm³  
c 144 cm³  
d 192 cm³
30 Consider the diagram below.

What is the value of $x$?

a  $61^\circ$

b  $68^\circ$

c  $112^\circ$

d  $119^\circ$

31 The following figure is a 15-sided regular polygon.

What is the value of $x$ shown in the diagram?

a  $24^\circ$

b  $34^\circ$

c  $46^\circ$

d  $48^\circ$
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
2014

RELEASED ASSESSMENT QUESTIONS

Record your answers to the multiple-choice questions on the Student Answer Sheet (2014, Academic).

Please note: The format of this booklet is different from that used for the assessment. The questions themselves remain the same.
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 □ to complete the equation below?

\( (8x^3)(□) = 24x^{12} \)

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  \(-5\)
6 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.
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, \( n \)?

- \( C \) vs. \( n \)
- \( C \) vs. \( n \)
- \( C \) vs. \( n \)
- \( C \) vs. \( n \)

9 Gertrude sells shoes.

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, \( s \)?

- \( P = 15s \)
- \( P = 40 + 0.15s \)
- \( P = 850 + 0.15s \)
- \( P = 167.50 + 0.15s \)
Multiple-Choice

Which of the following shows data from a non-linear relation?

a

<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>

b

<table>
<thead>
<tr>
<th>n</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>3.25</td>
</tr>
<tr>
<td>10</td>
<td>4.00</td>
</tr>
<tr>
<td>15</td>
<td>4.75</td>
</tr>
<tr>
<td>20</td>
<td>5.50</td>
</tr>
</tbody>
</table>

c

<table>
<thead>
<tr>
<th>n</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>8  (\frac{1}{3})</td>
</tr>
<tr>
<td>6</td>
<td>8 (\frac{2}{3})</td>
</tr>
<tr>
<td>8</td>
<td>9</td>
</tr>
</tbody>
</table>

d

<table>
<thead>
<tr>
<th>n</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>25</td>
</tr>
<tr>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>12</td>
<td>4</td>
</tr>
</tbody>
</table>

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 \[ S = 195n + 150 \]
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.

Draw the line of best fit for the data.
Determine the equation of your line of best fit.

______________________________________________________

Show your work.
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?
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?

19 A line has a $y$-intercept of 4 and a slope of $-3$.

Which equation represents this line?

a $y = 4x + 3$

b $y = 4x - 3$

c $y = 4 + 3x$

d $y = 4 - 3x$

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 There is no fixed fee, and the cost per kilometre is $0.15$.

b There is no fixed fee, and the cost per kilometre is $0.65$.

c There is a $50$ fixed fee, and the cost per kilometre is $0.15$.

d 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 7, 8, 9, ...

b 6, 7, 8, 9, ...

c 0, 1, 2, 3, 4, 5, 6

d 0, 1, 2, 3, 4, 5, 6, 7
22 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></th>
<th>(-2x + 6y = 18)</th>
<th>(y = 4x^2 + 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Circle one:</strong></td>
<td>Linear, Non-linear</td>
<td>Linear, Non-linear</td>
</tr>
<tr>
<td><strong>Justification</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

![Graph showing linear and non-linear equations]
**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.
24 The diagram below is made of a right triangle and three squares.

\[ p^2 = r^2 - m^2 \]

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.

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.

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?

- a 38°
- b 71°
- c 104°
- d 161°
The sum of the interior angles of a polygon is $2700^\circ$.

How many sides does the polygon have?

a 19  
b 17  
c 15  
d 13
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.
31 Daring Diagram

A diagram is shown below.

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>
<tbody>
<tr>
<td>( x = )</td>
<td></td>
</tr>
<tr>
<td>( y = )</td>
<td></td>
</tr>
</tbody>
</table>
Grade 9 Assessment of Mathematics
2013

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: 

DPCDSB - Page 51
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?
   \[
   \frac{x^4x^6}{x^2} = x^{12}
   \]
   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.

   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.
7 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

8 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 \( C = 0.25n + 20 \)

9 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
10. 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.  
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, $n$.

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

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

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 $y = -3x + 4$?

a

b

c

d

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

a $y = 3x + \frac{1}{5}$

b $y = -3x - \frac{1}{5}$

c $y = -\frac{1}{3}x + 7$

d $y = \frac{1}{3}x - 7$
Which of the following is the graph of the equation \( y = -2x + 6 \)?
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

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.

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>

Paul's Plant

Whose plant is growing faster?
Circle one: Lucia’s Paul’s

Justify your answer.
** 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.
24 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

25 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

26 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

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

What number completes this equation?

a  3
b  2
c  \( \frac{1}{2} \)
d  \( \frac{1}{3} \)
26 Consider the diagram below.

What is the value of $x$ in the diagram?

a $\ 30^\circ$

b $\ 53^\circ$

c $\ 60^\circ$

d $\ 83^\circ$

26 Consider the regular octagon below.

What is the value of $x$?

a $\ 15^\circ$

b $\ 30^\circ$

c $\ 45^\circ$

d $\ 60^\circ$
Cutting Cones

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

Determine the volume of this figure.
Show your work.
### Diamond Cut

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

![Diagram of 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>$x = \underline{}$</td>
<td></td>
</tr>
<tr>
<td>$y = \underline{}$</td>
<td></td>
</tr>
</tbody>
</table>