Dear User:

This booklet contains all publicly available EQAO questions for MPM1D – Principles of Mathematics from 2004-2005 to 2011-2012. The questions have been arranged according to the following sections:

1. Measurement
2. Number Sense and Algebra
3. Linear Relations
4. Analytic Geometry
5. Plane Geometry

Some notes:
• This order reflects the sequence of topics in which I cover with my classes. Measurement is first, since it is often used as a context to ask questions related to other strands (you will see many measurement questions in other sections, particularly in number sense, since they are more of an exercise in solving equations)
• If a question covers two strands, it will be placed in the latter strand of this document
• Each section has questions that are grouped together into sub-categories, such as Pythagorean Theorem or slope.
• Some questions located in the linear relations section may also apply to topics covered in analytic geometry, particularly those that involve solving problems in a realistic context.

Answers to the multiple-choice questions are provided.
1. Triangle KLM is shown below.

Which of the following is closest to the perimeter of triangle KLM?

a) 12.6 cm  

b) 16.3 cm  

c) 17.5 cm  

d) 21.0 cm

2. Consider the parallelogram shown below.

What is the perimeter of WXYZ?

a) 28 cm  

b) 30 cm  

c) 31 cm  

d) 34 cm

3. Consider the following triangle.

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

a) $16^2 - 3.5^2$  

b) $16^2 + 3.5^2$  

c) $\sqrt{16 + 3.5}$  

d) $\sqrt{16 - 3.5}$

4. The positions of the water fountain, the picnic table and the swings at a local park are shown below.

The Pythagorean theorem was used to determine the distance, in metres, from the water fountain to the swings. Which of the following is closest to this distance?

A) 28 m  

B) 19 m  

C) 15 m  

D) 9 m
Each of the diagrams below shows a right triangle and a square constructed on each of its sides.

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

a

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

b

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

c

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

d

\[ \begin{align*}
61 \text{ cm}^2 \\
11 \text{ cm}^2 \\
60 \text{ cm}^2 \\
\end{align*} \]
6. Chris has a square garden with an area of 38.4 m², as shown in the diagram.

He decreases the length of each side by 1.7 m to make a smaller garden.

Which is closest to the perimeter of the smaller garden?

a. 37 m  

b. 32 m  

c. 25 m  

d. 18 m

7. A garden is in the shape of a rectangle and a semicircle as shown below.

Which of the following is closest to the amount of fencing needed to enclose the garden?

a. 60 m  

b. 70 m  

c. 75 m  

d. 85 m

8. The floor plan of the lobby of a hotel is shown below.

Which of the following formulas is not useful to determine the area of part of the lobby?

a. \( \frac{b \times h}{2} \)  

b. \( \frac{\pi r^2}{2} \)  

c. \( \frac{4}{3} \pi r^3 \)  

d. \( l \times w \)
9. 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.

![Diagram of a triangle with dimensions and cost per square centimeter for red ($0.03/cm^2$), green ($0.02/cm^2$), and blue ($0.01/cm^2$).]

What is the total cost of the material?

- a) $75.00
- b) $87.50
- c) $150.00
- d) $175.00

10. A soccer goalie is standing in a goal opening. From this position, she can guard the area represented by the semicircle below.

![Diagram of a semicircle with dimensions](Image)

How much of the goal opening is she not guarding?

- a) 0.6 m$^2$
- b) 8.5 m$^2$
- c) 9.0 m$^2$
- d) 26.6 m$^2$

11. The frame of the roof of a small house is being constructed. A portion of the frame consists of four isosceles triangles as shown below.

![Diagram of a roof frame with dimensions](Image)

What is the total length of the three sides that form the shaded interior triangle?

- a) 3.7 m
- b) 6.1 m
- c) 13.5 m
- d) 18.3 m
12. Which of the following has a volume that can be represented by $s^3$?

a. 

b. 

c. 

d. 

13. The mould shown below is used to make a candle in the shape of a square-based pyramid.

What is the volume of the mould?

a. $1500 \text{ cm}^3$

b. $500 \text{ cm}^3$

c. $400 \text{ cm}^3$

d. $35 \text{ cm}^3$
A cylindrical hot water heater has a diameter of 40 cm and a height of 120 cm.

Which of the following expressions shows the maximum volume of water that the heater can hold?

a  $\pi \times 20^2 \times 120 \text{ cm}^3$

b  $\pi \times 40^2 \times 120 \text{ cm}^3$

c  $2\pi \times 20 \times 120 \text{ cm}^3$

d  $2\pi \times 40 \times 120 \text{ cm}^3$

Elisa wants to pack CD cases into a storage box.

What is the largest number of CD cases Elisa can pack inside the covered storage box?

a  about 40

b  about 50

c  about 60

d  about 70
16. A decoration is packed in a box shaped like a cube as shown below.

![Cube diagram]

The decoration has a volume of 651 cm$^3$.

Approximately how much empty space remains in the box?

- a) 128 cm$^3$
- b) 143 cm$^3$
- c) 623 cm$^3$
- d) 779 cm$^3$

17. If the diameter of a volleyball is three times the diameter of a tennis ball, which statement below is true?

- a) The volume of the volleyball is 3 times the volume of the tennis ball.
- b) The volume of the volleyball is 9 times the volume of the tennis ball.
- c) The surface area of the volleyball is 9 times the surface area of the tennis ball.
- d) The surface area of the volleyball is 27 times the surface area of the tennis ball.

18. The cylinder below has a volume of 150 cm$^3$.

![Cylinder diagram]

Which of the following is closest to the area of the lateral surface of the cylinder?

**Hint:**

\[ V_{\text{cylinder}} = \pi r^2 h \]
\[ A_{\text{lateral surface}} = 2\pi rh \]

- a) 38 cm$^2$
- b) 75 cm$^2$
- c) 150 cm$^2$
- d) 300 cm$^2$
19 Examine the tent below.

Which of the following is the surface area of the tent, including the ends and the floor?

a. 4.6 m²
b. 10.5 m²
c. 14.5 m²
d. 20.0 m²

20 Brad has a cylindrical metal container that is open at the top. He wants to paint the outer surfaces of the container, including the bottom.

Which expression should he use to calculate the area to be painted?

A. \( \pi(20)(50) \) cm²
B. \( 2\pi(20)(50) \) cm²
C. \( 2(\pi(20)^2 + \pi(20)(50)) \) cm²
D. \( (\pi(20)^2 + 2\pi(20)(50)) \) cm²

21 A tent has the shape of a cone. The radius of the base is 3 m, and the slant height is 5 m.

What is the approximate surface area of the tent, including the floor?

a. 38 m²
b. 48 m²
c. 75 m²
d. 95 m²
22. A pylon in the shape of a cone is shown below.

![Diagram of a cone with dimensions: 60 cm height, 25 cm base radius.]

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

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

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

23. The figure shows a greenhouse roof in the shape of half a cylinder.

![Diagram of a half cylinder with dimensions: 30 m length, 6 m radius, 30 m length.]

What is the approximate surface area of the curved roof?

a. 283 m²
b. 424 m²
c. 565 m²
d. 848 m²
24. Box A and Box B have about the same volume. The cost to make a box depends on the amount of cardboard used.

![Box A](image1)

![Box B](image2)

Which of the following statements is correct?

F. Box B costs less; it uses 48 cm³ less cardboard to make.
G. Box A costs less; it uses 290 cm³ less cardboard to make.
H. Box B costs less; it uses 496 cm² less cardboard to make.
J. Box A costs less; it uses 496 cm² less cardboard to make.

25. Hunaid is wrapping the gift shown below.

Which formula should he use to determine the amount of wrapping paper he needs to cover the box?

a. \( V = lwh \)

b. \( A = lw \)

c. \( P = 2l + 2w \)

d. \( SA = 2(lw + lw + lh) \)

26. If the radius of a sphere is tripled, the surface area of the sphere will increase

a. by a factor of 3.

b. by a factor of 4.

c. by a factor of 6.

d. by a factor of 9.
27 Ella wants a rectangle with
  • a perimeter of 100 cm and
  • the largest possible area.
What are the dimensions of the rectangle that satisfies her conditions?

- a 10 cm × 10 cm
- b 20 cm × 30 cm
- c 25 cm × 25 cm
- d 40 cm × 60 cm

28 Maria grows several varieties of plants in a rectangular-shaped garden. She uses fencing to divide the garden into 16 squares that are each 1 m by 1 m. She also puts fencing around the perimeter of the garden.

Which of the following represents the smallest amount of fencing that Maria needs?

- a 24 m
- b 40 m
- c 42 m
- d 49 m
29 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.
Tricky Triangle

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

Determine the value of $h$ in the diagram.

Show your work.
Cone Zone

Zach measures the slant height of a cone-shaped cup and finds that it is 12 cm. The height is 10 cm.

Determine the volume of water in the cup if Zach fills it to the top.
Show your work.
32  **Something’s Missing**  

The semicircle in the diagram below has a radius of 4 cm.

What is the area of the shaded region?  
Show your work.
33 Toy Sailboats

Emelina makes toy sailboats as shown below.

Determine the total area of the shaded sails.
Show your work.
Building an Ice Rink

Jake builds an ice rink as shown below.

Determine the perimeter of the rink.
Show your work.
Multiple-Choice:
1. C
2. B
3. A
4. B
5. D
6. D
7. A
8. C
9. B
10. B
11. C
12. D
13. B
14. A
15. C
16. A
17. C
18. B
19. C
20. C
21. C
22. C
23. A
24. H
25. D
26. D
27. C
28. B
1. The average temperature during 10 days in March is given by the expression
\[
\frac{6(-2) - 5 + 3(-1)}{10}
\]
What is the value of the expression?
- a 2
- b 1
- c -1
- d -2

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

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

4. Meg has been asked to determine the value of the numerical expression below.
\[
\frac{\frac{400}{2^{396}}}{2^3}
\]
Which of the following is the value of Meg’s expression?
- A 1
- B 2
- C 4
- D 8

5. If \( x = 8 \), what is the value of \( 2x^2 + 5x \)?
- a 21
- b 27
- c 33
- d 51

6. What is the value of \( 6x^2 \) when \( x = \frac{1}{3} \)?
- a \( \frac{2}{9} \)
- b \( \frac{2}{3} \)
- c 2
- d 4
7. What is the value of \((x^2)^3\) when \(x = \frac{1}{2}\)?
   a. \(\frac{1}{4}\)
   b. \(\frac{1}{12}\)
   c. \(\frac{1}{32}\)
   d. \(\frac{1}{64}\)

8. 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. \(\frac{16}{25}\)

9. While experimenting with a toy rocket, Dan determines that he can model the rocket’s height, \(h\), in metres, with respect to time, \(t\), in seconds, using the equation
   \[h = \frac{1}{2}t^2\]

   Which calculation correctly finds the value of \(h\) when \(t = 10\)?
   a. \(h = \frac{1}{2} \times 10^2\)
      \[= 5^2\]
      \[= 25\]
   b. \(h = \frac{1}{2} \times 10^2\)
      \[= \frac{1}{2} \times 20\]
      \[= 10\]
   c. \(h = \frac{1}{2} \times 10^2\)
      \[= \frac{1}{2} \times 100\]
      \[= 50\]
   d. \(h = \frac{1}{2} \times 10^2\)
      \[= \frac{1}{4} \times 100\]
      \[= 25\]
10. Which of the following fish tanks would contain an amount of water represented by the expression $V = 24x^2y$ when completely full?

A. 

B. 

C. 

D. 

11. The expression below can be simplified.

\[
\frac{(x^2y)^3}{(xy)^2}
\]

Which of the following shows the expression in its simplest form?

a. $x^4y$

b. $x^4$

c. $xy$

d. $x^3y$

12. A box with a volume of $12x^2y^2$ is shown below.

[Diagram of a box with dimensions 2x by 2y by w]

Hint: $V = lwh$

What is the width of the box?

a. $2xy$

b. $3xy$

c. $4x^3y^3$

d. $8x^3y^3$
13. Expressions for the base area and volume of a prism are given below.

Volume = $84a^2b^6$

Base area = $16ab^3$

Which expression represents the height of the prism?

F. $4a^2b^3$
G. $4a^3b^3$
H. $1024a^3b^9$
J. $1024a^4b^9$

14. 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. $9x^2$

da. $9x^3$

15. The area of the rectangle shown below is $6xy^2$ square units.

$3x$

$l = ?$

Hint: $A = lw$

If the width is $3x$ units, which expression represents the length of the rectangle?

a. $2xy^2$ units
b. $2y^2$ units
c. $3xy^2$ units
d. $3y^2$ units

16. Each side of a cube is $2y$ cm long. What is the volume of the cube?

a. $8y^3$ cm$^3$

b. $6y$ cm$^3$

c. $2y^3$ cm$^3$

da. $2y$ cm$^3$
17. The sum of the perimeters of two shapes is represented by $13x + 4y$.
   The perimeter of one shape is represented by $4x - 2y$.
   Which expression represents the perimeter of the other shape?
   a) $9x + 2y$
   b) $9x + 6y$
   c) $17x + 2y$
   d) $17x + 6y$

18. A rectangular field has a perimeter of $(10a - 6)$ metres and a width of $2a$ metres.
   
   Which expression represents the length of this field?
   A) $8a - 6$
   B) $12a - 6$
   C) $3a - 3$
   D) $3a^2 - 3$

19. Consider the expression below.
   $3x^2(5x^2 - 2x + 1)$
   Which of the following is equivalent to this expression?
   a) $8x^2 - 2x + 1$
   b) $8x^2 + x + 4$
   c) $15x^4 - 2x + 1$
   d) $15x^4 - 6x^3 + 3x^2$

20. Which of the following is equivalent to the expression below?
   $(4x - 5) + (2x + 1)$
   a) $2x - 6$
   b) $2x - 4$
   c) $6x - 6$
   d) $6x - 4$

21. Sabeeta expands and simplifies the expression below.
   
   Which expression is equivalent to the one above?
   a) $6x^2 + 22x$
   b) $10x^2 + 18x$
   c) $10x^2 - 38x$
   d) $28x^2$

22. Simplify the following expression:
   $3x(2x + 3) - 5x$
   a) $6x^2 - 5x + 3$
   b) $6x^2 - 6x$
   c) $15x^2 - 5x$
   d) $6x^2 + 4x$
23 Which of the following represents the expression $2(3x + 4) + 3(x - 1)$ in a simplified form?
   a) $9x + 3$
   b) $9x + 5$
   c) $8x + 8$
   d) $8x + 11$

24 Which of the expressions below is equivalent to $3(4x - 5) - 7(9x - 2)$?
   a) $-51x - 1$
   b) $-51x - 3$
   c) $-51x - 7$
   d) $-51x - 29$

25 Simplify fully:
   
   $$-5x(4 - 3x) + 2x^2$$

   a) $2x^2 - 17x$
   b) $2x^2 - 23x$
   c) $17x^2 - 5x$
   d) $17x^2 - 20x$

26 Which value of $x$ satisfies the equation $5 - 2x = 9$?
   F) $x = -7$
   G) $x = -2$
   H) $x = 2$
   J) $x = 3$

27 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
The playing chips of a board game are stored in cylindrical plastic cases. The plastic cases have a volume of 25 120 mm$^3$ and a diameter of 40 mm.

Which of the following is closest to the height of one playing chip if 50 playing chips can fit tightly into the plastic case as shown above?

a. 0.1 mm  
b. 0.4 mm  
c. 1.3 mm  
d. 2.5 mm

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

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

a. 1 cm  
b. 4 cm  
c. 20 cm  
d. 40 cm

Sand is being poured from one container to another, as shown below. The sand flows from the shaded part to the unshaded cone.

The shaded part starts full of sand. The sand empties into the unshaded cone and fills it to the top. What is the height of the unshaded cone?

F. 6.0 cm  
G. 8.3 cm  
H. 9.7 cm  
J. 12.5 cm
31. The cone shown below is 20 cm high and has a total volume of 1000 cm\(^3\).
   
   Which of the following is closest to the length of the radius, \( r \)?
   
   a) 6.9 cm  
   b) 6.2 cm  
   c) 4.0 cm  
   d) 2.3 cm

32. Luke designs a garden in the shape of a right triangle as shown below.
   
   The total area of the garden is 96 m\(^2\).
   
   Hint:
   
   \[ A = \frac{1}{2}bh \]
   
   Which is closest to the value of \( x \) in the diagram?
   
   a) 6 m  
   b) 8 m  
   c) 32 m  
   d) 64 m
MPM1D1 EQAO Preparation Questions (Number Sense and Algebra)

33. Bob is thinking of a number. He adds 15 to his number and finds that the result is four times his number.

Suppose \( x \) is Bob's number. Which equation is always true?

a. \( 15 - x = \frac{x}{2} \)

b. \( 15 - x = 4x \)

c. \( x + 15 = \frac{x}{4} \)

d. \( x + 15 = 4x \)

35. Josie works in a sports store. She receives 8% of the total sales each day. One day, she receives $35 for her portion of the total sales. What are the total sales for that day?

a. $37.80

b. $43.75

c. $280.00

d. $437.50

36. 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

34. 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
Two different stores sell coffee in cylindrical packages. The prices and dimensions of the packages from the two stores are shown below.

Which is closest to the difference between the unit prices of these two packages?

a $0.04/cm^3$

b $0.05/cm^3$

c $0.09/cm^3$

d $0.24/cm^3$

With $12.00, Sam and a friend are buying lunch from the menu below.

**Menu**

**Soups and Salads**
- Tomato Soup $1.95
- Green Salad $2.25

**Sandwiches**
- Ham & Cheese $4.65
- Turkey $5.15
- Hamburger $3.45

**Beverages**
- Soft Drink $1.35
- Tea/Coffee $0.99
- Juice $1.75

Tax included

Which of the following orders could they buy with their $12.00?

a two soft drinks and two turkey sandwiches

b one tomato soup, one tea and two ham and cheese sandwiches

c one tomato soup, one juice, two green salads and one hamburger

d one soft drink, one tea, one turkey sandwich and one ham and cheese sandwich
39. Asha receives $10,000.
   Asha keeps half his money and gives the rest to Bertha.
   Bertha keeps half her money and gives the rest to Calvin.
   Calvin keeps half his money and gives the rest to Dane.
   Dane keeps half his money and gives the rest to Evanna.
   Which expression shows the dollar amount of money that Evanna receives from Dane?

   a. \( \frac{10,000}{2^4} \)
   b. \( 5000 \times \frac{1}{2} \times \frac{1}{2} \)
   c. \( 10,000 \div \frac{1}{2} \div \frac{1}{2} \div \frac{1}{2} \)
   d. \( 2500 \div 2 \)

40. Two different cylindrical containers are shown below.

   ![Diagram of two cylinders with dimensions](Diagram)

   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
41 Juan would like to order some stationery items from a catalogue. He can spend up to $15.00 but not more.

Guaranteed Low Prices!

- 1st Binder: $3.13/item
- Glue Stick: $2.39/item
- Mechanical Pencil: $4.20/item
- Notebook: $1.96/item
- Stapler: $6.49/item
- Steel Clip: $1.51/item

Plus 15% tax on all items

Which of the following groups of items, including 15% tax, can Juan afford to buy with his $15.00?

- a One binder, one stapler and three steel clips
- b Two steel clips, two binders and two notebooks
- c One notebook, one stapler and one mechanical pencil
- d One binder, one glue stick and two mechanical pencils

42 The advertisement below shows the sale price of a big-digit calculator.

What is the best estimate of the regular price of the big-digit calculator?

- a $12
- b $14
- c $16
- d $18
43 In a soccer league, a win counts for 2 points, a tie counts for 1 point and a loss counts for 0 points. A soccer team has 5 wins, 2 ties and 3 losses.

If the team continues to win, tie and lose in the same ratio, which of the following values is the best prediction of their point total after 40 games?

a 36 points
b 48 points
c 96 points
d 480 points

44 What is the sale price of the skateboard?

Regular Price $180
All items 25% off

a $40.00
b $64.00
c $120.00
d $135.00

45 A frame around a photograph is 5 cm wide.

What percentage of the entire area is the frame?

a 25%
b 33%
c 50%
d 67%
Discussion

Tyler, Raven and Deb are discussing the number of CDs they each own. They find that the following statements are true:

- Tyler owns five more than twice the number of CDs Raven owns.
- Deb owns three times as many CDs as Tyler.

Using \(x\) to represent the number of CDs Raven owns, write an expression for the total number of CDs the three friends own. Show your work and simplify your answer.
What Side?

The perimeter of the triangle below is 75 m.

Determine the measure of each side of the triangle.
Show your work.
48  How High Is It?

The cylinder pictured below has a surface area of 660 cm\(^2\).

![Cylinder Diagram]

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

Surface area = \(2\pi r^2 + 2\pi rh\)

Show your work.
Pizza Puzzle

One weekend, a pizza shop offers two specials for the same price. The pizzas are all the same thickness.

Determine the diameter of the Galileo Special if the two specials contain the same amount of pizza. Show your work.
**Keepin' Tabs**

A student council collects aluminum pop tabs to raise money to purchase a wheelchair. A company buys the pop tabs for $0.88 per kilogram.

If 1267 pop tabs have a mass of one pound, how many pop tabs are needed to purchase a wheelchair worth $1500?

Show your work.

**Hint:**

1 kilogram = 2.2 pounds
Competing Sales

Sam is interested in buying a TV. At Fair Deal, the TV is regularly priced at $599.99 and is on sale for 20% off the regular price. At Big Big Discount, the same TV is regularly priced at $899.99 and is on sale for 30% off the regular price.

What is the difference in the sale price of the TV between these two stores?
Show your work.
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.
Multiple-Choice:
1. D
2. A
3. B
4. D
5. C
6. B
7. D
8. D
9. C
10. B
11. A
12. B
13. F
14. A
15. B
16. A
17. B
18. C
19. D
20. D
21. B
22. D
23. B
24. A
25. D
26. G
27. D
28. B
29. D
30. H
31. C
32. B
33. D
34. C
35. D
36. D
37. A
38. C
39. C
40. D
41. C
42. C
43. B
44. C
45. B
1. 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

2. The graph below represents the relationship between earnings and time worked.

Which of the following points represents the highest rate of pay?

a. M
b. N
c. P
d. Q
3. The following graph shows the relationship between the mass and the cost of four different brands of strawberry jam.

Which statement is true?

a. Brand A has the lowest cost.
b. Brand B has the smallest mass.
c. Brand C has the highest cost per gram.
d. Brand D has the lowest cost per gram.

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

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

a. (5, 500)
b. (9, 850)
c. (10, 1300)
d. (14, 1400)
For a new game, Xiao makes two numbered cubes: one green and one red. She randomly assigns numbers on the six faces of each of the cubes, possibly repeating some numbers.

She rolls the red and the green cubes together nine times. She displays the results in a graph.

**Number Rolled on Green Cube vs. Number Rolled on Red Cube**

Which of the following statements does the data in the graph *most likely* suggest about the cubes?

A. Each cube has fewer than 6 distinct numbers on its faces, as some numbers are repeated on the cubes’ faces.

B. Each cube has 6 distinct numbers on its faces, as no numbers are repeated on the cubes’ faces.

C. The green cube has fewer than 6 distinct numbers on its faces, as some numbers are repeated on the cube’s faces.

D. The red cube has fewer than 6 distinct numbers on its faces, as some numbers are repeated on the cube’s faces.

Sergio sells 7 models of CD players. The table shows the unit cost of each model and the number of CD players of that model sold in the past month.

<table>
<thead>
<tr>
<th>Model</th>
<th>Unit cost ($)</th>
<th>Number sold</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>55</td>
<td>11</td>
</tr>
<tr>
<td>B</td>
<td>70</td>
<td>14</td>
</tr>
<tr>
<td>C</td>
<td>90</td>
<td>17</td>
</tr>
<tr>
<td>D</td>
<td>100</td>
<td>21</td>
</tr>
<tr>
<td>E</td>
<td>120</td>
<td>24</td>
</tr>
<tr>
<td>F</td>
<td>150</td>
<td>29</td>
</tr>
<tr>
<td>G</td>
<td>200</td>
<td>41</td>
</tr>
</tbody>
</table>

Which statement about the relationship between the unit cost and the number of CD players sold is true?

a. There is no relationship between the unit cost and the number sold.

b. As the unit cost increases, the number sold decreases.

c. As the unit cost increases, the number sold is constant.

d. As the unit cost increases, the number sold increases.
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?

a) Distance from Home vs. Time

b) Distance from Home vs. Time

c) Distance from Home vs. Time

d) Distance from Home vs. Time
The graph below shows a runner’s \textit{distance} from the starting point of a race over time.

\begin{center}
\textbf{Distance vs. Time}
\end{center}

The runner
\begin{enumerate}
\item [a] ran at 2 different speeds and took 3 breaks.
\item [b] ran at 3 different speeds and took 2 breaks.
\item [c] always ran at the same speed and took 2 breaks.
\item [d] ran at 5 different speeds.
\end{enumerate}

Last weekend, Jeremy travelled from his home to a friend’s house. The graph below represents the relation between $D$, the distance from Jeremy’s home, and $t$, the time spent travelling to his friend’s house.

\begin{center}
\textbf{Distance from Jeremy’s Home vs. Time Spent Travelling}
\end{center}

This weekend, Jeremy travels to his friend’s house but leaves from school. Jeremy’s school is between his house and his friend’s house.

If he travels at a faster rate this weekend, how will the line representing this trip compare to the line representing the previous trip?

This new line will
\begin{enumerate}
\item [a] start at a higher point and be steeper.
\item [b] start at a higher point and be less steep.
\item [c] start at the current point and be steeper.
\item [d] start at the current point and be less steep.
\end{enumerate}
10. Tyler walks along a line leading from a motion sensor. The graph below shows information about Tyler’s walk.

![Distance from Motion Sensor vs. Time](image)

Which of the following is closest to Tyler’s speed in metres per second as he walks toward the motion sensor?

a) 2.0  
b) 1.3  
c) 0.8  
d) 0.5

11. Beth works at a grocery store. She earns $8/h for her first 20 h of work in a week. She earns $11/h for working beyond 20 h a week.

Which graph shows the relationship between Beth’s earnings and the number of hours she works in a week?

a) ![Graph a](image)  
b) ![Graph b](image)  
c) ![Graph c](image)  
d) ![Graph d](image)
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

The graph below represents the relationship between distance and time on Javier’s walk.

How much greater is Javier’s speed in section p than in section q?

a. 0.5 m/s
b. 1.5 m/s
c. 2.0 m/s
d. 3.0 m/s
14 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.

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.

15 Which of the following could be the slope of a line of best fit for the data shown in the scatter plot below?

- a. -2
- b. -1
- c. 1
- d. 2
16 Duncan records the outside temperature at noon each day. He also records the heating cost per day. The graph shows a scatter plot and a line of best fit for his data.

By approximately how much does the heating cost per day decrease when the outside temperature increases by 5º?

a $1
b $3
c $5
d $7

17 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

18 Gerry has a table of values representing a linear relation. Two of the numbers are hidden behind a ketchup spill.

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>−2</td>
<td>−6</td>
</tr>
<tr>
<td>−1</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>18</td>
</tr>
</tbody>
</table>

The values that are hidden are

a −2 and 14.
b 0 and 12.
c 2 and 10.
d 3 and 9.

19 A bus is rented for a class field trip. The transportation cost for the trip is made up of $225 to rent the bus, $50 for gas and $2 for each bus seat.

Which relation below describes the total transportation cost for the trip if $C$ is the total cost in dollars and $n$ is the number of seats?

a $C = −2n + 225$
b $C = −2n + 275$
c $C = 2n + 225$
d $C = 2n + 275$
The student council sells lollipops for $10 each. They pay $4 for each lollipop and spend $10 to advertise the sale.

*P* represents the student council's profit, in dollars, and *n* represents the number of lollipops sold.

Which equation represents the profit?

a) \( P = 0.06n - 10 \)

b) \( P = 0.06n + 10 \)

c) \( P = 10n + 0.06 \)

d) \( P = 10 + 0.04n \)

The charges on a monthly water bill are $0.86 per m³ of water used plus a service charge of $4.49.

Let \( C \) = total charge, in dollars, and \( w \) = total amount of water used, in m³.

Which equation represents the relationship between \( C \) and \( w \)?

F) \( C = 4.49 \times 0.86w \)

G) \( C = 4.49w + 0.86 \)

H) \( C = 4.49 + 0.86w \)

J) \( C = (4.49 + 0.86)w \)

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) \( P = 14n + 10.05 \)
23 The table below represents a linear relation.

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

Which equation represents this relation?

a \( D = 5t \)  
b \( D = 10t \)  
c \( D = 10t + 5 \)  
d \( D = 5t + 10 \)

24 The table of values below displays the cost of renting a bicycle.

<table>
<thead>
<tr>
<th>Time, ( t ) (h)</th>
<th>Cost, ( C ) ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>25</td>
</tr>
<tr>
<td>1</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>35</td>
</tr>
<tr>
<td>3</td>
<td>40</td>
</tr>
</tbody>
</table>

Which equation models the cost of renting a bicycle?

a \( C = 5t \)  
b \( C = 25t \)  
c \( C = 5t + 25 \)  
d \( C = 25t + 5 \)

25 The graph below represents the cost to belong to a local gym.

Which equation represents the graph?

a \( C = \frac{1}{25}n + 100 \)  
b \( C = \frac{1}{2}n + 100 \)  
c \( C = 2n + 100 \)  
d \( C = 25n + 100 \)
26. Which equation represents the line on the graph?

a. $C = 0.1d + 30$

b. $C = 0.4d + 30$

c. $C = d + 30$

d. $C = 10d + 30$

27. Data on distance travelled and the number of hours spent travelling are shown on the graph below. The line $D = 10n + 30$ is also shown on the graph.

Which equation best represents the line of best fit for the data shown?

a. $D = 5n + 33$

b. $D = 8n + 23$

c. $D = 10n + 18$

d. $D = 12n + 25$
28 Which graph represents the equation $P = -\frac{1}{2}n + 5$?

(a) [Graph A]

(b) [Graph B]

(c) [Graph C]

(d) [Graph D]
29. The following scatter plot shows the relationship between \( N \), the number of pages in Annie’s textbook that she has left to read, and \( t \), the time in minutes she spends reading the book.

Number of Pages Left to Read vs. Time

<table>
<thead>
<tr>
<th>Point</th>
<th>Coordinates</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>(10, 100)</td>
</tr>
<tr>
<td>B</td>
<td>(50, 75)</td>
</tr>
</tbody>
</table>

Which equation represents the line above?

A. \( N = -\frac{1}{2}t + 100 \)
B. \( N = -\frac{1}{2}t + 200 \)
C. \( N = -t + 100 \)
D. \( N = -t + 200 \)

30. A student council is selling tickets to a video dance for $5 each. The cost of the disc jockey and the equipment is $1200. Which of the following graphs represents the relationship between the profit in dollars made by the student council and the number of tickets sold?

A. $\begin{array}{c}
\text{Profit (\$)}
\hline
\text{Number of tickets sold}
\end{array}$

B. $\begin{array}{c}
\text{Profit (\$)}
\hline
\text{Number of tickets sold}
\end{array}$

C. $\begin{array}{c}
\text{Profit (\$)}
\hline
\text{Number of tickets sold}
\end{array}$

D. $\begin{array}{c}
\text{Profit (\$)}
\hline
\text{Number of tickets sold}
\end{array}$
A local community group is organizing a skating event. The group decides how much to charge for tickets to the event and then plots a graph to show the relationship between the money they will make from ticket sales and the number of tickets sold.

According to the graph, how many tickets must the community group sell in order to make $1500?

a  200
b  225
c  250
d  275

A submarine is submerging. The graph shows the distance below sea level the submarine has descended over time.

How far below sea level has the submarine descended after 24 min?

a  300 m
b  325 m
c  350 m
d  375 m
33. A sports company uses the equation \( C = 8t + 5 \) to represent the relationship between the total amount charged to rent a canoe, \( C \), in dollars and the rental time, \( t \), in hours.

What is the initial charge to rent a canoe?

a. \$0  
b. \$5  
c. \$8  
d. \$13

34. 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

35. The cost, \( C \), in dollars to print \( n \) leaflets is given by the formula:

\[ C = 35 + 0.03n. \]

What is the cost of printing 900 leaflets?

a. \$27.00  
b. \$35.00  
c. \$37.70  
d. \$62.00
36 Scientists find that the height of a person, $h$, in centimetres, is related to the length of the person’s femur bone, $f$, in centimetres, according to the following formula:

$$h = 69.09 + 2.24f$$

According to the formula, what is the height of a person with a femur bone of 48.6 cm in length?

- a 109 cm
- b 178 cm
- c 186 cm
- d 347 cm

37 Temira needs to rent a car. She considers the following price equations, where $C$ is the total cost, in dollars, and $n$ is the number of days.

<table>
<thead>
<tr>
<th>Company</th>
<th>Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rentway</td>
<td>$C = 20n + 100$</td>
</tr>
<tr>
<td>Cheapie’s Rentals</td>
<td>$C = 25n + 50$</td>
</tr>
<tr>
<td>Cars Cars Cars</td>
<td>$C = 50n$</td>
</tr>
<tr>
<td>Drive Away</td>
<td>$C = 15n + 125$</td>
</tr>
</tbody>
</table>

Which company should she choose if she is planning to rent the car for at least 10 days?

- F Rentway
- G Cheapie’s Rentals
- H Cars Cars Cars
- J Drive Away

38 Nadia lives 11.4 km from school and rides her bike to school every day.

The equation $d = 11.4 - 0.6t$ represents the relationship between $d$, her distance from school in km, and $t$, her time spent travelling in minutes.

If she leaves home at 8:05 a.m., what time will she get to school?

- a 8:11 a.m.
- b 8:16 a.m.
- c 8:17 a.m.
- d 8:24 a.m.
39 A computer decreases in value over time. The relationship between the value of the computer, \( v \), in dollars after \( t \) years is written as the equation

\[ v = -300t + 2100. \]

A line representing the relationship is graphed.

What does the \( v \)-intercept of the line represent?
F The decrease in value per year
G The initial value of the computer
H The number of years until the value is $0
J The number of years the computer will work

40 The total cost of printing yearbooks is made up of a fixed setup cost, plus a cost per book.

Graph A represents the total cost of printing the yearbooks last year.

Graph B represents the total cost of printing the yearbooks this year.

Which statement is true?

a The fixed setup costs for printing yearbooks last year and this year are the same.

b The fixed setup cost for printing yearbooks this year is lower than the fixed setup cost last year.

c The cost per book for printing this year is more than the cost per book for printing last year.

d The cost per book for printing last year is more than the cost per book for printing this year.
41 The total cost of hiring Beth’s Plumbing Services is represented by the equation \( C = 50t + 70 \), where \( C \) is the total cost in dollars and \( t \) is the time in hours.

Next month, the rate will change to $60 per hour, but the initial charge will stay the same.

Which of the following describes how the graph of the relation will change?

a) The steepness of the line will increase.

b) The steepness of the line will decrease.

c) The vertical intercept will increase by 10 units.

d) The vertical intercept will decrease by 10 units.

42 Identical bottles are packed in a box. The box will hold a maximum of 38 bottles. The relationship between \( M \), the total mass of the box and its contents, and \( n \), the number of bottles in the box, is represented by the equation \( M = 500n + 800 \).

Which of the following are possible integer values for the variable \( n \)?

a) \( n \) is greater than 37.

b) \( n \) is greater than or equal to 0.

b) \( n \) is greater than 0 but less than 39.

d) \( n \) is greater than or equal to 0 but less than 39.

43 Alfredo and his wife, Jody, work in a restaurant.

Last week Alfredo received an average of $15 in tips for each of the 55 tables he served. Jody received an average of $20 in tips for each of the 60 tables she served.

They are planning a weekend trip. Alfredo will pay a total of $220 for their hotel room and Jody will pay a total of $160 for their rental car.

How much of their combined tips will be left over after they have paid for their hotel room and rental car?

a) $1620

b) $1645

c) $2025

d) $2405

44 Theo plans to purchase a new long-distance telephone plan called the Silver Plan. Under this plan, the telephone company determines the monthly cost using the following charges.

- The base fee is $30/month, which includes up to 150 minutes of long distance.

- The cost for all minutes over 150 each month is $0.15/minute.

With the Silver Plan, how much will it cost Theo to talk long-distance for 230 minutes over one month?

F) $12.00

G) $34.50

H) $42.00

J) $64.50
45. 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>22.00</td>
</tr>
<tr>
<td>20</td>
<td>19.00</td>
</tr>
</tbody>
</table>

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

a. $V = 22 - 3t$
b. $V = 22 - 0.30t$
c. $V = 25 - 3t$
d. $V = 25 - 0.30t$

46. Alex’s Rose Shop makes up bouquets and charges for the vase, plus a cost per rose.

- The shop charges $32.85 for a bouquet of 12 roses.
- The shop charges $50.85 for a bouquet of 20 roses.

What does Alex’s Rose Shop charge for a vase?

A. $18.00
B. $8.00
C. $5.85
D. $2.74

47. 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.
48 Two Internet service providers are competing.

The equation $C = 0.04t + 10$ represents the relationship between the total cost, $C$, charged by Internet Connections and the time, $t$.

Surf Away wants always to be cheaper than Internet Connections.

Which of the following equations represents this situation?

A  $C = 15$
B  $C = 0.02t + 11$
C  $C = 0.03t + 9$
D  $C = 0.05t + 8$

49 The graph below shows the relationship between how much a taxi company charges for a ride and the distance travelled.

How far has a customer travelled if the charge for the ride is $9?$

a  4.8 km
b  5.2 km
c  5.8 km
d  6.0 km
50  Natasha works for a computer company. The table shows her annual salary in the last five years.

<table>
<thead>
<tr>
<th>Year</th>
<th>Annual salary ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>32 000</td>
</tr>
<tr>
<td>2</td>
<td>33 600</td>
</tr>
<tr>
<td>3</td>
<td>35 200</td>
</tr>
<tr>
<td>4</td>
<td>36 800</td>
</tr>
<tr>
<td>5</td>
<td>38 400</td>
</tr>
</tbody>
</table>

If the trend continues, what will Natasha’s annual salary be in the 8th year?

a  $40 000  

b  $43 200  

c  $46 400  

d  $49 600  

51  Square gardens are arranged side by side as shown below.

1 garden  4 sides  
3 gardens  10 sides  
5 gardens  16 sides  

Which table of values represents the relationship between the number of gardens and the number of sides?

a  

<table>
<thead>
<tr>
<th>Number of gardens</th>
<th>Number of sides</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>5</td>
<td>20</td>
</tr>
</tbody>
</table>

b  

<table>
<thead>
<tr>
<th>Number of gardens</th>
<th>Number of sides</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>5</td>
<td>16</td>
</tr>
</tbody>
</table>

c  

<table>
<thead>
<tr>
<th>Number of gardens</th>
<th>Number of sides</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>5</td>
<td>16</td>
</tr>
</tbody>
</table>

d  

<table>
<thead>
<tr>
<th>Number of sides</th>
<th>Number of sides</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>5</td>
<td>16</td>
</tr>
</tbody>
</table>
The figures below are made with sticks of equal length. Figure 1 is made with 4 sticks.

![Sticks in figures 1, 2, and 3]

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

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

- **b**

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

- **c**

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

- **d**

<table>
<thead>
<tr>
<th>$n$</th>
<th>$S$</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>17</td>
</tr>
<tr>
<td>6</td>
<td>21</td>
</tr>
<tr>
<td>7</td>
<td>25</td>
</tr>
</tbody>
</table>

---

Mark records his car’s odometer reading. He travels at approximately the same speed for the whole journey and makes only one 30-min rest stop.

<table>
<thead>
<tr>
<th>Time</th>
<th>Reading (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12:00 noon</td>
<td>25 091</td>
</tr>
<tr>
<td>1:00 p.m.</td>
<td>25 178</td>
</tr>
<tr>
<td>2:00 p.m.</td>
<td>25 222</td>
</tr>
<tr>
<td>3:00 p.m.</td>
<td>25 310</td>
</tr>
<tr>
<td>4:00 p.m.</td>
<td>25 395</td>
</tr>
<tr>
<td>5:00 p.m.</td>
<td>25 483</td>
</tr>
</tbody>
</table>

When does Mark most likely make his 30-min rest stop?

- **a** Between 1:00 p.m. and 2:00 p.m.
- **b** Between 2:00 p.m. and 3:00 p.m.
- **c** Between 3:00 p.m. and 4:00 p.m.
- **d** Between 4:00 p.m. and 5:00 p.m.
54 Which table of values shows a linear relation between $C$ and $n$?

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

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

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

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

55 The following tables express distance, in metres, as a function of time, in seconds. Which table represents a linear relation?

<table>
<thead>
<tr>
<th>Time (s)</th>
<th>Distance (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>236</td>
</tr>
<tr>
<td>1</td>
<td>231</td>
</tr>
<tr>
<td>2</td>
<td>216</td>
</tr>
<tr>
<td>3</td>
<td>191</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time (s)</th>
<th>Distance (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>b</td>
<td></td>
</tr>
<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>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time (s)</th>
<th>Distance (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>c</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>28</td>
</tr>
<tr>
<td>1</td>
<td>46</td>
</tr>
<tr>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td>64</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time (s)</th>
<th>Distance (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>d</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>16</td>
</tr>
<tr>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
Which table of values represents a linear relation?

a

<table>
<thead>
<tr>
<th>x</th>
<th>y'</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1/2</td>
</tr>
<tr>
<td>2</td>
<td>2/3</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>4/3</td>
</tr>
</tbody>
</table>

b

<table>
<thead>
<tr>
<th>x</th>
<th>y'</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>15</td>
<td>14</td>
</tr>
</tbody>
</table>

c

<table>
<thead>
<tr>
<th>x</th>
<th>y'</th>
</tr>
</thead>
<tbody>
<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>

d

<table>
<thead>
<tr>
<th>x</th>
<th>y'</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1/2</td>
</tr>
<tr>
<td>5</td>
<td>3/4</td>
</tr>
<tr>
<td>10</td>
<td>1/6</td>
</tr>
<tr>
<td>15</td>
<td>1/8</td>
</tr>
</tbody>
</table>

57 The graph below shows a non-linear relationship between temperature and wind speed.

Which table of values represents this non-linear relationship?

a

<table>
<thead>
<tr>
<th>Wind speed (km/h)</th>
<th>Temperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-20</td>
</tr>
<tr>
<td>10</td>
<td>-30</td>
</tr>
<tr>
<td>20</td>
<td>-40</td>
</tr>
<tr>
<td>30</td>
<td>-60</td>
</tr>
</tbody>
</table>

d

<table>
<thead>
<tr>
<th>Wind speed (km/h)</th>
<th>Temperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-20</td>
</tr>
<tr>
<td>10</td>
<td>-35</td>
</tr>
<tr>
<td>20</td>
<td>-50</td>
</tr>
<tr>
<td>30</td>
<td>-65</td>
</tr>
</tbody>
</table>
58 Inez created the following table of values based on a relationship between $x$ and $y$ and calculated the first differences. The values of $y$ have been concealed.

<table>
<thead>
<tr>
<th>$x$</th>
<th>$y$</th>
<th>First differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td></td>
<td>$-3$</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>$-3$</td>
</tr>
<tr>
<td>13</td>
<td></td>
<td>$-3$</td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Which statement describes the relationship between $x$ and $y$?

a) $y$ increases linearly as $x$ increases.
b) $y$ decreases linearly as $x$ increases.
c) $y$ increases non-linearly as $x$ increases.
d) $y$ decreases non-linearly as $x$ increases.

59 Soheila needs to calculate the first differences for the relations below. Which relation will she find is linear?

a) 

<table>
<thead>
<tr>
<th>Time (in hours)</th>
<th>Distance (km)</th>
<th>First differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>10000</td>
<td></td>
</tr>
</tbody>
</table>

b) 

<table>
<thead>
<tr>
<th>Time (in hours)</th>
<th>Distance (km)</th>
<th>First differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>45</td>
<td></td>
</tr>
</tbody>
</table>

c) 

<table>
<thead>
<tr>
<th>Time (in hours)</th>
<th>Distance (km)</th>
<th>First differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>60</td>
<td></td>
</tr>
</tbody>
</table>

d) 

<table>
<thead>
<tr>
<th>Time (in hours)</th>
<th>Distance (km)</th>
<th>First differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>45</td>
<td></td>
</tr>
</tbody>
</table>
60. Which of the following represents a non-linear relation?

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

61. Study the display on Marie’s graphing calculator.

Which statement describes the relation between \( x \) and \( y \)?

- a. \( y \) increases linearly as \( x \) increases.
- b. \( y \) decreases linearly as \( x \) increases.
- c. \( y \) increases non-linearly as \( x \) increases.
- d. \( y \) decreases non-linearly as \( x \) increases.
In an investigation, a student holds a motion detector, points it at a wall and walks toward the wall.

The student walks slowly at first and then speeds up as he approaches the wall.

Which of the following graphs would be produced on the graphing calculator?

a

b

c

d
Wing Length

Wing length is a reliable method for determining the age of young birds. Below is an example of data for a particular species.

<table>
<thead>
<tr>
<th>Wing length (cm)</th>
<th>Age (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>4</td>
</tr>
<tr>
<td>3.1</td>
<td>8</td>
</tr>
<tr>
<td>3.2</td>
<td>10</td>
</tr>
<tr>
<td>4.1</td>
<td>12</td>
</tr>
<tr>
<td>5.2</td>
<td>16</td>
</tr>
</tbody>
</table>

Determine the age of a bird with a wing length of 3.6 cm.
You may use the grid if you wish.
Justify your answer.
March Temperatures

The average March temperatures for six Ontario communities are plotted according to their latitudes on the following scatter plot.

The city of Kenora has a latitude of 50° and has an average March temperature of \(-6.3\) °C. Does the community of Kenora follow the trend of the data?

Justify your answer.
Dogs Versus Cats

The Bryant Bulldogs basketball team takes the bus to play the Jordan High Thundercats.

Distance from School vs. Time

Describe the three parts of the Bulldogs’ bus trip, using the information on the graph. Include information about distance, time, direction and speed in kilometres per minute for each section of the graph.
Selena's Stroll

The graph below represents 4 segments of Selena's morning walk.

Describe the four segments of Selena's walk.

**Hint**
Include information about:
- direction,
- distance,
- time and
- speed, in m/min.
Hot New Wheels

Cybelle and Peter each buy a car. The graph below represents the value of Cybelle’s car over time.

Peter’s car costs less than Cybelle’s. The value of both cars changes at the same rate.

Determine a possible equation to represent the relationship between the value of Peter’s car, \( V \), in dollars, and time, \( t \), in years.

\( V = \) _____________

Justify your equation.
**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.

Number of visits

Determine the equation for your graph.

\[ C = \text{______________} \]

Explain how you know your equation represents a partial variation.
Follow the Bouncing Ball

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

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

Determine an equation for your line of best fit.

Show your work.

Equation of line of best fit: ____________________________
### Picture Perfect

The cost of producing a family photo album is $0.50 per photo, plus a fixed cost for the album. Circle the table below that represents this scenario.

<table>
<thead>
<tr>
<th>Option 1</th>
<th>Option 2</th>
<th>Option 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of photos, ( p )</strong></td>
<td><strong>Cost, ( C )</strong></td>
<td><strong>Number of photos, ( p )</strong></td>
</tr>
<tr>
<td>5</td>
<td>$2.50</td>
<td>5</td>
</tr>
<tr>
<td>10</td>
<td>$5.00</td>
<td>10</td>
</tr>
<tr>
<td>15</td>
<td>$7.50</td>
<td>15</td>
</tr>
<tr>
<td>20</td>
<td>$10.00</td>
<td>20</td>
</tr>
</tbody>
</table>

Justify your choice and include an explanation of why you did not choose the other options.
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>

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

Show your work.
Counting Pennies

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

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

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

Use the data to determine the number of pennies in the container when the total mass is 185 g. Justify your answer. You may use the grid if you wish.
Population Plans

Alvin is researching the population of Canada. He finds data for the year 2001 and predictions for every 5 years after that, as shown below.

<table>
<thead>
<tr>
<th>Number of years since 2000, $t$</th>
<th>Population (in millions), $P$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>31.1</td>
</tr>
<tr>
<td>6</td>
<td>32.2</td>
</tr>
<tr>
<td>11</td>
<td>33.4</td>
</tr>
<tr>
<td>16</td>
<td>34.4</td>
</tr>
<tr>
<td>21</td>
<td>35.4</td>
</tr>
<tr>
<td>26</td>
<td>36.2</td>
</tr>
</tbody>
</table>

Determine an algebraic model for Alvin's data, and use it to make a reasonable prediction for the population of Canada in 2036.

Justify your answer.
Part-Time Job

Ezra works part-time at a clothing store. He earns $80 per week plus 6% of the value of his weekly sales.

This week Ezra earns $119.

What is the total value of his sales this week?

Show your work.

The total value of his sales is ________________.
Sales Goals

Alexis works part-time at a clothing store. She is paid an hourly rate of $10.25/h and also earns a commission of 3.5% of her total weekly sales.

Alexis works at the store 12 hours a week.

If Alexis’s goal is to earn $150 every week, what do her total weekly sales need to be? Show your work.
To Colour or Not to Colour

The graph below shows the cost to print a document at the Graphics Shop. Line A represents the cost of printing the document in colour. Line B represents the cost to print it with black ink only.

For a 500-page document, how much more will it cost to print in colour than with black ink only?
Show your work.
77 What’s the Charge?

The table below represents the linear relationship between cost and repair time at an appliance store.

<table>
<thead>
<tr>
<th>Repair time, ( t ) (h)</th>
<th>Cost, ( C ) ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>205</td>
</tr>
<tr>
<td>6</td>
<td>385</td>
</tr>
<tr>
<td>8</td>
<td>505</td>
</tr>
</tbody>
</table>

Determine the initial value of this relationship. Show your work.

Initial value: ____________________

Is this relationship a direct or a partial variation?

Circle one:  Direct variation  Partial variation

Justify your answer.
Multiple-Choice:

1. C
2. A
3. D
4. C
5. D
6. D
7. D
8. B
9. A
10. A
11. A
12. C
13. D
14. B
15. C
16. B
17. B
18. C
19. D
20. A
21. H
22. C
23. C
24. C
25. D
26. A
27. B
28. A
29. A
30. A
31. C
32. A
33. B
34. B
35. D
36. B
37. J
38. D
39. G
40. D
41. A
42. D
43. B
44. H
45. C
46. C
47. A
48. C
49. D
50. B
51. D
52. B
53. A
54. D
55. D
56. A
57. B
58. B
59. D
60. A
61. B
62. B
1. P is the point \((-6, 3)\) and Q is the point \((6, 1)\).

Which statement about the line segment PQ is true?

a. It has a positive slope.
b. It has a negative slope.
c. It has a slope of 0.
d. It is parallel to the y-axis.

2. Four points, A, B, C and D, are marked on an xy-plane and joined by line segments as shown.

Which line segment has a negative slope?

a. BA
b. BC
c. CD
d. AD

3. For the slope of a line, the change in \(x\) is greater than the change in \(y\). Which of the following could represent the slope of this line?

a. \(\frac{4}{3}\)
b. 2
c. 1
d. \(\frac{2}{5}\)
4. Line P is shown below.

Which equation represents Line P?

a) $x = 5$

b) $y = 5$

c) $y = x + 5$

d) $x = y + 5$

5. Identify the equation that represents the line with a $y$-intercept of 600 and a slope of 50.

a) $y = 50x$

b) $x = 600y$

c) $y = 600x + 50$

d) $y = 50x + 600$

6. Which graph represents the relation $y = \frac{2}{3}x + 2$?

F

G

H

J
7. Which relation does not have an initial value of 50?
   a. \( y = 50 \)
   b. \( y = 50 + 8x \)
   c. \( y = 50x \)
   d. \( y = 50 - x \)

8. How would the graph of the relation \( y = 3x - 2 \) change if the 3 and -2 were both doubled?
   The graph would be
   a. steeper and have a lower \( y \)-intercept.
   b. steeper and have a higher \( y \)-intercept.
   c. less steep and have a lower \( y \)-intercept.
   d. less steep and have a higher \( y \)-intercept.

9. The graph of a line is shown below.

   If the slope is doubled and the \( y \)-intercept remains constant, which graph below best represents the new line?
   a. 
   b. 
   c. 
   d. 

   ![Graphs](image_url)
10. 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).

11. What is the equation of the line that passes through the points \((2, 4)\) and \((4, 0)\)?
   a. \( y = -\frac{1}{2}x + 2 \)
   b. \( y = -\frac{1}{2}x + 5 \)
   c. \( y = -2x + 4 \)
   d. \( y = -2x + 8 \)

12. Janelle draws a line that passes through the points \((-1, 6)\) and \((0, 3)\). If Janelle writes the equation of the line in \( y = mx + b \) form, what are the values of \( m \) and \( b \)?
   a. \( m = -9 \), \( b = 3 \)
   b. \( m = -3 \), \( b = 6 \)
   c. \( m = -9 \), \( b = 6 \)
   d. \( m = -3 \), \( b = 3 \)

13. Consider the following linear relations.

![Graph of linear relations](image)

Which line represents the graph of the equation \( y = -2x + 5 \)?
   a. Line \( p \)
   b. Line \( q \)
   c. Line \( r \)
   d. Line \( s \)
14. Consider the following graph.

Which statement is false?

a. The slope of AB is $-2$.
b. The slope of CD is 1.
c. The y-intercept of the line through CD is $-4$.
d. The y-intercept of the line through AB is $-1$.

15. Which of the following graphs best represents the line with

- a slope of 3 and
- a y-intercept of $-2$?
16. 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.

17. Rearrange \( 4y - x = 8 \) so that it is in the form \( y = mx + b \).
   a. \( y = x + 8 \)
   b. \( y = -x + 2 \)
   c. \( y = \frac{1}{4}x + 2 \)
   d. \( y = -\frac{1}{4}x + 2 \)

18. Which of the following statements is true for the line \( 5x - 2y - 12 = 0 \)?
   a. The slope is \( \frac{2}{5} \) and the \( y \)-intercept is 12.
   b. The slope is -5 and the \( y \)-intercept is 6.
   c. The slope is 5 and the \( y \)-intercept is -12.
   d. The slope is \( \frac{5}{2} \) and the \( y \)-intercept is -6.

19. Salazar is asked to graph the linear relation represented by \( 2x - 3y + 6 = 0 \).
   What is the \( y \)-intercept of this line?
   A. -6
   B. -2
   C. 2
   D. 6

20. Imagine the graph for the relation \( 4x - 5y + 20 = 0 \).
   What is the slope?
   F. \( \frac{4}{5} \)
   G. -\( \frac{4}{5} \)
   H. \( \frac{5}{4} \)
   J. 4

21. 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. \( y = \frac{1}{3}x - 12 \)
22 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 \(y = 5x + 16\)

23 What are the slope, \(m\), and \(y\)-intercept, \(b\), of the line represented by \(3x - 2y + 16 = 0\)?

- a \(m = \frac{3}{2}, b = 8\)
- b \(m = \frac{2}{3}, b = -16\)
- c \(m = -\frac{2}{3}, b = -8\)
- d \(m = -\frac{3}{2}, b = 16\)

24 The grid below shows the graphs of four linear relations.

Which of the following matches the line with its equation?

A Line 1: \(y = -\frac{3}{2}x + 5\)
B Line 2: \(2x + 3y + 12 = 0\)
C Line 3: \(y = \frac{3}{2}x + 5\)
D Line 4: \(2x - 3y - 12 = 0\)
25. Which of the following represents the graph of the equation $2x - 4y = 8$?

a.

b.

c.

d.

26. Which pair of equations best matches the lines shown on the graph?

a. $L_1: y = x + 5$
   $L_2: y = x - 4$

b. $L_1: y = x + 5$
   $L_2: y = -x + 4$

c. $L_1: y = -x + 5$
   $L_2: y = x - 2$

d. $L_1: y = -x + 5$
   $L_2: y = -x - 4$
27. The following table shows values for a linear relation.

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>-15</td>
<td>-33</td>
</tr>
<tr>
<td>-9</td>
<td>-25</td>
</tr>
<tr>
<td>3</td>
<td>-9</td>
</tr>
<tr>
<td>12</td>
<td>3</td>
</tr>
</tbody>
</table>

Which of the following equations represents the relationship shown in the table of values?

a. \( y = \frac{4}{3}x - 16 \)

b. \( y = \frac{4}{3}x - 13 \)

c. \( y = \frac{3}{4}x - 9 \)

d. \( y = \frac{3}{4}x - 6 \)

28. PQ and RS are parallel line segments. What is the value of \( y \)?

[Diagram with points Q(9, 20), P(6, 10), S(3, y), R(0, -2)]

- a. 5
- b. 6
- c. 7
- d. 8
29. PQ is a line segment with slope $\frac{3}{7}$, as shown below.

The point R is plotted so that RQ is perpendicular to PQ.

Which of the following points could be point R?

- a (1, 5)
- b (2, 4)
- c (3, 2)
- d (4, 1)

30. Donna has correctly drawn a line on an xy-plane.

My line is parallel to the line $y = -x + 1$ and has the same y-intercept as the line $y = -2x + 6$.

Donna

Which of the following equations represents the line that Donna has drawn?

- a $y = x + 3$
- b $y = x + 6$
- c $y = -x + 6$
- d $y = -x + 3$
The following graph shows the quadrilateral $ABCD$. Which of the following statements is false?

A.  $AD$ is parallel to $BC$.
B.  $DC$ is parallel to $AB$.
C.  $CB$ is perpendicular to $AB$.
D.  $DA$ is perpendicular to $AB$.

What is the equation of the line that passes through the point $(2, 0)$ and is parallel to the line $y = -3x + 4$?

a.  $y = 3x + 2$

b.  $y = 3x + 6$

c.  $y = -3x + 2$

d.  $y = -3x + 6$

A line has the following characteristics.
- It is perpendicular to the line $y = \frac{1}{2}x + 3$.
- It passes through the point $(4, 0)$.
What are $m$, the slope, and $b$, the $y$-intercept, of the line?

A.  $m = \frac{1}{2}$; $b = 0$
B.  $m = \frac{1}{2}$; $b = 3$
C.  $m = -2$; $b = 0$
D.  $m = -2$; $b = 8$

Consider the points $A(1, 4), B(6, 3), C(-1, 5), D(-3, 0)$ and $E(2, -1)$. Which line segment is parallel to $AB$?

a.  $AE$

b.  $BE$

c.  $CE$

d.  $DE$
35. What are the coordinates of the point of intersection of the lines \( y = -x + 1 \) and \( x = 3 \)?

- a) (2, 3)
- b) (3, 2)
- c) (3, -2)
- d) (-2, 3)

36. The equations \( y = -x - 5 \) and \( y = 3 \) represent straight lines that intersect.

In which quadrant do they intersect?

- a) 1st
- b) 2nd
- c) 3rd
- d) 4th

37. Which of the following equations is NOT represented by a straight line on a graph?

- A) \( x = 3y - 4 \)
- B) \( y = -2x \)
- C) \( x = 4 \)
- D) \( y = 2x^2 - 2 \)
38 How many of these equations represent straight lines?
   \[
   \begin{align*}
   y &= x - 2 \\
   y &= 2 - 4x \\
   y &= x^2 + 8
   \end{align*}
   \]
   a one  
   b two  
   c three  
   d none

39 Which of the following represents an equation of a line?
   a \( y = 2^x \)  
   b \( y = x^2 - 5 \)  
   c \( x^2 + y^2 - 25 = 0 \)  
   d \( 2x + 3y - 5 = 0 \)

40 Which of the following equations does not represent a linear relation?
   a \( x = -2 \)  
   b \( y = 3x - 1 \)  
   c \( y = x^2 + 3 \)  
   d \( 3x - 2y - 1 = 0 \)

41 Which of the following cannot be an equation of a line?
   a \( x = 2 \)  
   b \( y = 7 \)  
   c \( y = 2x^2 + 7 \)  
   d \( 2x + y + 7 = 0 \)

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

43 The table below shows examples of linear and non-linear equations.

<table>
<thead>
<tr>
<th>Equation Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear equations</td>
</tr>
<tr>
<td>( y = 5x - 3 )</td>
</tr>
<tr>
<td>( y = 125 - 4.25x )</td>
</tr>
<tr>
<td>( y = -3x )</td>
</tr>
</tbody>
</table>

Which of these statements best describes how linear equations are different from non-linear equations in the table above?
   a The exponent of both variables in the linear equations is 1.
   b The exponent of exactly one variable in the linear equations is 1.
   c The exponent of both variables in the non-linear equations is 1.
   d The exponent of exactly one variable in the non-linear equations is 1.
44. A is the point \((-2, 1)\), B is the point \((1, -4)\) and D is the point \((1, 6)\).

If ABCD is a rhombus, which of the following points is point C?

- a \((1, 1)\)
- b \((1, 4)\)
- c \((4, 1)\)
- d \((4, 4)\)

45. Which of the following could be the slope of a line of best fit for the data shown in the scatter plot below?

- a \(-2\)
- b \(-1\)
- c \(1\)
- d \(2\)
46. Consider the following chart and graph.

<table>
<thead>
<tr>
<th>Temperature in degrees Celsius, $C$</th>
<th>Temperature in degrees Fahrenheit, $F$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$5^\circ$</td>
<td>$41^\circ$</td>
</tr>
<tr>
<td>$15^\circ$</td>
<td>$59^\circ$</td>
</tr>
<tr>
<td>$25^\circ$</td>
<td>$77^\circ$</td>
</tr>
</tbody>
</table>

What temperature in degrees Celsius is equivalent to $-20^\circ F$?

a. $-4^\circ C$

b. $-18^\circ C$

c. $-29^\circ C$

d. $-40^\circ C$

47. 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. $y = -2x - 6$

48. 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

49. 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
50  Lineup

The line $y = \frac{1}{5} x + 50$ passes through only one pair of points below.

Which pair of points could the line pass through? Justify your response.
The New Line

A line has

- the same slope as the line represented by $4x - 3y + 15 = 0$ and
- the same $y$-intercept as the line represented by $2x + y + 6 = 0$.

Determine an equation of this line.

Show your work.
Hit the Slopes

Consider the two relations represented below.

<table>
<thead>
<tr>
<th>Relation 1</th>
<th>Relation 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>[5x - 2y = 4]</td>
<td>[Graph of a line passing through the points (0, 2) and (4, 0)]</td>
</tr>
</tbody>
</table>

Determine the slope of the line representing each relation.

Show your work.

Slope of line representing Relation 1: ________________

Slope of line representing Relation 2: ________________

Which of these relations is represented by the steeper line?

__________________________

Justify your answer.
Excellent Equations

A line is perpendicular to the line \( y = 2x + 3 \) and has the same \( x \)-intercept as \( x + 3y + 10 = 0 \).

Find the equation of this line. Express your answer in the form \( y = mx + b \).

Justify your answer.
**Washed Up on the Shore**

A boat is travelling from Point C toward Point D, which is on the shoreline. The shoreline is represented by the line through points A and B.

Determine whether the path from C to D is perpendicular to the shoreline. Justify your answer.
55 Know Your Lines

Consider the equations of the two lines below.

Line A: \[ y = -\frac{3}{2}x - 7 \]

Line B: \[ y = \frac{2}{3}x - 4 \]

Compare Line A and Line B. You may use the grid if you wish.

Justify your answers.

Complete the table below.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Comparison of Line A and Line B, with justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direction from left to right</td>
<td></td>
</tr>
<tr>
<td>Steepness</td>
<td></td>
</tr>
<tr>
<td>Parallel, perpendicular or neither</td>
<td></td>
</tr>
</tbody>
</table>
A Tale of Two Lines

Below are the equations of two lines.
Line A: \( x - 2y + 8 = 0 \)
Line B: \( 2x + y + 1 = 0 \)

Compare the two lines by considering their slopes.
Justify your answer.

Hint:
Include information about
• steepness,
• direction and
• whether the lines are parallel or perpendicular, or whether they are neither.
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 ________________________________.

The possible values for \( C \) are ________________________________.
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.

The possible values of $n$ are ________________________________.

The possible values of $C$ are ________________________________.
Event-full

At Lowell High School, the cost to attend special events depends on whether or not a student has purchased a $10 discount card.

Option A: The student buys a discount card. The cost is $5 per event.

Option B: The student does not buy a discount card. The cost is $7.50 per event.

Graph the relationship between total cost and number of events for each option on the grid.

Determine the conditions under which a student at Lowell High School should choose each option. Justify your answer.
Cellphone Plans

Serge is choosing a cellphone plan and wants the lowest cost. Cell-a-Bration charges $12 per month plus $0.05 per minute for cellphone service. E-Phone charges $28 per month for unlimited minutes.

Determine under which conditions Serge should choose Cell-a-Bration and under which conditions Serge should choose E-Phone.

Justify your answer.
Multiple-Choice:
1. B
2. D
3. D
4. B
5. D
6. F
7. C
8. A
9. B
10. A
11. D
12. D
13. C
14. D
15. D
16. C
17. C
18. D
19. C
20. F
21. B
22. A
23. A
24. B
25. A
26. D
27. B
28. D
29. A
30. C
31. B
32. D
33. D
34. D
35. C
36. B
37. D
38. B
39. D
40. C
41. C
42. C
43. A
44. C
45. C
46. C
47. A
48. B
49. D
1. The figure below shows an isosceles triangle.

What is the value of $m$?

a. $40^\circ$

b. $50^\circ$

c. $60^\circ$

d. $70^\circ$

2. Examine the figure below.

What is the measure of $\angle FEG$?

a. $36^\circ$

b. $54^\circ$

c. $60^\circ$

d. $72^\circ$

3. In the figure, BC is extended to D. $\angle BAC = 42^\circ$ and $\angle ACD = 105^\circ$.

What is the value of $\angle ABC$?

A. $33^\circ$

B. $42^\circ$

C. $52^\circ$

D. $63^\circ$

4. Consider the following diagram.

What is the value of $x$?

a. $14^\circ$

b. $28^\circ$

c. $62^\circ$

d. $76^\circ$
5. A flowerpot hangs from a brace. \( \triangle MNQ \) and \( \triangle MNP \) form the brace.

What is the value of \( x \)?

a. 22°

b. 30°

c. 40°

d. 50°

6. ABC is an equilateral triangle. BC is extended to D so that \( \angle CAD = 25° \).

What is the measure of \( \angle ADC \)?

a. 25°

b. 35°

c. 45°

d. 55°

7. Consider the diagram below:

Which of the following equations is always true?

a. \( x = a + b \)

b. \( x = b + c \)

c. \( x = a - b \)

d. \( x = b - c \)
8. ABC is a triangle. AB is extended to D.

What type of angle is \( \angle CBD \)?

a. A straight angle
b. An obtuse angle
c. An acute angle
d. A reflex angle

9. What is the measure, in degrees, of the sum of the interior angles of a 12-sided regular polygon?

a. 2160°
b. 1800°
c. 1500°
d. 1080°

10. ABCD is a quadrilateral.

What is the measure of \( \angle BAD \)?

F. 108°
G. 120°
H. 132°
J. 144°

11. Consider the diagram below.

Which of the following is the value of \( y \) in the diagram?

a. 55°
b. 70°
c. 125°
d. 130°
12. ABCD is a quadrilateral.

What is the value of $a$?

a. $105^\circ$

b. $115^\circ$

c. $120^\circ$

d. $125^\circ$

13. Consider the diagram below.

What is the value of $y$?

a. $43^\circ$

b. $60^\circ$

c. $137^\circ$

d. $150^\circ$

14. What is the measure of $x$?

a. $95^\circ$

b. $110^\circ$

c. $120^\circ$

d. $132^\circ$

15. The relation shown below can be expressed as $3x + 4y - 180 = 0$.

Another way to write this relation is

a. $y = \frac{3}{4}x - 45$.

b. $y = -\frac{3}{4}x + 45$.

c. $y = -\frac{4}{3}x + 60$.

d. $y = \frac{4}{3}x - 60$. 
16. Consider the diagram below.

![Diagram]

What is the value of $x$?

a. $80^\circ$

b. $120^\circ$

c. $140^\circ$

d. $170^\circ$

17. Teresa needs to cut a piece of wood in order to make a parallelogram. She marks a line on the wood where she will cut.

![Diagram]

What is the size of angle $x$?

a. $25^\circ$

b. $35^\circ$

c. $45^\circ$

d. $55^\circ$

18. In the figure, $PQ$ is parallel to $RS$.

![Diagram]

Which of the following angles has a measure equal to $100^\circ$?

a. $a$

b. $b$

c. $c$

d. $d$


![Circle Graph]

What is the approximate measure of the marked angle?

a. $60^\circ$

b. $90^\circ$

c. $110^\circ$

d. $150^\circ$
20. ABCD is a quadrilateral with all sides the same length. $\angle B = 80^\circ$.

What is the measure of $\angle A$?

a. $80^\circ$

b. $90^\circ$

c. $100^\circ$

d. $110^\circ$

21. In the diagram below, line segment EB bisects $\angle ABD$.

What is the measure of $\angle ABE$?

a. $60^\circ$

b. $65^\circ$

c. $70^\circ$

d. $130^\circ$

22. A parallelogram is inscribed in a quadrilateral as shown.

What is the value of $x$?

a. $48^\circ$

b. $49^\circ$

c. $83^\circ$

d. $97^\circ$

23. 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. $64^\circ$
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
Shazam

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>(x = )</td>
<td></td>
</tr>
<tr>
<td>(y = )</td>
<td></td>
</tr>
</tbody>
</table>
Twinkle Twinkle

Nicole notices the star design shown below on the pavement outside a movie theatre.

Determine the sum of the angle measures in the corners of this star: \( a + b + c + d + e \).
Justify your answer using geometric properties.
What’s Missing?

Consider the diagram 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>( x = ______ )</td>
<td></td>
</tr>
<tr>
<td>( y = ______ )</td>
<td></td>
</tr>
</tbody>
</table>
**Wheels of Fun**

A Ferris wheel has six sides of equal length. The exit ramp of the Ferris wheel is in the shape of a trapezoid and has an angle of incline of 20°.

What are the values of $x$ and $y$?

Use geometric properties to justify your answer.
Geometric Quilts

Paul's grandmother wants to use quilt pieces to make an eight-pointed star like the one shown.

Her quilt pieces are in the shape of a rhombus with two angles of 130°.

Is it possible to make an eight-pointed star using copies of her quilt piece? Justify your answer.
Multiple-Choice

1. A
2. B
3. D
4. C
5. D
6. B
7. A
8. B
9. B
10. J
11. B
12. B
13. B
14. C
15. B
16. C
17. B
18. A
19. D
20. C
21. B
22. D
23. D
24. B