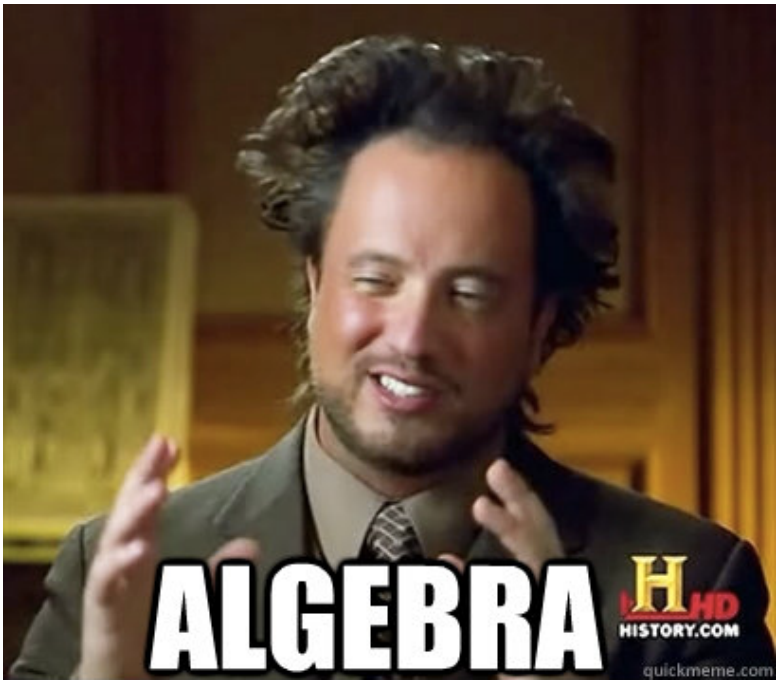
Unit 2 Solving Linear Equations



Target 2.1: Solving linear equations with variables on one side of the equation

- ***2.1a – Solve One-Step Equations***
- ***2.1b – Solve Two-Step Equations***
- ***2.1c – Solve Multi-Step Equations***

Target 2.2: Solving linear equations with variables on both sides of the equation

Target 2.3: Writing and solving problems using proportions and percentages

- ***2.3a: Write ratios and Proportions***
- ***2.3b: Solve proportions using cross-products***
- ***2.3c: Solve percent problems***

Target 2.4: Modeling and solving real world problems with linear equations

Target (2.Extra): Solving Absolute Value Equations

Name: _____

2.1a – Solve One-Step Equations

Target 1: Solving linear equations with variables on one side of the equation

Vocabulary:

Inverse Operations: _____

_____

Example:

Equivalent Equations: _____

_____

Example:

Annotate Here

Addition Property of Equality

Adding the same number to each side of equation produces an _____.

Subtraction Property of Equality

Subtracting the same number to each side of equation produces an _____.

Example 1: Solve the equation

$y + 3 = 10$

Example 2: Solve the equation

$x - \frac{7}{10} = \frac{1}{2}$

Multiplication Property of Equality

Multipliying each side of equation produces an

_____.

Division Property of Equality

Dividing each side of equation by the same non-zero number

produces an _____.

Example 3: Solve the equation

$8x = 56$

Example 4: Solve the equation

a) $\frac{a}{5} = 12$ *b)* $\frac{3}{5}t = 6$

YOU TRY NOW!

Solve the equation. Check your solution

1). $-17 + b = 12$

2) $-3 = x + 2$

3) $-24 = 4x$

4) $\frac{b}{4} = 13$

YOUTRYNOW Answers:
1) b = 29 2) x = -5 3) x = -6 4) b = 52

Annotate Here

2.1b – Solve Two-Step Equations

Target 1: Solving linear equations with variables on one side of the equation

Identifying Operations

Identify the operations involved in the equation.

$$3x + 7 = 19$$

Operations ***performed*** *on x*	*Operations to* ***isolate*** *x*
1. *Mulitply by* _____.	1. *Subtract by* _____.
2. *Add* _____.	2. *Divide by* _____.

Example 1: Solve a two-step equation

$3x + 7 = 19$

Example 2: Solve a two-step equation

$4a + 3a = 63$

Example 3: Find the input of a function

The output of a function is 2 more than 4 times the input. Find the input when the output is 14. (Use y to represent the output and x to represent the input

Annotate Here

Order of Operations
G
E
M
D
A
S

Isolate the variable term, then work in reverse order of the order of operations.

Reverse Order
S
A
D
M
E
G

What are other phrases that is used to indicate the operation of addition?

YOU TRY NOW!

Solve the equation. Check your solution.

1) $\frac{r}{4} - 12 = -5$

2) $7k - 14 = 42$

3) $5g - 9g = 36$

4) $12 - 2t = 24$

5) Write the function and then find the input with the given situation.

The output of a function is 3 less than 6 times the input. Find the input when the output is 15. (Use y to represent the output and x to represent the input)

Function: _____

Solution: _____

Annotate Here

YOUTRYNOW Answers: 1) $r = 28$ ***2)*** $k = 8$ ***3)*** $g = -9$ ***4)*** $t = -6$ ***5) Function:*** $y = 6x - 3$ ***Solution:*** $x = 3$

2.1c – Solve Multi-Step Equations

Target 1: Solving linear equations with variables on one side of the equation

Example 1: Solve the equation

$3t + 5t - 5 = 11$

Annotate Here

Distributive Property

The distributive property is used to _____ a number by a group of terms added or subtracted together.

Example 2: Solve the equation

$22 = 5a + 3(a + 2)$

Example 3: Solve the equation

$\frac{3}{4}(x - 5) = 9$

YOU TRY NOW!

Solve the equation. Check your solution.

1) $9d - 4d - 2 = 18$

2) $2x + 7(x - 3) = 6$

3) $3w + 4 + w = 36$

4) $40 = 2(10 + 4k) + 2k$

5) $\frac{1}{2}(4x - 2) = 7$

6) $10 = \frac{5}{6}(2y + 4)$

YOUTRYNOW Answers: 1) $d = 4$ ***2)*** $x = 3$ ***3)*** $w = 8$ ***4)*** $k = 2$ ***5)*** $x = 4$ ***6)*** $y = 4$

Annotate Here

2.2 – Solve Equations with Variable on Both Sides

Target 2: Solving linear equations with variables on both sides of the equation

Vocabulary:

Identity: _____

_____

Example:

Example 1: Solve an equation with variables on both sides

$15 + 4a = 9a - 5$

Example 2: Solve an equation an equation with grouping symbols

$4t - 12 = 6(t + 3)$

Example 3: Identify the number of solutions of an equation

a) $4x + 5 = 4(x + 5)$

b) $6x - 3 = 3(2x - 1)$

Annotate Here

ALWAYS put the variable terms on _____ side and then the constant terms on the other side.

Examples of Variable terms:

1.

2.

3.

Example of Constant Terms:

1.

2.

3.

When you see the grouping symbols, you should always use the _____ property!

YOU TRY NOW!

Solve the equation. Check your solution

1) $3b + 7 = 8b + 2$

2) $6d - 6 = \frac{3}{4}(4d + 8)$

3) $\frac{1}{2}(4t - 6) = 2t$

4) $10m - 4 = -2(2 - 5m)$

Annotate Here

YOUTRYNOW Answers: 1) $b = 1$ **2)** $d = 4$ **3)** *no solution* **4)** *identity*

2.3a – Write Ratios and Proportions

Target 3: Write and solve problems using proportions and percentages

Vocabulary:

Ratio: _____

_____

Example:

Proportion: _____

_____

Example:

Example 1: Write a ratio

A person makes 6 long distance calls and 15 local calls in 1 month

a) *Find the ratio of long distance calls to local calls.*

b) *Find the ratio of long distance calls to all calls.*

Example 2: Solve a proportion

$$\frac{y}{15} = \frac{3}{5}$$

Annotate Here

Which way is the MOST useful?

Make sure all ratios written in _____ form.

Example 3: Model and solve the problem

An empty swimming pool is being filled with water. After 5 minutes, the pool has 400 gallons of water. If the pool has a volume of 11,200 gallons, how long does it take to fill the empty pool?

Annotate Here

YOU TRY NOW!

Shawn and Myra are selling tickets to their school's talent show. Shawn sold 36 tickets, and Myra sold 44 tickets. Find the specified ratio.

1) The number of tickets Shawn sold to the number of tickets Myra sold.

2) The number of tickets Myra sold to the number of tickets Shawn and Myra sold

Solve the proportion. Check your solution

3) $\frac{9}{4} = \frac{c}{28}$

4) $\frac{a}{22} = \frac{7}{8}$

5) At a book sale, 6 books cost $13. At that rate, how many books could you buy for $32.50?

YOUTRYNOW Answers: 1) $\frac{9}{11}$ **2)** $\frac{11}{20}$ **3)** $c = 63$ **4)** $a = \frac{77}{4}; 19.25$ **5)** $\frac{6\ books}{\$13} = \frac{x\ books}{\$32.50}; 15\ books$

2.3b – Solve Proportions Using Cross Products

Target 3: Write and solve problems using proportions and percentages

Vocabulary:

Cross Product: _____

_____

Example:

Example 1: Solve a proportion using the cross products

$$\frac{5}{y} = \frac{15}{75}$$

Example 2: Write and solve a proportion

To feed your plants, you need to mix 3 tablespoons of plant food with 16 ounces of water. If it takes 80 ounces of water to feed all of your plants, how many tablespoons of plant food are needed?

YOU TRY NOW!

Solve the proportion. Check your solution.

1) $\frac{5}{n} = \frac{25}{45}$

2) $\frac{6}{b} = \frac{3}{b-2}$

3) An architect creates a scale model of a school. The actual school is 50 feet high. The scale of the model to the actual school 1 foot to 75 feet. Estimate the height of the model.

YOUTRYNOW Answers: 1) $n = 9$ **2)** $b = 4$ **3)** $\frac{2}{3} foot\ or\ 8\ inches$

Annotate Here

2.3c – Solve Percent Problems

Target 3: Write and solve problems using proportions and percentages

Example 1: Find a percent using a proportion

What percent of 50 is 33?

Example 2: Find a percent using a proportion

What number is 75% of 164?

Types of Percent Problems		
Percent Problem	**Example**	**Proportion**
Find a percent.	*What percent of 252 is 84?*	
Find part of the base	*What number is 30% of 90?*	
Find a base	*16 is 20% of what number?*	

Annotate Here

What is the proportion that we can use to help solve percent problems?

A percent is ALWAYS out of how many?

YOU TRY NOW!

Write each proportion then solve.

1) What percent of 80 is 28?	*2) What percent of 90 is 36?*
3) What percent of 76 is 57?	*4) What number is 35% of 80?*
5) 27 is 25% of what number?	*6) 78 is 150% of what number?*

Annotate Here

YOUTRYNOW Answers: 1) $\frac{28}{80} = \frac{x}{100}; 35\%$ **2)** $\frac{36}{90} = \frac{x}{100}; 40\%$ **3)** $\frac{57}{76} = \frac{x}{100}; 75\%$ **4)** $\frac{x}{80} = \frac{35}{100}; 28$

5) $\frac{27}{x} = \frac{25}{100};\ 108$ **6)** $\frac{78}{x} = \frac{150}{100};\ 52$

2.4 – Modeling Linear Equations

Target 4: Modeling and solving real world problems with linear equations

Solving Word Problems

1) Don't _____ and just _____.

2) _____ the problem _____

3) _____ variables to quantities in a meaningful manner.

Example:

4) Use the _____ of the problem to _____ an algebraic expression and equation.

5) Complete the process by _____ the equation.

Example 1: *The sum of two numbers is 20. Four times the larger is 1 less than five times the smaller. What are the numbers?*

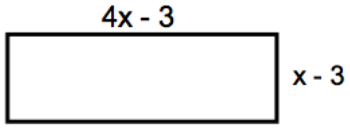
Example 2: *Moving Company A charges a flat fee of $1200 plus $18 an hour. Company B charges $900 plus $23 an hour. After how many hours would the price be the same regardless of which company was chosen?*

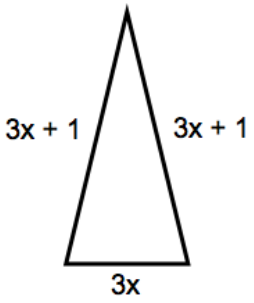
Annotate Here

Did you follow all the steps?

YOU TRY NOW!

1) *The perimeters of two gardens are equal. The measures of those gardens are shown below. One is a rectangle and the other is an isosceles triangle. Find the perimeters of the gardens.*





2) *The difference between twice a number and $\frac{2}{3}$ of the number is 68. What is the number?*

Annotate Here

How do you find the perimeter of a square if each side was 9 feet long?

YOUTRYNOW Answers: 1) $x = 14; P_{rectangle} = 128, P_{iscosceles\ triangle} = 128$ **2)** 51

(2.Extra)– Solve Absolute Value Equations

Target (EXTRA): Solve absolute value equations

Vocabulary:

Absolute Value: _____

_____

Example:

Absolute Value Equation: _____

_____

Example:

Example 1: Solve an absolute value equation

$|x - 9| = 2$

Example 2: Solve an equation an equation with grouping symbols

$4|2x + 8| + 6 = 30$

Annotate Here

How many units away is "x – 9" from zero on the number line?

How is example 2 similar to solving a multi-step linear equation?

Example 3: Decide if an equation has no solutions

$|7x - 3| + 8 = 5$

Annotate Here

YOU TRY NOW!

Solve the equation. Check your solution

1. $|x + 6| + 8 = 5$

2. $21 = 3|5x - 10| + 6$

YOUTRYNOW Answers: 1) $x = 5 \& -17$ ***2)*** $x = 3 \& 1$