Exercise Solutions

Exercise 1
1. \(x + 5 - 5 = 27 - 5\)
   \(x = 22\)
2. \(x - 3 + 3 = 19 + 3\)
   \(= 2\)
3. \(33 - 3 = x + 3 - 3\)
   \(30 = x\)
4. \(14 + 7 = x - 7 + 7\)
   \(21 = x\)

Exercise 2
1. \(23 + 4 = x + 5 + 11\)
   \(27 - 16 = x + 16 - 16\)
   \(11 = x\)
2. \(16 - 3 = x - 10 + 7\)
   \(13 + 3 = x - 3 + 3\)
   \(16 = x\)
3. \(x - 31 - 12 = 15 - 13\)
   \(x - 43 + 43 = 2 + 43\)
   \(x = 45\)
4. \(x + 20 - 36 = 19 - 14\)
   \(x - 16 + 16 = 5 + 16\)
   \(x = 21\)

Exercise 3
1. \(\frac{2x}{2} = \frac{14}{2}\)
   \(x = 7\)
2. \(\frac{x}{9} \times 9 = 6 \times 9\)
   \(x = 54\)
3. \(\frac{110}{11} = \frac{11x}{11}\)
   \(10 = x\)
4. \(12 \times 7 = \frac{x}{7} \times 7\)
   \[84 = x\]

Exercise 4

1. \(10x = (4)(5)\)
   \[
   \frac{10x}{10} = \frac{20}{10}
   \]
   \[x = 2\]

2. \(\frac{x}{3} = \frac{63}{9}\)
   \[
   \frac{x}{3} \times 3 = \frac{7 \times 3}{3}
   \]
   \[x = 21\]

3. \((14)(2) = 7x\)
   \[
   \frac{28}{7} = \frac{7x}{7}
   \]
   \[4 = x\]

4. \(\frac{48}{4} = \frac{x}{5}\)
   \[
   12 \times 5 = \frac{x}{5} \times 5
   \]
   \[60 = x\]

Problem Set Solutions

1. a) \(x + 4 - 4 = 12 - 4\)
   \[x = 8\]

   b) \(19 + 11 = x - 11 + 11\)
   \[30 = x\]

   c) \(-27 = x - 15 - 34\)
   \[-27 + 49 = x - 49 + 49\]
   \[22 = x\]

   d) \(71 - 36 = x + 15 + 8\)
   \[35 - 23 = x + 23 - 23\]
   \[12 = x\]
e) \[-126 + 14 + x = 6 - 20\]
\[-112 + x + 112 = -14 + 112\]
\[x = 98\]

f) \[47 - 21 + 8 = 16 + x - 58\]
\[34 + 42 = x - 42 + 42\]
\[76 = x\]

2. a) \[\frac{6x}{6} = \frac{48}{6}\]
\[x = 8\]

b) \[4 \times 8 = \frac{x}{8} \times 8\]
\[32 = x\]

c) \[6x = (12)(3)\]
\[\frac{6x}{6} = \frac{36}{6}\]
\[x = 6\]

d) \[\frac{27}{3} = \frac{x}{9}\]
\[9 \times 9 = \frac{x}{9} \times 9\]
\[81 = x\]

e) \[\frac{(10)(6)}{5} - 3^2 = \frac{x}{4}\]
\[(12 - 9) \times 4 = \frac{x}{4} \times 4\]
\[12 = x\]

f) \[\frac{(6)(3)}{4} - \frac{(7)(12)}{4} = \frac{x}{8} - (5)(2)\]
\[18 - 21 + 10 = \frac{x}{8} - 10 + 10\]
\[7 \times 8 = \frac{x}{8} \times 8\]
\[56 = x\]

3. Let \(x\) be Linlin’s present age

\[x - 17 = 8\]
\[x - 17 + 17 = 8 + 17\]
\[x = 25\]

\[\therefore\] Linlin is now 25.
4. Let \( x \) be the amount of bridge that Jon must build.

\[
\begin{align*}
x + 3 &= 17 \\
x + 3 - 3 &= 17 - 3 \\
x &= 14
\end{align*}
\]

\( \because \) Jon must build 14 metres more of the bridge.

5. Let \( x \) be the number of green shoes.

\[
\begin{align*}
x + 2 + 3 + 1 &= 9 \\
x + 6 - 6 &= 9 - 6 \\
x &= 3
\end{align*}
\]

\( \because \) 3 pairs of shoes are green.

6. Let \( x \) be the amount of change that Gary received.

\[
\begin{align*}
x + 56.95 &= 2(50) \\
x + 56.95 - 56.95 &= 100 - 56.95 \\
x &= 43.05
\end{align*}
\]

\( \because \) Gary received $43.05

7. Let \( x \) be the number of hockey cards Matt bought.

\[
\begin{align*}
8x &= 96 \\
\frac{8x}{8} &= \frac{96}{8} \\
x &= 12
\end{align*}
\]

\( \because \) Matt bought 12 cards.

8. Let \( x \) be the time Gabby took to finish her training.

\[
\begin{align*}
\frac{60}{15} &= \frac{x}{25} \\
4 \times 25 &= \frac{x}{25} \times 25 \\
100 &= x
\end{align*}
\]

\( \because \) It took 100 minutes to finish the training.

9. Let \( x \) be the number of gum balls Sarah bought

\[
\begin{align*}
25 - 3x &= 16 \\
25 - 3x - 25 &= 16 - 25 \\
-3x &= -9 \\
\frac{-3x}{-3} &= \frac{-9}{-3} \\
x &= 3
\end{align*}
\]

\( \because \) Sarah bought 3 gum balls.
10. Let \( x \) be the other number.

\[
-36 + x = 32
\]
\[
-36 + x + 36 = 32 + 36
\]
\[
x = 68
\]

\[\therefore \text{The other number is 68.}\]

11. Let \( x \) be the number as described in the question

\[
\frac{1}{3} x = 30
\]
\[
\frac{1}{3} x \times 3 = 30 \times 3
\]
\[
x \times 3 = 90 \times 3
\]
\[
3x = 270
\]

\[\therefore 3x \text{ is 270}\]

12. Let \( x \) be the number

\[
59 = 9x + 5
\]
\[
59 - 5 = 9x + 5 - 5
\]
\[
\frac{54}{9} = \frac{9x}{9}
\]
\[
6 = x
\]

13. Let \( a \) be as described in the question

\[
b + c = 18
\]
\[
b + 12 = 18
\]
\[
b + 12 - 12 = 18 - 12
\]
\[
b = 6
\]

\[
a + b = 33
\]
\[
a + 6 = 33
\]
\[
a + 6 - 6 = 33 - 6a = 27
\]

\[\therefore a \text{ is 27}\]

14. Let \( s, k, \) and \( b \) be the prices of the soccer ball, basketball and baseball respectively.

\[
s + k + b = 75 \quad (1)
\]
\[
s + 3k + b = 129 \quad (2)
\]
\[
s + k + 4b = 117 \quad (3)
\]
\[(3) - (1) = 117 - 75\]  \[\text{and}\]
\[(2) - (1) = 129 - 75\]
\[s + k + 4b - (s + k + b) = 42\]  \[s + 3k + b - (s + k + b) = 54\]
\[s + k + 4b - s - k - b = 42\]  \[s + 3k + b - s - k - b = 54\]
\[
\begin{align*}
3b &= 42 \\
\frac{3b}{3} &= \frac{42}{3} \\
b &= 14
\end{align*}
\[
\begin{align*}
2k &= 54 \\
\frac{2k}{2} &= \frac{54}{2} \\
k &= 27
\end{align*}
\]

Going back to equation (1), we have
\[
\begin{align*}
s + k + b &= 75 \\
s + 27 + 14 &= 75 \\
s + 41 - 41 &= 75 - 41 \\
s &= 34
\end{align*}
\]
\[\therefore \text{Soccer balls cost}\$34\text{ each.}\]

15. Let \(x\) be the amount of dough (in grams) needed.
\[
\begin{align*}
\frac{10}{15} &= \frac{x}{120} \\
\frac{2}{3} \times 120 &= \frac{x}{120} \times 120 \\
80 &= x
\end{align*}
\]
\[\therefore \text{80 grams of dough is needed.}\]

16. Let \(x\) be the cost to rent the building for a month.
\[
(15)(20) - x = 150
\]
\[
300 - x - 300 = 150 - 300
\]
\[
x = -150
\]
\[
x = 150
\]
\[\therefore \text{It costs}\$150\text{ to rent the building for a month.}\]

17. Let \(j\) and \(m\) be Jessica’s age and her mother’s age respectively.
\[
\begin{align*}
j \times 10 &= \frac{1}{10}m \times 10 \\
j &= \frac{1}{10}m \\
j &= m \quad (1) \\
7(j + 1) &= m + 1 \quad (2)
\end{align*}
\]
Using substitution, we get

\[7(j + 1) = (10j) + 1\]
\[7j + 7 = 10j + 1\]
\[7j + 7 - 7j = 10j + 1 - 7j\]
\[7 - 1 = 3j + 1 - 1\]
\[6 = \frac{3j}{3}\]
\[2 = j \quad \Rightarrow \quad m = 20\]

\[\therefore \text{The difference in their ages is 18 years}\]

18. Let \(x\) be the number of shovels of concrete needed.

\[\frac{4}{1} = \frac{x}{350}\]
\[4 \times 350 = \frac{x}{350} \times 350\]
\[1400 = x\]

\[\therefore \text{1400 shovels of stone is required.}\]

19. Let \(l, s,\) and \(t\) be the largest, smallest and third angles respectively.

\[l = 35 + s \quad \text{(1)}\]
\[t = s + 10 \quad \text{(2)}\]
\[180 = l + s + t \quad \text{(3)}\]

Substituting equations (1) and (2) into equation (3), we have

\[180 = (35 + s) + s + (s + 10)\]
\[180 - 45 = 3s + 45 - 45\]
\[135 = \frac{3s}{3}\]
\[45 = s\]

\[\therefore \text{The number of degrees of the smallest angle is 45.}\]

20. a) \(x\)

b) \(x^2\)

c) \(x^2 + x\)

d) \(\frac{x^2 + x}{x} = x + 1\)

e) \(x + 1 + 20 = x + 21\)
f) \( x + 21 - x = 21 \)

g) \( \frac{21}{7} = 3 \)