For #1 to #5, choose the best answer.

1. What is the solution to $\frac{x}{3} = -12$?

A $x = 36$ **B** $x = 4$

C $x = -4$ **D** $x = -36$

2. The force, F, in newtons, required to stretch a spring a distance, d, in centimetres, is represented by the equation $F = 15d$. If a force of 38 N is used, how far will the spring stretch, to the nearest tenth of a centimetre?

A 0.3 cm   **B** 0.4 cm

C 2.5 cm   **D** 2.6 cm

3. What is the solution to $5n - 7 = -4$?

A $n = \frac{3}{5}$ **B** $n = \frac{4}{5}$

C $n = \frac{11}{5}$ **D** $n = \frac{31}{5}$

4. Which of these equations has the solution $p = -6$?

A $\frac{p}{3} - 4 = -2$ **B** $\frac{p}{3} + 4 = -2$

C $\frac{p}{-3} - 4 = -2$ **D** $\frac{p}{-3} + 4 = -2$

5. Wanda solved the equation $4(x - 3) = 2$ like this:

$$4(x-3) = 2$$
Step 1 $4x - 12 = 8$
Step 2 $4x = 20$
Step 3 $x = 5$

At which step did Wanda make her first mistake?

A Step 1   **B** Step 2

C Step 3   **D** No mistake was made.

Complete the statements in #6 and #7.

6. The opposite operation of division is �.

7. The solution to $-4(y + 10) = 24$ is $y = \blacksquare$.

Short Answer

8. a) Draw a diagram that models the equation $-3x - 4 = 2$.

b) What is the solution to this equation?

9. Dillon used algebra tiles to model a problem.

a) What equation is being modelled?

b) What is the first step that Dillon should take to solve the equation using the algebra tiles?

10. Solve each equation. Verify your solution.

a) $4x = 48$ **b)** $\frac{t}{-5} = -8$

c) $2k - 6 = 31$ **d)** $\frac{d}{7} - 5 = 16$

e) $3 - \frac{n}{4} = 8$ **f)** $12 = 4(x - 2)$

11. a) Describe the steps you would take to solve the equation $-3(b + 3) = -15$.

b) How are these steps different from the steps you would take to solve the equation $-3b + 3 = -15$?

12. The surface elevation of Lake Louise is 1536 m. This elevation is 45 m higher than seven times the elevation of Lake Athabasca.

a) Choose a variable to represent the elevation of Lake Athabasca. Write an equation to model this situation.

b) What is the elevation of Lake Athabasca?

13. The length of a rectangular vegetable garden is to be increased by 3 m. The new garden will have an area of 90 m². Write and then solve an equation to determine the length of the original garden.

5 m

Extended Response

14. a) What is wrong with the method used to solve the following equation?

$$-6 = 18 + 3x$$
$$-6 + 18 = 18 - 18 + 3x$$
$$12 = 3x$$
$$4 = x$$

b) What is the correct method?

15. The formula for the perimeter of a rectangle is $P = 2(l + w)$, where P is the perimeter, l is the length, and w is the width of the rectangle. The perimeter of the rectangle shown is 14 cm.

$w = 3$ cm

a) What is the length of the rectangle? Check your solution.

b) Another rectangle has the same length as the rectangle shown but a perimeter of 12 cm. What is the area of this rectangle?

Wrap It Up!

Report on how different linear equations could be used in everyday situations. Include all five of these types of linear equations:

$ax = b$ $\frac{x}{a} = b, a \neq 0$ $ax + b = c$

$\frac{x}{a} + b = c, a \neq 0$ $a(x + b) = c$

In your report,
• describe a different situation or job for each of the five linear equations
• identify what each variable, constant, and numerical coefficient represents in each of your equations
• solve each of your linear equations, using values appropriate for the situation or job
• identify how one of your equations may change based on the circumstances

1. D

2. $F = 15d$

$$\frac{38}{15} = \frac{15d}{15}$$

$2.5 \, cm = d$ Answer is Ⓒ

3. $5n - 7 \overset{+7}{=} -4^{+7}$

$$\frac{5n}{5} = \frac{3}{5}$$

$n = \frac{3}{5}$ Answer is Ⓐ

4. Answer is Ⓒ:

$$\frac{-6}{-3} - 4 = -2$$

$2 - 4 = -2$
$-2 = -2$ ✓

5. Ⓐ - step 1 is not correct:
Wanda should not have
multiplied the "2" on the
right side by 4.

6. Multiplication

7. $\dfrac{-4(y + 10)}{-4} = \dfrac{24}{-4}$

$y + 10 = -6 \quad -10$
$y = -16$

8.

a)

b)

$\rightarrow -x = 2$

"cover
← up"
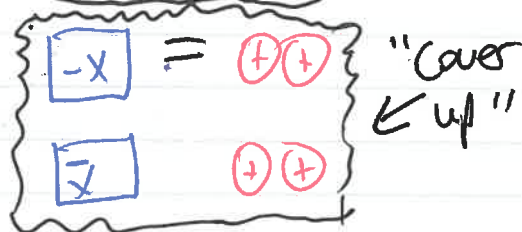
if: $\dfrac{-x}{-1} = \dfrac{2}{-1}$ } divide by (-1) to make x positive.

$x = 2$

9. a) $2x - 8 = 6$

b) Add eight to both sides.

10. a) $\dfrac{4x}{4} = \dfrac{48}{4}$ Verify

$x = 12$ $4(12) = 48$
$48 = 48$ ✓

b) $\dfrac{t + 5}{-5} = -8 \times -5$ verify

$t = 40$ $\dfrac{40}{-5} = -8$
$-8 = -8$ ✓

10c) $2k - 6^{+6} = 31 + 6$ | Verify

$\dfrac{2k}{2} = \dfrac{37}{2}$ | $2(18.5) - 6 = 31$

| $37 - 6 = 31$

$k = 18.5$ | $31 = 31$ ✓

10d) $\dfrac{d}{7} - 5^{+5} = 16 + 5$ | Verify

$\dfrac{d \times 7}{7} = 21 \times 7$ | $\dfrac{147}{7} - 5 = 16$

| $21 - 5 = 16$

$d = 147$ | $16 = 16$ ✓

10e) $3^{-3} - \dfrac{n}{4} = 8 - 3$ | Verify

$-\dfrac{n \times (-4)}{4} = 5 \times (-4)$ | $3 - \dfrac{(-20)}{4} = 8$

| $3 - (-5) = 8$

$n = -20$ | $8 = 8$ ✓

10f) $\dfrac{12}{4} = \dfrac{4(x-2)}{4}$ | Verify

| $12 = 4(5 - 2)$

$3^{+2} = x - 2^{+2}$ | $12 = 4(3)$

| $12 = 12$ ✓

$5 = x$

11 a) divide by -3, then subtract 3

b) Subtract 3, then divide by (-3)

12. ℓ is Lake Louise , a is lake Athabasca

$\boxed{\ell = 1536\,m}$

Substitute

$\rightarrow \ell = 7a + 45$

$1536 = 7a + 45 \quad ^{-45} \quad ^{+45}$

$\dfrac{1491}{7} = \dfrac{7a}{7}$

$213 = a.$

Lake Athabasca has an elevation of 213m

13.

$A = 90m$ | $5m$ (width) ↑↓

← ? length →

$(\ell + 3)$

$A = \ell \times w$

$A = (\ell + 3) \times w$

$A = w(\ell + 3)$

$\dfrac{90}{5} = \dfrac{5(\ell + 3)}{5}$

$18 \overset{-3}{=} \ell + 3 \,^{-3}$

$15 = \ell$
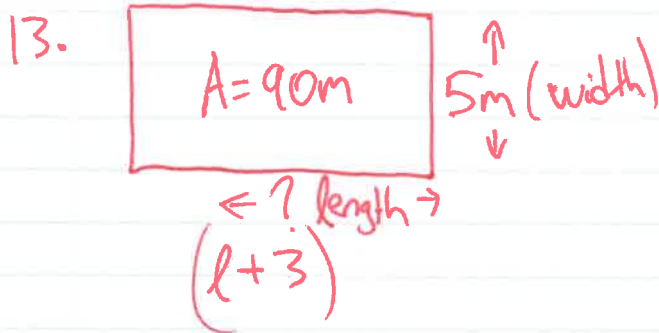
The original length of the garden was 15m.

14)a) Needed to subtract 18 from the left side, rather than add

b)

15a) $P = 2(l + w)$

$\dfrac{14}{2} = \dfrac{2(l + 3)}{2}$

$7 \overset{=}{=} l + 3 \; {}^{-3}$

$4 = l$

Verify

$14 = 2(4 + 3)$

$14 = 2(7)$

$14 = 14 \checkmark$

The length of the rectangle is 4

b) $P = 2(l + w)$

$\dfrac{12}{2} = \dfrac{2(4 + w)}{2}$

$6 \overset{=}{=} 4 + w \quad {}^{-4}$

$2 = w$

$A = l \times w$

$A = 4 \times 2$

$A = 8 m^2$