# 1-11 Addition and Subtraction Equations

Warm Up

Problem of the Day

Lesson Presentation

## Warm Up

**Determine if the given numbers are solutions to the given equations.**

**1.** $x = 2$ for $4x = 9$ no

**2.** $x = 5$ for $8x + 2 = 42$ yes

**3.** $x = 4$ for $3(x - 2) = 10$ no

## Problem of the Day

Four couples have dinner together. The wives are Ginny, Helen, Sarah, and Bridget. The husbands are Mark, Alex, Stephen, and Henry. Who is married to whom?

- Sarah is Mark's sister.
- Sarah introduced Henry to his wife.
- Bridget has 2 brothers, but her husband is an only child.
- Ginny is married to Stephen.

Ginny and Stephen, Helen and Mark, Sarah and Alex, Bridget and Henry

# 1-11 Addition and Subtraction Equations

*Learn* to solve one-step equations by using addition or subtraction.

# Vocabulary

Addition Property of Equality

inverse operations

Subtraction Property of Equality

To solve an equation means to find a solution to the equation. To do this, isolate the variable—that is, get the variable alone on one side of the equal sign.

$x = 8 - 5$
$7 - 3 = y$

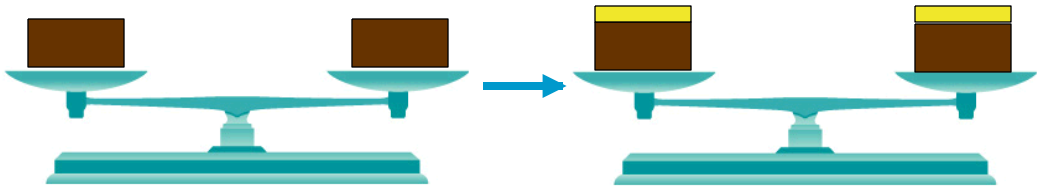
**The variables are isolated.**

$x + 5 = 8$
$7 = 3 + y$

**The variables are *not* isolated.**

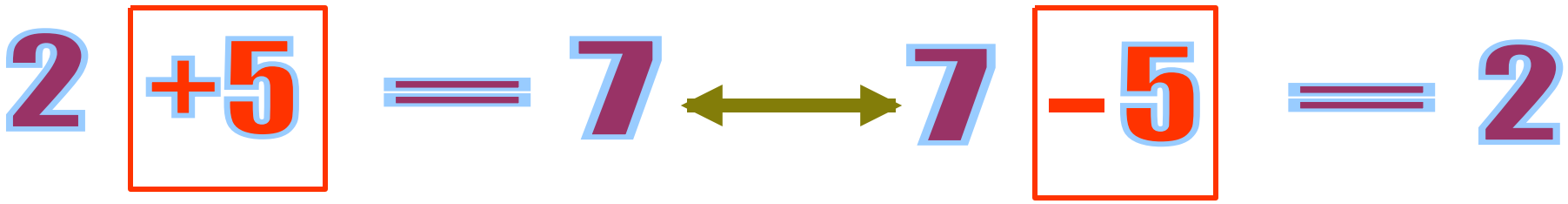
Recall that an equation is like a balanced scale. If you increase or decrease the weights by the same amount on both sides, the scale will remain balanced.

# ADDITION PROPERTY OF EQUALITY



| Words | Numbers | Algebra |
|---|---|---|
| You can add the same amount to both sides of an equation, and the statement will still be true. | $2 + 3 = 5$<br>$+ 4 \quad + 4$<br>$2 + 7 = 9$ | $x = y$<br>$+ z = + z$<br>$x + z = y + z$ |

Use *inverse operations* when isolating a variable. Addition and subtraction are **inverse operations**, which means that they "undo" each other.



## Additional Example 1: Solving an Equation by Addition

**Solve the equation *b* – 7 = 24. Check your answer.**

$b - 7 = 24$

$+7 \quad +7$

$b = 31$

*Think: 7 is **subtracted** from b, so **add** 7 to both sides to isolate b.*

***Check***

$b - 7 = 24$

$31 - 7 \stackrel{?}{=} 24$ *Substitute 31 for b.*

$24 \stackrel{?}{=} 24$ ✓ *31 is a solution.*

## Check It Out: Example 1

**Solve the equation $y - 3 = 21$. Check your answer.**

$y - 3 = 21$

$+3 \quad +3$

$y = 24$

*Think: 3 is **subtracted** from y, so **add** 3 to both sides to isolate y.*

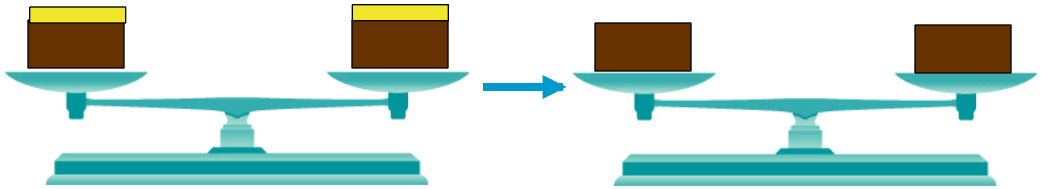
***Check***

$y - 3 = 21$

$24 - 3 \stackrel{?}{=} 21$ *Substitute 24 for y.*

$21 \stackrel{?}{=} 21$ ✓ *24 is a solution.*

# SUBTRACTION PROPERTY OF EQUALITY



| Words | Numbers | Algebra |
|---|---|---|
| You can subtract the same amount from both sides of an equation, and the statement will still be true. | $4 + 7 = 11$<br>$-3 \quad -3$<br>$4 + 4 = 8$ | $x = y$<br>$-z = -z$<br>$x - z = y - z$ |

## Additional Example 2: Solving an Equation by Subtraction

**Solve the equation $t + 14 = 29$. Check your answer.**

$$t + 14 = 29$$
$$-14 \quad -14$$
$$t = 15$$

*Think: 14 is **added** to t, so **subtract** 14 from both sides to isolate t.*

***Check***

$$t + 14 = 29$$
$$15 + 14 \stackrel{?}{=} 29$$
$$29 \stackrel{?}{=} 29 \checkmark$$

*Substitute 15 for t.*

*15 is a solution.*

## Check It Out: Example 2

**Solve the equation $x + 11 = 36$. Check your answer.**

$$x + 11 = 36$$
$$-11 \quad -11$$
$$x = 25$$

*Think: 11 is **added** to x, so **subtract** 11 from both sides to isolate x.*

***Check***

$$x + 11 = 36$$
$$25 + 11 \stackrel{?}{=} 36$$
$$36 \stackrel{?}{=} 36 \checkmark$$

*Substitute 25 for x.*

*25 is a solution.*

## Additional Example 3: *Sports Application*

**The Giants scored 13 points in a game against Dallas. They scored 7 points for a touchdown and the rest of their points for field goals. How many points did they score on field goals?**

Let $f$ represent the field goal points.

| 7 points | + | field goal points | = | points scored |
|---|---|---|---|---|
| 7 | + | $f$ | = | 13 |

$$7 + f = 13$$

$$-7 \qquad -7$$

*Subtract 7 from both sides to isolate f.*

$$f = 6$$

They scored 6 points on field goals.

## Check It Out: Example 3

**A basketball player scored 23 points during a game. Of those points, 3 were from 3-point goals and the remainder were 2 point goals. How many points did he score with 2 point goals?**

Let $x$ equal the points scored by 2 point goals.

| 3 point goals | + | 2 point goals | = | points scored |
|---|---|---|---|---|
| 3 | + | x | = | 23 |

$$3 + x = 23$$

$$\underline{-3} \qquad \underline{-3}$$

$$x = 20$$

*Subtract 3 from both sides to isolate x.*

He scored 20 points from 2 point goals.

## Lesson Quiz

**Solve each equation. Check your answer.**

**1.** $x - 9 = 4$ $x = 13$; $13 - 9 = 4$

**2.** $y + 6 = 72$ $y = 66$; $66 + 6 = 72$

**3.** $21 = n - 41$ $n = 62$; $21 = 62 - 41$

**4.** $127 = w + 31$ $w = 96$; $127 = 96 + 31$

**5.** $81 = x - 102$ $x = 183$; $81 = 183 - 102$

**6.** Tamika has sold 16 dozen cookies this week. This was 7 dozen more than she sold last week. Write and solve an equation to find how many dozen cookies she sold last week.

$x + 7 = 16$; 9 dozen