

## Indicator 24 Class Notes by Mrs. Joshi One Step Equations-(19, 19a)

I can write and solve one-step addition and subtraction equations.

I can write and solve one-step multiplication and division equations.

You can use *inverse operations* to solve equations. **Inverse operations** “undo” each other. Addition and subtraction are inverse operations.

### **Key Ideas**

#### **Addition Property of Equality**

**Words** If you add the same number to each side of an equation, the two sides remain equal.

**Numbers**  $8 = 8$   
 $\begin{array}{r} +5 \\ 8 \\ \hline 13 \end{array} = \begin{array}{r} +5 \\ 8 \\ \hline 13 \end{array}$

**Algebra**  $x - 4 = 5$   
 $\begin{array}{r} +4 \\ x - 4 \\ \hline x \end{array} = \begin{array}{r} +4 \\ 5 \\ \hline 9 \end{array}$

#### **Subtraction Property of Equality**

**Words** If you subtract the same number from each side of an equation, the two sides remain equal.

**Numbers**  $8 = 8$   
 $\begin{array}{r} -5 \\ 8 \\ \hline 3 \end{array} = \begin{array}{r} -5 \\ 8 \\ \hline 3 \end{array}$

**Algebra**  $x + 4 = 5$   
 $\begin{array}{r} -4 \\ x + 4 \\ \hline x \end{array} = \begin{array}{r} -4 \\ 5 \\ \hline 1 \end{array}$

### **EXAMPLE 2 Solving Equations Using Addition**

a. Solve  $x - 2 = 6$ .

$$\begin{array}{r} x - 2 = 6 \\ +2 \quad +2 \\ \hline x = 8 \end{array}$$

Undo the subtraction.

Write the equation.  
Add 2 to each side.  
Simplify.

∴ The solution is  $x = 8$ .

**Check**

$$\begin{array}{r} x - 2 = 6 \\ 8 - 2 \stackrel{?}{=} 6 \\ \hline 6 = 6 \quad \checkmark \end{array}$$

#### **Study Tip**

You can check your solution by substituting it for the variable in the original equation.

b. Solve  $18 = x - 7$ .

$$\begin{array}{r} 18 = x - 7 \\ +7 \quad +7 \\ \hline 25 = x \end{array}$$

Write the equation.  
Add 7 to each side.  
Simplify.

∴ The solution is  $x = 25$ .

**Check**

$$\begin{array}{r} 18 = x - 7 \\ 18 \stackrel{?}{=} 25 - 7 \\ \hline 18 = 18 \quad \checkmark \end{array}$$

## Indicator 24 Class Notes by Mrs. Joshi

### EXAMPLE 3 Solving Equations Using Subtraction

a. Solve  $x + 2 = 9$ .

$$x + 2 = 9$$

Write the equation.

Undo the addition.  $\rightarrow$   $\begin{array}{r} -2 \\ -2 \end{array}$

Subtract 2 from each side.

$$x = 7$$

Simplify.

∴ The solution is  $x = 7$ .

**Check**

$$x + 2 = 9$$

$$7 + 2 \stackrel{?}{=} 9$$

$$9 = 9 \quad \checkmark$$

b. Solve  $26 = 11 + x$ .

$$26 = 11 + x$$

Write the equation.

$$\begin{array}{r} -11 \\ -11 \end{array}$$

Subtract 11 from each side.

$$15 = x$$

Simplify.

∴ The solution is  $x = 15$ .

**Check**

$$26 = 11 + x$$

$$26 \stackrel{?}{=} 11 + 15$$

$$26 = 26 \quad \checkmark$$

### EXAMPLE 4 Real-Life Application

You climb 23 feet on a rock climbing wall. Write and solve an equation to find the distance to the top.



Wall height: 48 ft

**Words** The distance **plus** the distance **is** the height of the wall.

**Variable** Let  $d$  be the distance to the top.

**Equation**  $23 + d = 48$

$$23 + d = 48$$

Write the equation.

$$\begin{array}{r} -23 \\ -23 \end{array}$$

Subtract 23 from each side.

$$d = 25$$

Simplify.

∴ The distance to the top is 25 feet.

## Indicator 24 Class Notes by Mrs. Joshi

### Key Idea

#### Multiplication Property of Equality

**Words** If you multiply each side of an equation by the same nonzero number, the two sides remain equal.

**Numbers**  $\frac{8}{4} = 2$

$$\frac{8}{4} \times 4 = 2 \times 4$$

$$8 = 8$$

**Algebra**  $\frac{x}{4} = 2$

$$\frac{x}{4} \cdot 4 = 2 \cdot 4$$

$$x = 8$$

### EXAMPLE 1 Solving Equations Using Multiplication

a. Solve  $\frac{w}{4} = 12$ .

$$\frac{w}{4} = 12$$

Write the equation.

Undo the division.

$$\frac{w}{4} \cdot 4 = 12 \cdot 4$$

Multiply each side by 4.

$$w = 48$$

Simplify.

∴ The solution is  $w = 48$ .

**Check**

$$\frac{w}{4} = 12$$

$$\frac{48}{4} \stackrel{?}{=} 12$$

$$12 = 12 \quad \checkmark$$

b. Solve  $x \div 7 = 5$ .

$$x \div 7 = 5$$

Write the equation.

Undo the division.

$$x \div 7 \cdot 7 = 5 \cdot 7$$

Multiply each side by 7.

$$x = 35$$

Simplify.

∴ The solution is  $x = 35$ .

**Check**

$$x \div 7 = 5$$

$$35 \div 7 \stackrel{?}{=} 5$$

$$5 = 5 \quad \checkmark$$

## Indicator 24 Class Notes by Mrs. Joshi

### Key Idea

#### Division Property of Equality

**Words** If you divide each side of an equation by the same nonzero number, the two sides remain equal.

**Numbers**  $8 \times 4 = 32$

$$8 \times 4 \div 4 = 32 \div 4$$

$$8 = 8$$

**Algebra**  $4x = 32$

$$\frac{4x}{4} = \frac{32}{4}$$

$$x = 8$$

#### EXAMPLE 2 Solving an Equation Using Division

Solve  $5b = 65$ .

$$5b = 65$$

Write the equation.

Undo the multiplication.

$$\frac{5b}{5} = \frac{65}{5}$$

Divide each side by 5.

$$b = 13$$

Simplify.

**Check**

$$5b = 65$$

$$5(13) \stackrel{?}{=} 65$$

$$65 = 65 \checkmark$$

∴ The solution is  $b = 13$ .

#### EXAMPLE 3 Using the Formula for Distance

Martin Strel set a world record by swimming 5268 kilometers down the Amazon River at a rate of about 80 kilometers per day. About how many days did it take him to complete his journey?

#### Study Tip

When solving a real-life problem, check that each side of your equation has the same units.

$$5268 \text{ km} = \frac{80 \text{ km}}{\text{day}} \cdot t \text{ days}$$

$$d = rt$$

Write formula for distance.

$$5268 = 80t$$

Substitute 5268 for  $d$  and 80 for  $r$ .

$$\frac{5268}{80} = \frac{80t}{80}$$

Divide each side by 80.

$$65.85 = t$$

Simplify.

∴ It took him about 66 days to complete his journey.