Exercise Solutions

Exercise 1

1. $$\begin{aligned} x + 5 - 5 &= 27 - 5 \\ x &= 22 \end{aligned}$$

2. $$\begin{aligned} x - 3 + 3 &= 19 + 3 \\ &= 2 \end{aligned}$$

3. $$\begin{aligned} 33 - 3 &= x + 3 - 3 \\ 30 &= x \end{aligned}$$

4. $$\begin{aligned} 14 + 7 &= x - 7 + 7 \\ 21 &= x \end{aligned}$$

Exercise 2

1. $$\begin{aligned} 23 + 4 &= x + 5 + 11 \\ 27 - 16 &= x + 16 - 16 \\ 11 &= x \end{aligned}$$

2. $$\begin{aligned} 16 - 3 &= x - 10 + 7 \\ 13 + 3 &= x - 3 + 3 \\ 16 &= x \end{aligned}$$

3. $$\begin{aligned} x - 31 - 12 &= 15 - 13 \\ x - 43 + 43 &= 2 + 43 \\ x &= 45 \end{aligned}$$

4. $$\begin{aligned} x + 20 - 36 &= 19 - 14 \\ x - 16 + 16 &= 5 + 16 \\ x &= 21 \end{aligned}$$

Exercise 3

1. $$\begin{aligned} \frac{2x}{2} &= \frac{14}{2} \\ x &= 7 \end{aligned}$$

2. $$\begin{aligned} \frac{x}{9} \times 9 &= 6 \times 9 \\ x &= 54 \end{aligned}$$

3. $$\begin{aligned} \frac{110}{11} &= \frac{11x}{11} \\ 10 &= x \end{aligned}$$

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. $\frac{x}{3} = \frac{63}{9}$

$\frac{x}{3} \times 3 = 7 \times 3$

$x = 21$

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) $$\begin{aligned} -126 + 14 + x &= 6 - 20 \\ -112 + x + 112 &= -14 + 112 \\ x &= 98 \end{aligned}$$

f) $$\begin{aligned} 47 - 21 + 8 &= 16 + x - 58 \\ 34 + 42 &= x - 42 + 42 \\ 76 &= x \end{aligned}$$

2. a) $$\begin{aligned} \frac{6x}{6} &= \frac{48}{6} \\ x &= 8 \end{aligned}$$

b) $$\begin{aligned} 4 \times 8 &= \frac{x}{8} \times 8 \\ 32 &= x \end{aligned}$$

c) $$\begin{aligned} 6x &= (12)(3) \\ \frac{6x}{6} &= \frac{36}{6} \\ x &= 6 \end{aligned}$$

d) $$\begin{aligned} \frac{27}{3} &= \frac{x}{9} \\ 9 \times 9 &= \frac{x}{9} \times 9 \\ 81 &= x \end{aligned}$$

e) $$\begin{aligned} \frac{(10)(6)}{5} - 3^2 &= \frac{x}{4} \\ (12 - 9) \times 4 &= \frac{x}{4} \times 4 \\ 12 &= x \end{aligned}$$

f) $$\begin{aligned} (6)(3) - \frac{(7)(12)}{4} &= \frac{x}{8} - (5)(2) \\ 18 - 21 + 10 &= \frac{x}{8} - 10 + 10 \\ 7 \times 8 &= \frac{x}{8} \times 8 \\ 56 &= x \end{aligned}$$

3. Let x be Linlin's present age

$$\begin{aligned} x - 17 &= 8 \\ x - 17 + 17 &= 8 + 17 \\ x &= 25 \end{aligned}$$

$\therefore$ Linlin is now 25.

4. Let x be the amount of bridge that Jon must build.

$$\begin{aligned} x + 3 &= 17 \\ x + 3 - 3 &= 17 - 3 \\ x &= 14 \end{aligned}$$

$\therefore$ Jon must build 14 metres more of the bridge.

5. Let x be the number of green shoes.

$$\begin{aligned} x + 2 + 3 + 1 &= 9 \\ x + 6 - 6 &= 9 - 6 \\ x &= 3 \end{aligned}$$

$\therefore$ 3 pairs of shoes are green.

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

$$\begin{aligned} x + 56.95 &= 2(50) \\ x + 56.95 - 56.95 &= 100 - 56.95 \\ x &= 43.05 \end{aligned}$$

$\therefore$ Gary received \$43.05

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

$$\begin{aligned} 8x &= 96 \\ \frac{8x}{8} &= \frac{96}{8} \\ x &= 12 \end{aligned}$$

$\therefore$ Matt bought 12 cards.

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

$$\begin{aligned} \frac{60}{15} &= \frac{x}{25} \\ 4 \times 25 &= \frac{x}{25} \times 25 \\ 100 &= x \end{aligned}$$

$\therefore$ It took 100 minutes to finish the training.

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

$$\begin{aligned} 25 - 3x &= 16 \\ 25 - 3x - 25 &= 16 - 25 \\ \frac{-3x}{-3} &= \frac{-9}{-3} \\ x &= 3 \end{aligned}$$

$\therefore$ Sarah bought 3 gum balls.

10. Let x be the other number.

$$\begin{aligned} -36 + x &= 32 \\ -36 + x + 36 &= 32 + 36 \\ x &= 68 \end{aligned}$$

$\therefore$ The other number is 68.

11. Let x be the number as described in the question

$$\begin{aligned} \frac{1}{3}x &= 30 \\ \frac{1}{3}x \times 3 &= 30 \times 3 \\ x \times 3 &= 90 \times 3 \\ 3x &= 270 \end{aligned}$$

$\therefore$ $3x$ is 270

12. Let x be the number

$$\begin{aligned} 59 &= 9x + 5 \\ 59 - 5 &= 9x + 5 - 5 \\ \frac{54}{9} &= \frac{9x}{9} \\ 6 &= x \end{aligned}$$

13. Let a be as described in the question

$$\begin{aligned} b + c &= 18 \\ b + 12 &= 18 \\ b + 12 - 12 &= 18 - 12 \\ b &= 6 \end{aligned}$$

$$\begin{aligned} a + b &= 33 \\ a + 6 &= 33 \\ a + 6 - 6 &= 33 - 6a \qquad = 27 \end{aligned}$$

$\therefore$ a is 27

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

$$s + k + b = 75 \tag{1}$$
$$s + 3k + b = 129 \tag{2}$$
$$s + k + 4b = 117 \tag{3}$$

$$\begin{aligned}(3)-(1) &= 117-75\\ s+k+4b-(s+k+b) &= 42\\ s+k+4b-s-k-b &= 42\\ \frac{3b}{3} &= \frac{42}{3}\\ b &= 14\end{aligned}$$

$$\begin{aligned}(2)-(1) &= 129-75\\ s+3k+b-(s+k+b) &= 54\\ s+3k+b-s-k-b &= 54\\ \frac{2k}{2} &= \frac{54}{2}\\ k &= 27\end{aligned}$$

Going back to equation (1), we have

$$\begin{aligned}s+k+b &= 75\\ s+27+14 &= 75\\ s+41-41 &= 75-41\\ s &= 34\end{aligned}$$

$\therefore$ Soccer balls cost \$34 each.

15. Let x be the amount of dough (in grams) needed.

$$\begin{aligned}\frac{10}{15} &= \frac{x}{120}\\ \frac{2}{3}\times 120 &= \frac{x}{120}\times 120\\ 80 &= x\end{aligned}$$

$\therefore$ 80 grams of dough is needed.

16. Let x be the cost to rent the building for a month.

$$\begin{aligned}(15)(20)-x &= 150\\ 300-x-300 &= 150-300\\ -x &= -150\\ x &= 150\end{aligned}$$

$\therefore$ It costs \$150 to rent the building for a month.

17. Let j and m be Jessica's age and her mother's age respectively.

$$\begin{aligned}j\times 10 &= \frac{1}{10}m\times 10\\ 10j &= m && (1)\\ 7(j+1) &= m+1 && (2)\end{aligned}$$

Using substitution, we get

$$\begin{aligned} 7(j+1) &= (10j)+1 \\ 7j+7 &= 10j+1 \\ 7j+7-7j &= 10j+1-7j \\ 7-1 &= 3j+1-1 \\ \frac{6}{3} &= \frac{3j}{3} \\ 2 &= j \Rightarrow m = 20 \end{aligned}$$

$\therefore$ The difference in their ages is 18 years

18. Let x be the number of shovels of concrete needed.

$$\begin{aligned} \frac{4}{1} &= \frac{x}{350} \\ 4 \times 350 &= \frac{x}{350} \times 350 \\ 1400 &= x \end{aligned}$$

$\therefore$ 1400 shovels of stone is required.

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

$$l = 35 + s \tag{1}$$
$$t = s + 10 \tag{2}$$
$$180 = l + s + t \tag{3}$$

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

$$\begin{aligned} 180 &= (35+s)+s+(s+10) \\ 180-45 &= 3s+45-45 \\ \frac{135}{3} &= \frac{3s}{3} \\ 45 &= s \end{aligned}$$

$\therefore$ The number of degrees of the smallest angle is 45.

20. a) x

    b) x^2

    c) $x^2 + x$

    d) $\dfrac{x^2+x}{x} = x+1$

    e) $x + 1 + 20 = x + 21$

f) $x + 21 - x = 21$

g) $\dfrac{21}{7} = 3$