7. 2 Solving Equations Using Addition or Subtraction

ESSENTIAL QUESTION:

EXPRESSIONS	EQUATIONS
4 + 8	4 + 8 = 12
x + 8.	x + 8 = 12

EQUATION->a mathematical sentence that uses an equal sign to show that two expressions are equal.

A solution of an equation is a value that makes the equation true.

Value of x	$x + 3 = 7$	Are both sides equal?
3	$3 + 3 \stackrel{?}{=} 7$ $6 \neq 7$ ✗	no
4	$4 + 3 \stackrel{?}{=} 7$ $7 = 7$ ✓	yes
5	$5 + 3 \stackrel{?}{=} 7$ $8 \neq 7$ ✗	no

EXAMPLE 1->Checking Solutions

Is the value a solution of the equation?

1. p + 10 = 30; p = 10

10 + 10 = 30

20 = 30

not a solution

2. 4y = 56; y = 14

4(14) = 56

56 = 56

solution

3. a + 6 = 17; a = 9

9 + 6 = 17

15 = 17

not a solution

On Your Own

Is the value a solution of the equation?

1. 9 − g = 5; g = 3

9 − 3 = 5

6 = 5

not a solution

2. 35 = 7n; n = 5

35 = 7(5)

35 = 35

solution

3. $\frac{q}{2} = 28; q = 14$

$\frac{14}{2} = 28$

7 = 28

not a solution

You can use inverse operations to solve equations.

Inverse operations "undo" each other. Addition and Subtraction are inverse operations.

EXAMPLE 2->Solving Equations Using Addition

Solve the equation.

1. x − 2 = 6

+2 +2

x = 8

2. 18 = x − 7

+7 +7

25 = x

EXAMPLE 3->Solving Equations Using Subtraction

Solve the equation.

1. $x + 2 = 9$

$-2 \quad -2$

$x = 7$

2. $26 = 11 + x$

$-11 \quad -11$

$15 = x$

ON YOUR OWN

Solve the equation.

1. $k - 3 = 1$

$+3 \quad +3$

$k = 4$

2. $n - 10 = 4$

$+10 \quad +10$

$n = 14$

3. $15 = r - 6$

$+6 \quad +6$

$21 = r$

4. $s + 8 = 17$

$-8 \quad -8$

$s = 9$

5. $9 = y + 6$

$-6 \quad -6$

$3 = y$

6. $13 + m = 20$

$-13 \quad -13$

$m = 7$

Solve the equation.

1. $34 + 16 = w - 14$

$50 = w - 14$

$+14 \quad +14$

$64 = w$

2. $m + 10 - 3 = 25$

$m + 7 = 25$

$-7 \quad -7$

$m = 18$

3. $7 + 84 = 3 + d$

$91 = 3 + d$

$-3 \quad -3$

$88 = d$

4. $f - 12 = 24 + 15$

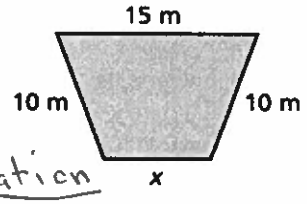
$f - 12 = 39$

$+12 \quad +12$

$f = 51$

Write and solve an equation to find x.

1. Perimeter = 43 m



Equation

$10 + 15 + 10 + x = 43$

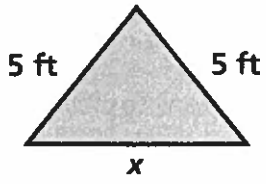
$10 + 15 + 10 + x = 43$

$35 + x = 43$

$-35 \quad -35$

$x = 8$

2. Perimeter = 18 ft



Equation

$5 + 5 + x = 18$

$10 + x = 18$

$-10 \quad -10$

$x = 8$

EXAMPLE 4->Real Life Application

Your parents give you $20 to help buy the new pair of shoes shown. After you buy the shoes, you have $5.50 left. Write and solve an equation to find how much money you had before your parents gave you $20

(S) Starting amount + amount parents gave you − cost of shoes = amount left

$S + 20 - 59.95 = 5.50$

$+59.95 \quad +59.95$

$S + 20 = 65.45$

$-20 \quad -20 \rightarrow S = 45.45$

You had $45.45 before your parents gave you money

You eat 8 blueberries and your friend eats 11 blueberries from a package. There are 23 blueberries left. Write and solve an equation to find the number of blueberries in a full package.

$x - 8 - 11 = 23$

$+11 \quad +11$

$x - 8 = 34$

$+8 \quad +8$

$x = 42$

There are 42 blueberries in a full package.

Solving Equations Using Addition or Subtraction

- Goal is to isolate or get the variable by itself.
- Need to keep the equation balanced.
- What you do to one side of the equation, need to do to the other side.
- To solve an addition equation, you need to do the inverse of addition (subtract on both sides)

$x + 5 = 13$

$-5 \quad -5$

$x = 8$

- To solve a subtraction equation, you need to do the inverse of subtraction (add on both sides)

$r - 4 = 19$

$4 \quad 4$

$r = 23$