

Solutions

1. Frankie measures a stack of cups to be 20.5 cm high. The number of cups is modelled using the formula

$$h = 7 + 1.5c.$$

- a) Describe the steps to solve the equation.
b) If the formula is rewritten as $1.5c + 7 = h$, will your steps change? Explain.

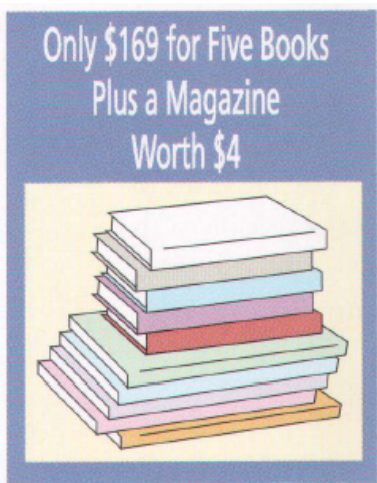
a) $h = 7 + 1.5c$
The height, h , is 20.5 cm
 $\Rightarrow 20.5 = 7 + 1.5c$
Subtract 7 from both sides
 $\Rightarrow 20.5 - 7 = 7 + 1.5c - 7$
 $13.5 = 1.5c$
Divide through by 1.5
 $\Rightarrow \frac{13.5}{1.5} = \frac{1.5c}{1.5}$
 $9 = c \Rightarrow 9 \text{ cups}$

b) No. The process/steps will still be the same.

2. Look at the bookstore flyer. Which statement best defines the variable? Why?

- A Let x represent the number of books.
- B Let x represent the cost of one book.
- C Let x represent the cost of five books.

B



We know there are FIVE books.
The total of the five books plus a magazine (\$4) is \$169.

$$\Rightarrow 5x + 4 = 169$$

of books
Cost of one book
Magazine
Total

3. Look at the pattern of marbles.



- a) Copy and complete the table.
- b) Write an equation that models the pattern.
- c) How many marbles are in diagram 5?
- d) What diagram in the pattern uses 41 marbles?

Diagram	Number of Marbles	Pattern
1	$5 = 2 + 3$	$2 + 3 \times 1$
2	$8 = 2 + 3 + 3$	$2 + 3 \times 2$
3	$11 = 2 + 3 + 3 + 3$	$2 + 3 \times 3$
4	$14 = 2 + 3 + 3 + 3 + 3$	$2 + 3 \times 4$

b) Increases by 3
zero term is 2 $\Rightarrow M = 3n + 2$

of marbles
pattern #

c) $M = 3n + 2$
 $M = 3(5) + 2$
 $M = 15 + 2$
 $M = 17$

\Rightarrow 17 marbles in pattern #5

d) $M = 3n + 2$
 $41 = 3n + 2$
 $41 - 2 = 3n + 2 - 2$
 $39 = \frac{3n}{3}$

$13 = n$
 \Rightarrow pattern #13 has 41 marbles

4. Leo measures the heights of stacks of one, two, and three baskets to be 17 cm, 19 cm, and 21 cm.



- Describe the pattern.
- Predict the height of the next three stacks of baskets.
- Develop a formula for the height of b baskets.
- How many baskets are in a stack that is 65 cm high?

a) increasing by 2 cm

b) 23 cm, 25 cm, 27 cm

c) increases by 2
 $\Rightarrow 2b$
 zero term is 15
 $\Rightarrow h = 2b + 15$

$$\begin{aligned} \text{d) } h &= 2b + 15 \\ 65 &= 2b + 15 \\ 65 - 15 &= 2b + 15 - 15 \\ \frac{50}{2} &= \frac{2b}{2} \Rightarrow 25 \text{ baskets} \\ 25 &= b \end{aligned}$$

5. Orly buys movie tickets over the telephone. Tickets cost \$9.25 each, plus a \$3 service charge for the order.

- What is the price of ordering one ticket? two tickets? three tickets?
- Write a formula to model the price of ordering tickets by telephone.
- Orly pays \$58.50. How many movie tickets does she buy?

$$\text{a) one} = 9.25 + 3 = \$12.25$$

$$\text{two} = 2 \times 9.25 + 3 = 18.50 + 3 = \$21.50$$

$$\text{three} = 3 \times 9.25 + 3 = 27.75 + 3 = \$30.75$$

b) increases by 9.25
 zero term is 3

$$\Rightarrow C = 9.25n + 3$$

$$\begin{aligned} \text{c) } C &= 9.25n + 3 \\ 58.50 &= 9.25n + 3 \\ 58.50 - 3 &= 9.25n + 3 - 3 \\ \frac{55.50}{9.25} &= \frac{9.25n}{9.25} \end{aligned}$$

$$6 = n \Rightarrow \text{Orly bought 6 tickets}$$

6. Kareem is designing a mouse pad to use with his computer. He has a design of a square mouse pad with side length 16 cm. He wants to design a mouse pad with a perimeter of 84 cm. By how much does Kareem have to increase each side length?

$$P = 4x$$

$$84 = \frac{4x}{4}$$

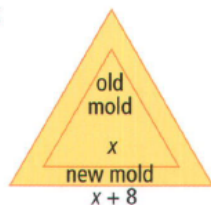
$$21 = x \Rightarrow \text{side length needs to be } 21 \text{ cm}$$

$$P = 4x$$

Perimeter side length

side length needs to be increased by $21 - 16 = 5 \text{ cm}$

7. Wei designs floor tiles using a mould of an equilateral triangle. He increases the length of each side of the triangle mould by 8 cm.



The perimeter of Wei's new mould is 93 cm. What was the original perimeter of his mould?

Equilateral Δ has equal side lengths

$$P_{\text{New}} = x + 8 + x + 8 + x + 8$$

$$P_{\text{New}} = 3x + 24$$

$$P_{\text{Old}} = x + x + x$$

$$P_{\text{Old}} = 3x$$

$$P_{\text{New}} = 3x + 24$$

$$93 = 3x + 24$$

$$93 - 24 = 3x + 24 - 24$$

$$\frac{69}{3} = \frac{3x}{3}$$

$$23 = x$$

$$P_{\text{Old}} = 3x$$

$$P_{\text{Old}} = 3(23)$$

$$P_{\text{Old}} = 69 \text{ cm}$$

\Rightarrow original perimeter was 69 cm

8. Solve each equation using the variables given. What might the variables represent? Justify your answer.

a) $C = 160 + 160t$. Substitute $C = 171.20$.

b) $v = d \div t$. Substitute $v = 52.5$ and $t = 4$.

c) $e = 30h + 25$. Substitute $h = 8\frac{1}{2}$.

a) $C = \text{cost}$
 $t = \text{time}$

$$C = 160 + 160t$$

$$171.20 = 160 + 160t$$

$$171.20 - 160 = 160 + 160t - 160$$

$$\frac{11.20}{160} = \frac{160t}{160}$$

$$0.07 = t$$

b) $v = \text{velocity}$
 $d = \text{distance}$
 $t = \text{time}$

$$v = d \div t$$

$$52.5 = d \div 4$$

$$52.5 \times 4 = d \div 4 \times 4$$

$$210 = d$$

c) $e = 30h + 25$

$$e = 30(8\frac{1}{2}) + 25$$

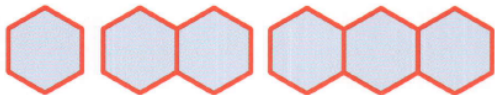
$$e = 255 + 25$$

$$e = 280$$

$h = \# \text{ of tickets}$

$e = \text{total cost}$

9. Filomena decorates the bottom of her jeans. She sews one piece of ribbon along each side of the regular hexagons.



The pattern can be modelled using the formula $r = 1 + 5h$. In the formula, r represents the number of pieces of ribbon and h represents the number of hexagons.

a) Filomena has 96 pieces of ribbon. How many hexagons can she sew together?

b) Filomena has 41 pieces of ribbon. How many hexagons can she sew together?

a) $r = 1 + 5h$

$$96 = 1 + 5h$$

$$96 - 1 = 1 + 5h - 1$$

$$\frac{95}{5} = \frac{5h}{5}$$

$$19 = h \Rightarrow 19 \text{ hexagons}$$

b) $r = 1 + 5h$

$$41 = 1 + 5h$$

$$41 - 1 = 1 + 5h - 1$$

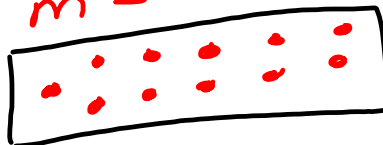
$$\frac{40}{5} = \frac{5h}{5}$$

$$8 = h \Rightarrow 8 \text{ hexagons}$$

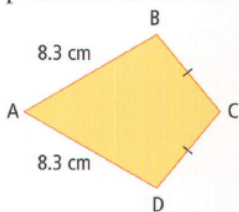
10. Anton developed the formula $m = 1 + 2d$ to model a pattern of marble diagrams.
- a) Describe what the variables could represent.
 - b) What might the fifth diagram look like?

a) $m = \#$ of marbles
 $d =$ diagram #

b) $m = 1 + 2d$
 $m = 1 + 2(5)$
 $m = 1 + 10$
 $m = 11$ marbles



11. a) Develop a formula for the perimeter of the kite.



- b) If the perimeter is 31.4 cm, what is the length of side CD?
- c) If the perimeter is 49.8 cm, what is the relationship among the side lengths? Model your answer using an equation.
- d) Design your own kite. Make sure that sides BC and CD are the same length.

a) $P = 8.3 + 8.3 + x + x$
 $P = 16.6 + 2x$

b) $P = 16.6 + 2x$
 $49.8 = 16.6 + 2x$
 $49.8 - 16.6 = 16.6 + 2x - 16.6$

$\frac{33.2}{2} = \frac{2x}{2} \Rightarrow CD \text{ is } 16.6 \text{ cm}$
 $16.6 = x$

c) Sides BC and CD are double the length of the other two sides.

