

3-4 Using Equations to Solve Problems

Objective: To use the five-step plan to solve word problems.

Example 1 The sum of 25 and twice a number is 93. Find the number.

Solution

Steps 1, 2 Let n = the number. Then $2n$ = twice the number.

Step 3 The sum of 25 and twice a number is 93.

$$25 + 2n = 93$$

Step 4 Solve. $25 - 25 + 2n = 93 - 25$

$$2n = 68$$

$$n = 34$$

Step 5 *Check in the words of the problem:* Is the sum of 25 and twice 34 equal to 93?

$$25 + 2(34) \stackrel{?}{=} 93$$

$$25 + 68 \stackrel{?}{=} 93$$

$$93 = 93 \checkmark \quad \text{The number is 34.}$$

Solve each problem using the five-step plan to help you.

1. The sum of 17 and twice a number is 87.

Find the number.

2. The sum of 8 and three times a number is 128.

Find the number.

3. Seven more than twice a number is 175.

Find the number.

4. Four less than half a number is 15.

Find the number.

5. When one half of a number is decreased

by 13, the result is 62. Find the number.

6. Six less than two thirds of a number is 18.

Find the number.

Example 2 Find four consecutive even integers whose sum is 44.

Solution

Steps 1, 2 Let n = the first integer. Then $n + 2$ = the second integer,
 $n + 4$ = the third integer, and $n + 6$ = the fourth integer.

Step 3 The sum of the four consecutive even integers is 44.

$$n + (n + 2) + (n + 4) + (n + 6) = 44$$

Step 4 Solve.

$$4n + 12 = 44$$

$$4n = 32$$

$$n = 8 \quad \text{---the first integer}$$

$$n + 2 = 10 \quad \text{---the second integer}$$

$$n + 4 = 12 \quad \text{---the third integer}$$

$$n + 6 = 14 \quad \text{---the fourth integer}$$

Step 5 *Check:* $8 + 10 + 12 + 14 \stackrel{?}{=} 44$

$$44 = 44 \checkmark \quad \text{The numbers are 8, 10, 12, and 14.}$$

3-4 Using Equations to Solve Problems (continued)

Solve each problem using the five-step plan to help you.

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|---|---|
| 7. Find three consecutive integers whose sum is 138. | 8. Find three consecutive odd integers whose sum is 87. |
| 9. Find three consecutive even integers whose sum is 150. | 10. Find four consecutive odd integers whose sum is 144. |
| 11. Find five consecutive integers whose sum is 160. | 12. Otto has \$140. If he saves \$2.50 per week, how long will it take him to have \$200? |

Example 3 The length of a rectangle is 9 cm more than the width. The perimeter is 78 cm. Find the length and the width.

Solution

Step 1 Draw a diagram to help you understand the problem.

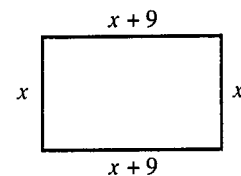
Step 2 Let x = the width. Then $x + 9$ = the length.

Step 3
$$\begin{aligned} \text{perimeter} &= 78 \\ x + (x + 9) + x + (x + 9) &= 78 \end{aligned}$$

Step 4 Solve.
$$\begin{aligned} 4x + 18 &= 78 \\ 4x &= 60 \\ x &= 15 \quad \text{and} \quad x + 9 = 24 \end{aligned}$$

Step 5 *Check:* Is the sum of the lengths of the sides 78 cm?

$$\begin{aligned} 15 + 24 + 15 + 24 &\stackrel{?}{=} 78 \\ 78 &= 78 \checkmark \quad \text{The width is 15 cm. The length is 24 cm.} \end{aligned}$$



Solve each problem using the five-step plan. Draw a diagram to help you.

13. The length of a rectangle is 11 cm more than the width. The perimeter is 90 cm. Find the length and width of the rectangle.
14. The width of a rectangle is 12 cm less than the length. The perimeter is 120 cm. Find the length and width of the rectangle.
15. The perimeter of a rectangle is 232 cm and the width is 56 cm. Find the length of the rectangle.
16. The perimeter of a rectangle is 340 cm and the length is 90 cm. Find the width of the rectangle.

Mixed Review Exercises

Solve.

1. $-3 + y = 2$

2. $x - 1.2 = 6$

3. $y + 6 = 15$

4. $\frac{2}{3}y = 6$

5. $-15 = \frac{c}{2}$

6. $-\frac{1}{5}x = 12$

7. $31 = y - 9$

8. $x - 15 = 16$

9. $0.25y = 8$

10. $3y + 2 = 17$

11. $2x - 3 = 15$

12. $3(a - 1) + 5 = 32$