

# UNIT 2: EQUATIONS & INEQUALITIES

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Objectives: I can solve one-step equations using addition and subtraction.

## SOLVING EQUATIONS BY ADDING OR SUBTRACTING

When you solve an equation, the goal is to get the variable alone. The value on the other side of the variable tells you the **solution** to the original equation. You use **inverse operations** which **undo each other**, to **get the variable alone**. (Remember that, in previous math classes, you used related equations like  $3 + 5 = 8$  and  $8 - 3 = 5$ . These equations show that addition and subtraction undo each other.)

### SUBTRACTION PROPERTY OF EQUALITY:

You can subtract the same number from each side of an equation.

Arithmetic  
 $10 = 2(5)$   
 $10 - 5 = 2(5) - 5$   
 balanced

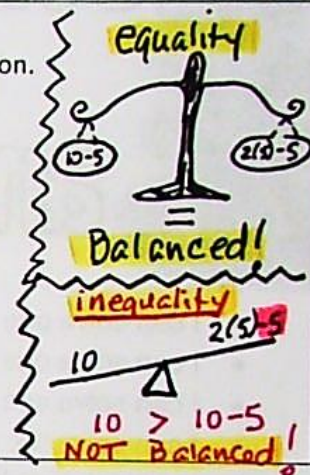
Algebra  
 If  $a = b$ ,  
 then  $a - c = b - c$   
 balanced

### ADDITION PROPERTY OF EQUALITY:

You can add the same number to each side of an equation.

Arithmetic  
 $10 = 2(5)$   
 $10 + 3 = 2(5) + 3$   
 $13 = 10 + 3$   
 $13 = 13 \checkmark$

Algebra  
 If  $a = b$   
 then  $a + c = b + c$



### EXAMPLES:

1)  $y + 5 = 13$   
 $-5 \quad -5$   
 $y = 8$

Check:

1)  $8 + 5 = 13$   check!  
 $13 = 13$

2)  $c - (-12) = 24$   
 $c + 12 = 24$  (ADD THE OPPOSITE!)  
 $-12 \quad -12$   
 $c = 12$

check

2)  $12 - (-12) = 24$   check!  
 $12 + 12 = 24$   
 $24 = 24$

3)  $x - 10 = 12$   
 $x + 10 = 12$   
 $+10 \quad +10$   
 $x = 22$

check

3)  $22 - 10 = 12$   check!  
 $12 = 12$

### PRACTICE:

check  
 $-5 + 8 = 3$   
 $3 = 3 \checkmark$

a)  $a + 8 = 3$   
 $-8 \quad -8$   
 $a = 3 + (-8)$   
 $a = -5$

Work  
 $3 + (-8)$   
 $-5$

b)  $5 = d + 1$   
 $-1 \quad -1$   
 $4 = d$

check

$5 = (4) + 1$   
 $5 = 5 \checkmark$

c)  $c + (-4) = -5$   
 $+4 \quad +4$   
 $c = -1$

Work  
 $-(-4)$  means  
 $+4$

Work  
 $-5 + 4$   
 $-1$

check  
 $(-1) + (-4) = -5$   
 $-5 = -5 \checkmark$

check  
 $13 - 5 = 8$   
 $8 = 8 \checkmark$

d)  $y - 5 = 8$   
 $+5 \quad +5$   
 $y = 13$

e)  $p - 40 = 42$   
 $+40 \quad +40$   
 $p = 82$

check  
 $(82) - 40 = 42$   
 $42 = 42 \checkmark$

d)  $98 = x - 14$   
 $+14 \quad +14$   
 $112 = x$

check

$98 = (112) - 14$   
 $98 = 98 \checkmark$



**Applying Solving Equations**

When translating words in sentences, you can write equations to be solved. This skill will enable you to solve more complex word problems. Let's review some words and their corresponding math symbols. Make a list of words that correspond with the given symbol.

+	-	*	÷	=
<b>Addition</b> sum plus added to more than more increased by total profit deposit gain	<b>Subtraction</b> difference minus subtract less than less decreased by loss debt withdraw spent	<b>Multiplication</b> product times multiply multiply by double (*2) triple (*3) quadruple (*4) of	<b>Division</b> quotient divide shared equally per group halve (:2) third (:3) quarter (:4)	<b>equals</b> now has <b>is</b>

**PRACTICE**

Write an equation for each sentence. You may have to choose your own variable.

- ① The **sum** of 63 and some number,  $x$ , **is** -82. Find the number.

$$(63 + x) = -82$$

$$\begin{array}{r} 63 + x = -82 \\ -63 \quad -63 \\ \hline x = -145 \end{array}$$

work

$$\begin{array}{r} -82 \\ + -63 \\ \hline -145 \end{array}$$

- ② Sixty-eight **is** ninety-seven **less than** a number. Find the number.

$$68 = (n - 97)$$

$$\begin{array}{r} 68 = n - 97 \\ +97 \quad +97 \\ \hline 165 = n \end{array}$$

- ③ Fifty-seven **is** 19 **more than** some number. Find the number.

$$57 = 19 + n$$

$$\begin{array}{r} 57 = 19 + n \\ -19 \quad -19 \\ \hline 38 = n \end{array}$$

- ④ A number **decreased by** 16 **is** -26. Find the number.

$$n - 16 = -26$$

$$\begin{array}{r} n - 16 = -26 \\ +16 \quad +16 \\ \hline n = -10 \end{array}$$

- ⑤ After buying has 24 **more** bracelets, Tasha **now has** 137. How many did Tasha <sup>used</sup> to have?

$$x + 24 = 137$$

$$\begin{array}{r} x + 24 = 137 \\ -24 \quad -24 \\ \hline x = 113 \end{array}$$

- ⑥ Sarah **spent** \$28.50 of her savings. She **now has** \$42. Previously how much did Sarah have in savings?

$$x - 28.50 = 42$$

$$\begin{array}{r} x - 28.50 = 42 \\ +28.50 \quad +28.50 \\ \hline x = 70.50 \end{array}$$

\$70.50