

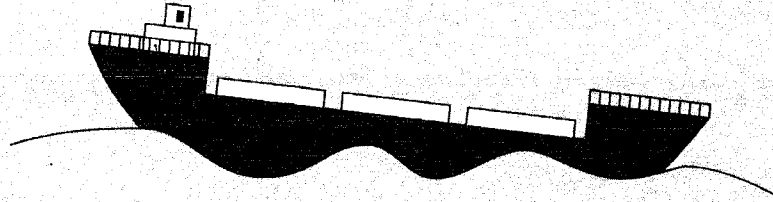
2-7

Solving Equations: Balancing

FOCUS

Begin to solve equations about geometric figures.

A cargo ship has ballast tanks to which water can be added or from which water can be removed. These ballast tanks serve the purpose of stabilizing the ship by maintaining a state of balance and equilibrium in the ship.



KEY TERMS

EXAMPLE / ILLUSTRATION

<p>Equation (p. 99) a mathematical statement in which one expression equals another</p>	$x - 2 = 5$
<p>Solution (p. 99) a value of a variable that makes an equation true</p>	<p>7 is a solution to $x - 2 = 5$, since $7 - 2 = 5$.</p>
<p>Solving an equation (p. 99) the process of finding the solution to an equation</p>	$\begin{aligned} x - 2 &= 5 \\ x - 2 + 2 &= 5 + 2 \\ x &= 7 \end{aligned}$
<p>Equivalent equations (p. 100) equations that have the same solution</p>	<p>$x = 7$ and $x - 2 = 5$ are equivalent equations.</p>

UNDERSTANDING THE MAIN IDEAS

Solving equations by balancing

Equations can be solved by making changes to both sides until the variable is alone on one side and the solution is alone on the other side. In changing an equation as you solve it, you must keep the equation in balance. This balance is maintained if you perform the same operation on both sides of the equation.

Sample 1

Solve the equation $2x + 8 = 2$.

Sample Response

$$\begin{aligned}2x + 8 &= 2 \\2x + 8 - 8 &= 2 - 8 \quad \leftarrow \text{To get } 2x \text{ alone, subtract } 8 \text{ from } \textit{both} \text{ sides.} \\2x &= -6 \\ \frac{2x}{2} &= \frac{-6}{2} \quad \leftarrow \text{To get } x \text{ alone, divide } \textit{both} \text{ sides by } 2. \\x &= -3\end{aligned}$$

Check (✓): $2x + 8 = 2$

$$\begin{aligned}2(-3) + 8 &\stackrel{?}{=} 2 \quad \leftarrow \text{Substitute } -3 \text{ for } x \text{ in the original equation.} \\-6 + 8 &\stackrel{?}{=} 2 \\2 &= 2 \quad \checkmark\end{aligned}$$

The solution is -3 .

Solve.

1. $3x = 24$

2. $y + 5 = 14$

3. $a - 8 = 0$

4. $4x - 5 = 15$

5. $3x + 18 = 3$

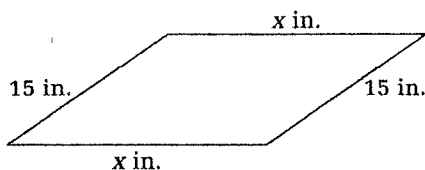
6. $2 + 5x = 12$

Solving equations about geometric figures

You can write and solve equations to find unknown measures in geometric figures.

Sample 2

The perimeter of the parallelogram below is 70 in. Find the value of x .



Sample Response

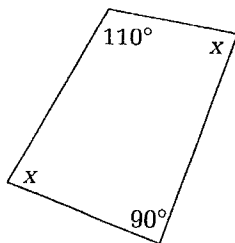
Write an equation for the perimeter.

$$\begin{aligned}2(x) + 2(15) &= 70 \\2x + 30 &= 70 \quad \leftarrow \text{Simplify the left side.} \\2x + 30 - 30 &= 70 - 30 \quad \leftarrow \text{Subtract } 30 \text{ from } \textit{both} \text{ sides.} \\2x &= 40 \\ \frac{2x}{2} &= \frac{40}{2} \quad \leftarrow \text{Divide } \textit{both} \text{ sides by } 2. \\x &= 20\end{aligned}$$

The value of x is 20.

Write and solve an equation to find each unknown measure in each figure. (Note: The sum of the measures of the angles of a quadrilateral is 360° .)

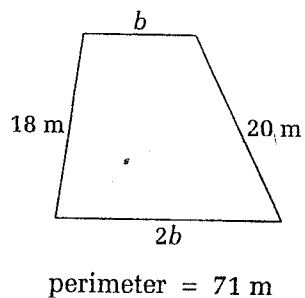
7.



8.



9.



Review **PREVIEW**

Simplify if possible. If not, explain why not. (Section 2-6)

10. $-6(-8x^3)$

11. $4b^3 + 4b + b$

12. $8p^3 - 10pq - 5p^3 + 6p + 12pq$

Simplify. (Section 2-2)

13. $12 + (-7)$

14. $13 - (-8)$

15. $(7.2)(-5)$

16. $-30 \div (0.3)$