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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
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Not like this: ✗ ✓ ☐ ☐

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Fill in only one circle for each question.

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td></td>
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<td>16</td>
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<td>21</td>
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<td></td>
</tr>
<tr>
<td>22</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. A ball is dropped from a height of 25 m. The ball's height, \( H \), in metres, after \( n \) bounces is represented by the equation below.

\[
H = 25 \left( \frac{1}{2} \right)^n
\]

What is the height of the ball after 4 bounces?

- a) \( \frac{25}{16} \) m
- b) \( \frac{25}{8} \) m
- c) \( \frac{25}{4} \) m
- d) \( \frac{25}{2} \) m

2. A cube with a given side length is pictured below.

Which algebraic expression represents the area of one face of the cube?

- a) \( 2x \)
- b) \( 4x \)
- c) \( x^2 \)
- d) \( x^3 \)

3. A school is planning a car wash to raise $600.

- There will be 8 teams,
- Each team will wash 2 cars per hour.
- The car wash will last \( 3 \frac{1}{2} \) hours.
- Each team will take two 15-minute breaks.

How much should the school charge per car to raise exactly $600?

- a) $15.00
- b) $7.50
- c) $6.82
- d) $6.25

4. Which of the following is equivalent to \( 3(5x - 1) - 2(3x + 5) \)?

- a) \( 9x - 13 \)
- b) \( 9x + 4 \)
- c) \( 21x - 13 \)
- d) \( 21x + 4 \)
Information about the relationship between the height of a plant and time is shown on the grid below.

Which table of values shows only information about this relationship?

a) 

<table>
<thead>
<tr>
<th>Number of weeks</th>
<th>Height (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

b) 

<table>
<thead>
<tr>
<th>Number of weeks</th>
<th>Height (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

c) 

<table>
<thead>
<tr>
<th>Number of weeks</th>
<th>Height (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>7</td>
</tr>
</tbody>
</table>

d) 

<table>
<thead>
<tr>
<th>Number of weeks</th>
<th>Height (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>
Two golf courses offer student memberships. Information about the linear relationships between the total cost, $C$, in dollars, and the number of games played, $n$, at these two golf courses is given below.

**First Golf Course**

<table>
<thead>
<tr>
<th>Number of games</th>
<th>Total cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>40</td>
</tr>
<tr>
<td>4</td>
<td>50</td>
</tr>
</tbody>
</table>

**Second Golf Course**

<table>
<thead>
<tr>
<th>Number of games, $n$</th>
<th>Total cost, $C$ ($$)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>51</td>
</tr>
<tr>
<td>5</td>
<td>85</td>
</tr>
<tr>
<td>9</td>
<td>153</td>
</tr>
<tr>
<td>12</td>
<td>204</td>
</tr>
</tbody>
</table>

Which of the following statements correctly describes the two relationships?

- **a** They are both direct variations.
- **b** The first is a direct variation, and the second is a partial variation with an initial value of $\$17$.
- **c** The first is a partial variation with an initial value of $\$10$, and the second is a direct variation.
- **d** The first is a partial variation with an initial value of $\$10$, and the second is a partial variation with an initial value of $\$17$.

The graph below represents Joe’s distance from a wall as he walks.

Which statement could describe Joe’s walk?

- **a** Joe walks toward the wall, stands still and then walks away from the wall.
- **b** Joe walks away from the wall, stands still and then walks toward the wall.
- **c** Joe walks toward the wall, stands still and then continues to walk toward the wall.
- **d** Joe walks away from the wall, stands still and then continues to walk away from the wall.
Consider the graph below.

Which of the following is an equation representing this graph?

- \( P = 2n + 6 \)
- \( P = \frac{1}{2}n + 6 \)
- \( P = -2n + 6 \)
- \( P = -\frac{1}{2}n + 6 \)
Information about four different linear relationships between \( C \) and \( n \) is shown below.

<table>
<thead>
<tr>
<th>( n )</th>
<th>( C )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>8</td>
<td>90</td>
</tr>
<tr>
<td>16</td>
<td>130</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>( n )</th>
<th>( C )</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>12</td>
<td>35</td>
</tr>
<tr>
<td>14</td>
<td>40</td>
</tr>
</tbody>
</table>

How many of the linear relationships have a rate of change of 5?

a) 4  
b) 3  
c) 2  
d) 1
16 Which graph shows a line that is perpendicular to the line \( y = \frac{4}{3}x - 4 \)?

\[ \text{slope} = -\frac{3}{4} \]
17. What is an equation of the line
   - perpendicular to the line represented by
     \[ y = -\frac{3}{2}x + 1 \] and \[ \text{slope} = \frac{2}{3} \]
   - with the same y-intercept as the line represented by \[ y = \frac{7}{7} + 5x \]?
     \[ b = -7 \]
   
   a. \( y = \frac{2}{3}x + 7 \)
   b. \( y = \frac{2}{3}x + 5 \)
   c. \( y = -\frac{2}{3}x + 7 \)
   d. \( y = -\frac{2}{3}x + 5 \)

18. The total cost to repair a fridge, \( C \), in dollars, can be represented by the equation \( C = 60t + 30 \), where \( t \) is the repair time in hours.

Which of the following statements is true about this relationship?

a. The hourly rate is $90.
   x
b. The fixed fee is $90.
   x
c. The hourly rate is $60, and the fixed fee is $30.

d. The hourly rate is $30, and the fixed fee is $60.

19. What is the area of the shape represented below?

   a. 28 cm²
   b. 56 cm²
   c. 84 cm²
   d. 168 cm²
20 This diagram shows a greenhouse that is built in the shape of a half-cylinder.

Material to cover the roof costs $3/m². The shaded ends will not be covered. Which is closest to the cost of covering the roof?

a $7540
b $12 570
c $15 080
d $37 700

Hint:
Use Pythagorean theorem as part of your process.

21 A cone is pictured below.

Which of the following is closest to the surface area of the cone?

a 267 cm²
b 283 cm²
c 691 cm²
d 723 cm²

\[ S^2 = s^2 + h^2 = 164 = 13 \]

\[ S = 13 \]

\[ \text{SA} = \pi r^2 + \pi rs \]
\[ = 3.14 (5^2) + 3.14 (5)(13) \]
\[ = 78.5 + 204.1 \]
\[ \text{SA} = 282.6 \]
22. Which of the following composite shapes has 900° as the sum of its interior angles?

a. \[360° = 720°\]

b. \[540° \text{ TOTAL 900°}\]

\[180(5-2) = 180(3) = 540°\]

c. \[180(7-2) = 180(5) = 900°\]

d. \[\text{Sum int. angles } 900°\]
Floored Areas

The diagram of the floor shown below has algebraic expressions for the lengths of its sides, in metres.

\[ A_1 = (4x-3)(5x) \]
\[ A_2 = 2x(3x-3) \]

Determine an unsimplified expression for the total area of the floor, \( A \), in m\(^2\).

\[ A = (4x-3)(5x) + 2x(3x-3) \]

Simplify your expression fully. Show your work.

\[ A = 20x^2 - 15x + 6x^2 - 6x \]
\[ = 26x^2 - 21x \]
10 Folding Time

A piece of paper is folded in half, which results in two layers of paper. Then the paper is folded in half again to make four layers, and so on.

The number of layers and the number of folds are recorded in the chart.

<table>
<thead>
<tr>
<th>Number of folds</th>
<th>Number of layers</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</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>
<tr>
<td>4</td>
<td>16</td>
</tr>
</tbody>
</table>

Determine whether this relationship is linear or non-linear.
Circle one: Linear  Non-linear

Justify your answer.
You have the option of using the grid if you wish.
Theatre Programs

A company charges schools to print programs for school plays. Information about the linear relationship between the total cost and number of programs printed is shown below.

<table>
<thead>
<tr>
<th>Number of programs, $n$</th>
<th>Total cost, $C$ ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>350</td>
<td>220</td>
</tr>
<tr>
<td>500</td>
<td>250</td>
</tr>
<tr>
<td>750</td>
<td>300</td>
</tr>
</tbody>
</table>

\[
\frac{\text{rise}}{\text{run}} = \frac{30}{150} = \frac{1}{5}
\]

\[
\text{Initial Value: } 350 \times 0.20 = 70
\]

Determine an equation to represent this relationship.

\[
C = 150 + 0.20n
\]

Show your work.

You have the option of using the grid if you wish.
**Standard Lines**

Two lines are represented by the equations below.

Line 1: \( x - 2y + 6 = 0 \)

Line 2: \( 3x + 6y - 18 = 0 \)

Determine which line could be represented by \( y = -\frac{1}{2}x + 3 \).

Circle one:  
- Line 1
- Line 2
- Both

Justify your answer. Include information for both Line 1 and Line 2.

\[
\begin{align*}
\text{Line 1:} & \quad x - 2y + 6 = 0 \\
& \quad -2y = -x - 6 \\
& \quad y = \frac{1}{2}x + 3 \\
& \quad \text{(positive slope)}
\end{align*}
\]

\[
\begin{align*}
\text{Line 2:} & \quad 3x + 6y - 18 = 0 \\
& \quad 6y = -3x + 18 \\
& \quad y = -\frac{1}{2}x + 3
\end{align*}
\]
Terrific Ts

A school orders T-shirts from Terrific Ts. The total cost is made up of a set-up fee of $115 and a cost of $3 per T-shirt.

Terrific Ts requires a minimum order of 25 T-shirts. The school can spend a maximum of $800.

Determine all the possible values of the total cost, C, and the number of T-shirts, n, for this situation.

Show your work.

\[ C = 115 + 3t \]
\[ = 115 + 3(25) \]
\[ = 115 + 75 \]
\[ C = 190 \]

\[ \text{MAX } n \leq 800 = 115 + 3t \]
\[ 685 = 3t \]
\[ 228.3 = t \]

The possible values of \( n \) in this situation are 25 → 228.

The possible values of \( C \) in this situation are 190 → 799.
### Six and Five Sides

A regular hexagon and a regular pentagon are joined as shown below.

![Diagram of a regular hexagon and a regular pentagon joined at a point](image)

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

<table>
<thead>
<tr>
<th>Value</th>
<th>Justification using geometric properties</th>
</tr>
</thead>
</table>
| $x = 120^\circ$ | \[
\begin{align*}
\text{Sum int angles} &= 180(n-2) \\
&= 180(6-2) \\
&= 180(4) \\
&= 720^\circ \\
720 \div 6 &= 120^\circ \text{ each}
\end{align*}
\] |
| $y = 132^\circ$ | \[
\begin{align*}
\text{Pentagon: } 180(5-2) &= 540^\circ \\
&= 180(3) \\
&= 540^\circ \\
\therefore y &= 360 - (120 + 108) \\
&= 360 - (228) \\
y &= 132^\circ
\end{align*}
\] |
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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 ● ● ● ● ●
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.

19 ○ ○ ○ ○ ○
20 ○ ○ ○ ○ ○
21 ○ ○ ○ ○ ○
22 ○ ○ ○ ○ ○
23 ○ ○ ○ ○ ○
24 ○ ○ ○ ○ ○
25 ○ ○ ○ ○ ○
26 ○ ○ ○ ○ ○
27 ○ ○ ○ ○ ○
28 ○ ○ ○ ○ ○
29 ○ ○ ○ ○ ○
30 ○ ○ ○ ○ ○
31 ○ ○ ○ ○ ○
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. $15x^2$

![Diagram of a rectangle divided into 5 sections](image)

2. The table below contains five expressions.

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

a. $4x + 5$

b. $8x + 10$

c. $3x^2 + 5$

d. $3x^2 + 15x$

![Diagram of a rectangle with algebraic expressions](image)
4. What is the solution to the equation below?

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

a. \( x = 12 \)

b. \( x = 16 \)

c. \( x = 24 \)

d. \( x = 36 \)

5. 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

6. 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?

![Graph showing distance vs. time]
Which of the following shows information from a linear relation between $C$ and $n$?

<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>

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.

**Total Mass vs. Number of CDs**

<table>
<thead>
<tr>
<th>Total mass (kg)</th>
<th>0</th>
<th>50</th>
<th>100</th>
<th>150</th>
<th>200</th>
<th>250</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of CDs</td>
<td>0</td>
<td>100</td>
<td>200</td>
<td>300</td>
<td>400</td>
<td>500</td>
</tr>
</tbody>
</table>

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.

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) \( \frac{1}{5} \)
   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

\[
\frac{y_2-y_1}{x_2-x_1} = \frac{-12-k}{3-6} = \frac{-2}{1}
\]

\[-12-k = 6
\]

\[-12-6 = k
\]

\[-18 = k\]

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>

rate: \(\frac{4}{2} = 2\)


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]

b) [Graph B]

c) [Graph C]

d) [Graph D]
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.

![Total Cost vs. Number of Classes Graph]

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.
6. 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, \( x \)?

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

\( x \)  
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.

\[
\begin{align*}
4 \text{ cm} & \\
4 \text{ cm} & \\
\end{align*}
\]

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. $48^\circ$
2 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.

\[
\frac{\text{raisins}}{\text{sunflower}} = \frac{3}{5}
\]

1 package 250 g

(8 total parts)

\[
\frac{3}{8} = \frac{x}{250}
\]

\[
3(250) = 8x
\]

\[
750 = 8x
\]

\[
93.75 g = x
\]

The mass of raisins in a package is 93.75 g.
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.

Cost per class (rate) = \[
\frac{74 - 67}{14 - 12} = \frac{7}{2} = $3.50 / \text{class}
\]

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.

"If Maddie attends no classes, her cost is $25"
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>3 km</td>
<td>10 min</td>
<td>away from home</td>
<td>( \frac{3}{10} = 0.3 \text{ km/min} )</td>
</tr>
<tr>
<td>b</td>
<td>0 km</td>
<td>15 min</td>
<td>not moving</td>
<td>( \frac{0}{15} = 0 \text{ km/min} )</td>
</tr>
<tr>
<td>c</td>
<td>1.5</td>
<td>25 min</td>
<td>away from home</td>
<td>( \frac{1.5}{25} = 0.06 \text{ km/min} )</td>
</tr>
</tbody>
</table>
Comparing Relationships

Information about three linear relationships is given below.

**Relationship 1**

\[
\begin{align*}
\text{Graph} & \\
\frac{5}{10} &= \frac{1}{2}
\end{align*}
\]

**Relationship 2**

\[
\begin{align*}
3x + 6y + 1 &= 0 \\
6y &= -3x - 1 \\
y &= -\frac{3}{6}x - \frac{1}{6} \\
y &= -\frac{1}{2}x - \frac{1}{6}
\end{align*}
\]

**Relationship 3**

\[
\begin{array}{c|c}
 x & y \\
-2 & -3 \\
0 & -2 \\
2 & -1 \\
4 & 0 \\
\end{array}
\]

Circle the relationships that have the same rate of change.

Justify your answer. Include information about all three relationships.

1. **Rel. #1** - rate is \( \frac{\text{rise}}{\text{run}} = \frac{5}{10} = \frac{1}{2} \) \( \text{positive} \)

2. **Rel. #2** - rate is \( -\frac{1}{2} \) \( \text{negative} \)

3. **Rel. #3** - rate is \( \frac{\text{rise}}{\text{run}} = \frac{1}{2} \) \( \text{positive} \)
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.

\[ y = -2x - 6 \quad \text{y-int.} \]

$\text{slope} = \frac{2}{3}$

\[ \text{perpendicular line has slope } = -\frac{3}{2} \]

Show your work.

'equation of line is $y = \frac{-3}{2}x - 6$
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.

\[
\text{Perimeter} = 48 + 26 + 48 + \left( \frac{\pi \cdot 10}{2} \right) \\
= 122 + \frac{\pi \cdot 20}{2} \\
= 122 + 40.82 \\
\text{P} = 162.82 \text{m} \\
\text{Cost of fencing: } 162.82 \times 6.20 = \$1009.48
\]
A Schoolyard

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

![Decagon Diagram]

\[
\text{Sum of interior angles:} \quad 180(n-2) \\
= 180(10-2) \\
= 180(8) \\
= 1440^\circ
\]

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>
</table>
| \( x = 54^\circ \) | \( \angle C = 180 - 144 = 36^\circ \) (SAT) Sum of interior angles of a triangle = 180° \\
|       | \( 180 = x + 36 + 90^\circ \) \\
|       | \( 180 - 126 = x \) \\
|       | \( 54^\circ = x \) |
| \( y = 144^\circ \) | Since sum of interior angles is 1440°, the measure of 1 interior angle \( (y) \) is \( 1440 \div 10 = 144^\circ \) |
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.
Directions

Make sure you have the following materials:

- Student Answer Sheet
- the Formula Sheet
- a pencil and an eraser
- a ruler
- a scientific or graphing calculator
- some paper for rough work for multiple-choice questions only

The diagrams in this booklet are not all drawn to scale.

Answering Multiple-Choice Questions

When answering the multiple-choice questions, be sure you use the Student Answer Sheet. The circles you will be filling in are lettered a, b, c, d.

1. Try to answer all of the multiple-choice questions. Be sure to read each question and its four answer choices carefully. Do not spend too much time on any one question.

2. To indicate your answer, use a pencil to fill in the circle completely on the Student Answer Sheet. 
   Like this: ○  Not like this: × ✓  ☐  ☐

3. If you fill in more than one answer to a question, the question will be scored zero.

4. If you leave a question blank, the question will be scored zero.

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

Answering Open-Response Questions

1. Do all of your work for each question (even your rough work) in the space provided for the question. Work on additional pages will not be scored.

2. Present a complete and well-organized solution to each question. Give as much information as you can.

3. Write your solutions so that they can be understood by someone who does not know your work.

4. Make sure you follow the directions on the Key Words page.
   For example, a question might ask you to “Show your work.” Read the Key Words page. It says to record all calculations and steps. So, if you sketch a graph in the process of getting to your answer, show the sketch and label it.

5. When using a calculator, write down the numbers you use and the operations you carry out.
   For example, a question might ask you to “Find the area of a circle with a radius of 7 cm.”
   You need to write $A = \pi (7)^2$ as well as the answer you get on your calculator.
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: ____________________________
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 \( \square \) to complete the equation below?

\[ (8\times^2)(\square) = 24\times^{12} \]

a. \( 3\times^9 \)
b. \( 3\times^4 \)
c. \( 16\times^9 \)
d. \( 16\times^4 \)

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

\[ \frac{24.50}{200} = 0.1225 \text{$/min} \] or \( 12.25 \text{$/min} \)

\[ \frac{68}{550} = 0.1236 \text{$/min} \] or \( 12.36 \text{$/min} \)

\[ \frac{80.25}{700} = 0.1146 \text{$/min} \] or \( 11.46 \text{$/min} \)

\[ \frac{99.50}{850} = 0.1170 \text{$/min} \] or \( 11.71 \text{$/min} \)

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.

\[ \sqrt{11.56} = 3.4 \text{m} \]
\[ \sqrt{6.76} = 2.6 \text{m} \]
\[ \sqrt{21.16} = 4.6 \text{m} \]

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. \( -5 \)

\[ -8x + 4 = 36 \]
\[ -8x = 32 \]
\[ x = \frac{32}{-8} \]
\[ x = -4 \]
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.

\[ L : D : M = 2 : 3 : 7 \quad 3 \text{ total parts} = 12 \]

Luc: \[ \frac{2}{12} = \frac{x}{176496} \]
\[ x = \$29 416 \]

Deborah: \[ \frac{3}{12} = \frac{x}{176496} \]
\[ x = \$44 128 \]

Melanie: \[ \frac{7}{12} = \frac{x}{176496} \]
\[ x = \$102 956 \]
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.

**Total Pay vs. Number of Flyers**

![Graph showing points for stores X, Y, W, and Z.]

Which store will pay $45 for 450 flyers delivered?

- a) Store W
- b) Store X
- c) Store Y
- d) Store Z

\[
\text{Store W} = \frac{150}{15} = 10
\]

\[
\text{Store X} = \frac{250}{45} = 5.5
\]

\[
\text{Store Y} = \frac{450}{30} = 15
\]

\[
\text{Store Z} = \frac{600}{65} = 9.2
\]
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

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?

a) P = 15s
b) P = 40 + 0.15s
c) P = 850 + 0.15s
d) P = 167.50 + 0.15s

\[
P = 64550 + b
\]
\[
167.50 = 0.15(850) + b
\]
\[
167.50 = 127.50 + b
\]
\[
b = 40
\]
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>

   (linear)

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

   \[ P = 4 - 2(-7) \]

   \[ P = 4 + 14 \]

   \[ P = 18 \]
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?

- \( S = 65n + 345 \) **\( \checkmark \)**
- \( S = 195n + 150 \) **\( \checkmark \)**
- \( S = \frac{195}{3} \)

\[ \text{rate} = \frac{195}{3} = 65 \text{ / month} \]

Initial value:

\[ S = 65n + b \]

\[ 345 = 65(3) + b \]

\[ 345 = 195 + b \]

\[ 150 = b \]
More Money, Please!

The graph below shows information about the amount of money, \( A \), in Shreyā’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.

\[
y - m \cdot t = 100
\]

\[
(0, 100) \quad \text{slope} = \frac{100 - 0}{0 - 5}
\]

\[
= \frac{100}{-5}
\]

\[
= -20
\]

\[
A = -20n + 100
\]
**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.
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. \( y = -\frac{5}{2}x + 10 \)

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. \(-\frac{1}{11}\)
17 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?

\[ y \text{-int} = 3 \]

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>$-2x + 6y = 18$</th>
<th>$y = 4x^2 + 3$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Circle one:</strong></td>
<td><strong>Linear</strong> Non-linear</td>
</tr>
<tr>
<td><strong>Justification</strong></td>
<td><strong>Justification</strong></td>
</tr>
<tr>
<td>$-2x + 6y = 18$</td>
<td>$x$ $y$</td>
</tr>
<tr>
<td>$6y = 2x + 18$</td>
<td>$7$</td>
</tr>
<tr>
<td>$y = \frac{1}{3}x + 3$</td>
<td>$3$</td>
</tr>
<tr>
<td>$\frac{1}{2}y$</td>
<td>$7$</td>
</tr>
<tr>
<td>$b$</td>
<td>$19$</td>
</tr>
</tbody>
</table>

[Graph showing the quadratic function $y = 4x^2 + 3$]
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.

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

Option A: \[ C = 30 + 2n \]

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

Justify your answer.

Opt. A - if downloading more than 10 movies, Option A would be less expensive

Opt. B - if downloading fewer than 10 movies, Option B would be 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.

The distance from Town A to Town B is 13 km.

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

Through B: \( 4 + 3 = 7 \) km

Through A: \( 12 + 13 = 25 \) km

B shorter by: \( 25 - 7 = 18 \) km
26 The sign below is made up of a rectangle and a semicircle.

![Diagram of a sign with dimensions: 15 cm width, 10 cm height, and 30 cm length, and a semicircle with radius 15 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

\[ A_{\text{semi}} = \frac{\pi r^2}{2} \]
\[ = \frac{3.14 (15^2)}{2} \]
\[ = 353.25 \text{ cm}^2 \]

\[ A_{\text{rectangle}} = l \times w \]
\[ = 30 \times 10 \]
\[ = 300 \text{ cm}^2 \]

\[ A_{\text{total}} = 353.25 + 300 \]
\[ = 653.25 \text{ cm}^2 \]

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

![Diagram of a container with a cone and a cylinder.]

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

- a) 2261 cm³
- b) 3016 cm³
- c) 3393 cm³
- d) 4524 cm³

Total: \[ V_{\text{total}} = V_{\text{cone}} + V_{\text{cylinder}} \]
\[ = \frac{1}{3}(2260.8) + 2260.8 \]
\[ = 3016 \text{ cm}^3 \]

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

![Diagram of a triangle with angles 38° and 104°, and another angle labeled as \( x \).]

\[ 38 + 2x = 180 \]
\[ 2x = 142 \]
\[ x = 71° \]
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

\[
180(n-2) = 2700 \\
(n-2) = \frac{2700}{180} \\
(n-2) = 15 \\
(n = 17)
\]
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.

\[ A_{\text{lateral}} = \pi rs \]
\[ = 3.14 \times 6 \times 11.66 \]
\[ = 219.67 \text{ cm}^2 \]
31 Daring Diagram

A diagram is shown below.

\[
\begin{align*}
5\text{-sided figure} & : 180(n-2) = 180(5-2) \\
& = 180(3) \\
& = 540^\circ \\
\text{Sum of interior angles} & \end{align*}
\]

\[
\begin{align*}
4\text{-sided figure} & : \text{Sum of interior angles is } 360^\circ \\
\end{align*}
\]

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>
| \(x = 113.3^\circ\) | \[
540 = 3x + 200 \\
340 = 3x \\
113.3^\circ = x
\] |
| \(y = 115^\circ\) | \[
360 = y + 85 + 90 + 70 \\
360 = y + 245 \\
115^\circ = y
\] |