Math-2

Lesson 1-2 Solving Single-Unknown Linear Equations

Linear Equation: an equation where all of the letters (either <u>variables</u> or <u>unknown values</u>) have NO EXPONENTS.

$$4x - 2 = 6$$
 $2x + 3y = 6$

Previous Vocabulary

<u>Solution to an equation</u>: the value of the <u>variables</u> or <u>unknown value</u> that makes the equation "true".

Equivalent equation:

has the same solution as the original equation

$$4x + 2 = 10$$
 $4x = 8$

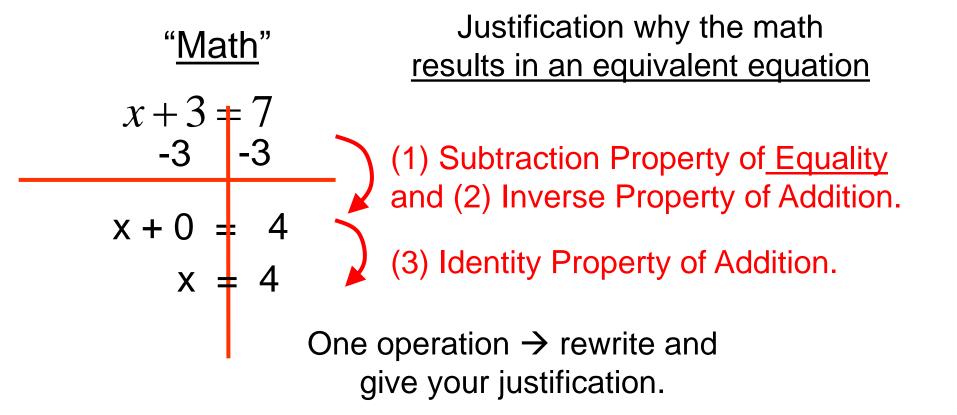
The solution to both equations is x = 2.

They are equivalent equations.

Property of Equality

Only apply to equations!!!

"+, -, x, \div " by the same number on both sides of the equal sign and you are guaranteed that the next equation is an equivalent equation.



Your turn: solve the following equations using "one step—rewrite—justify"

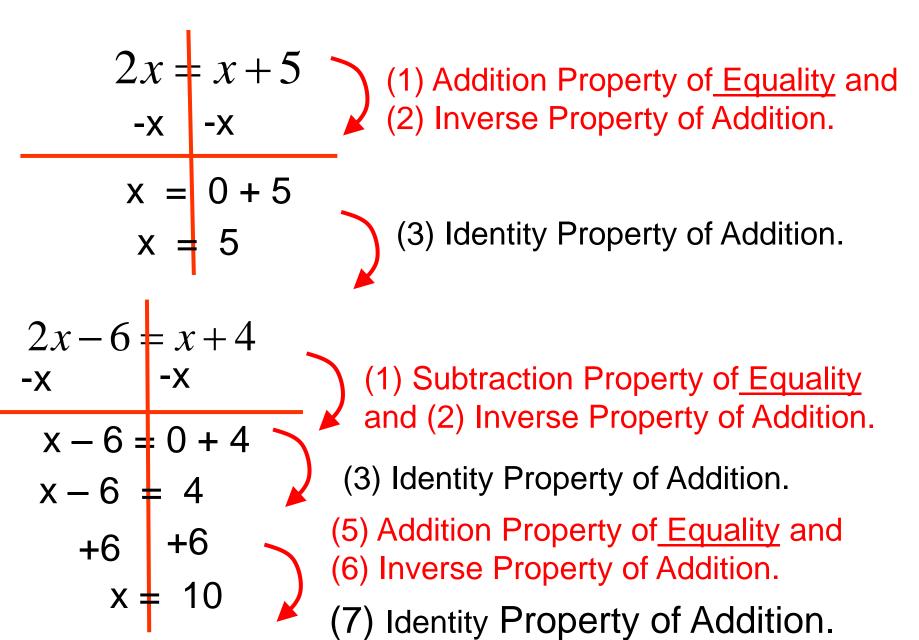
$$-9 = x + 4$$

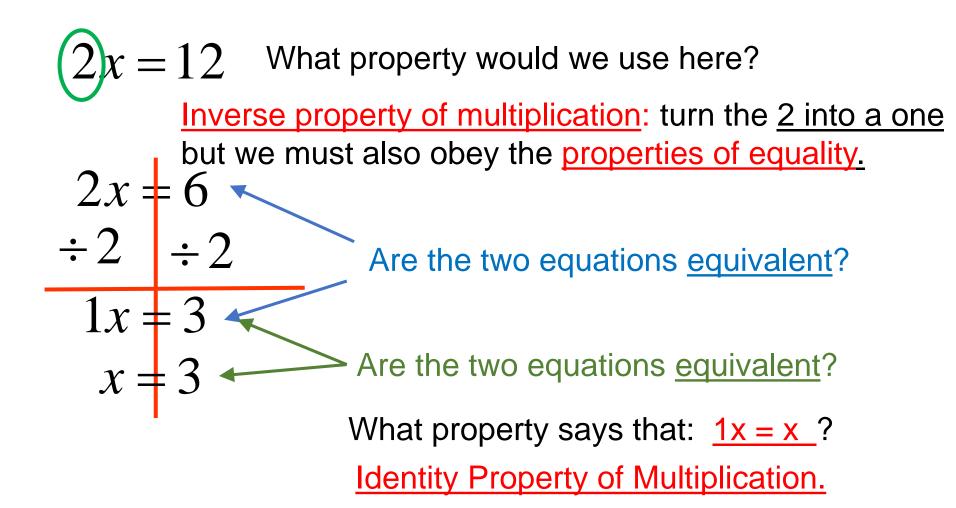
-4 -4
-13 = x + 0
-13 = x

(1) Subtraction Property of <u>Equality</u>and (2) Inverse Property of Addition.

(3) Identity Property of Addition.

Solve the following equations using "one step rewrite—justify" <u>Hint</u>: gather x's to one side of the equal sign.





Your turn: solve the following equations using "<u>one step—rewrite—justify</u>"

$$5x + 2 = 17$$

$$-2 - 2$$
(1) Subtraction Property of Equality
(2) inverse property of addition,
(3) Identity property of addition

$$5x = 15$$

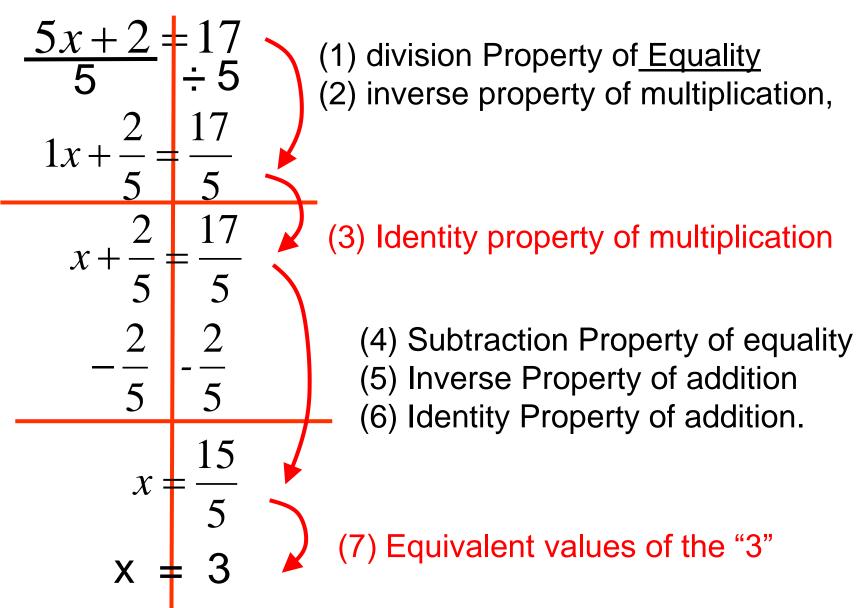
$$\div 5 \div 5$$
(4) Division property of equality
(5) Inverse Property of Multiplication
(6) Identity Property of Multiplication.

Turn <u>coefficients</u> into <u>ones</u> and <u>addends</u> into <u>zeroes</u> so that they disappear!

Could we have used the division property of equality first?

YES...but....

Your turn: solve the following equations using "<u>one step—rewrite—justify</u>"



Your turn: solve using "1 step—rewrite—justify" (identify the properties that you used)

1.
$$2 = 3 + x$$

2.
$$12 - x = 3x$$

3.
$$-27 = 2x - 3 + 2x$$

4.
$$\frac{x}{3} = -2$$

5.
$$\frac{2x}{5} - 4 = -8$$

6.
$$3x - 8 = 1$$

The <u>Distributive Property</u> (of multiplication over addition)

When multiplying a factor and the sum of two or more addends, the factor can be <u>distributed</u> to each of the addends.

$$2(x + 4) \rightarrow 2x + 2(4) \rightarrow 2x + 8$$
Factor Addends

Your Turn: Use the distributive property to simplify the expression

$$4(x + 5)$$

- $3(x - 4)$
 $5(3x - 2)$

Order of Operations!! $5 + 2(x + 4) \rightarrow$ $2x - 3(x - 1) \rightarrow$ \rightarrow 5 + 2x + 8 \rightarrow 2x - 3x + 3 \rightarrow 2x + 13 \rightarrow -x + 3 $3-2(x+5) \rightarrow$ $4 - 3x - (-5x - 2) \rightarrow _$ \rightarrow 4 – 3x + 5x + 2 \rightarrow 3 – 2x – 10 \rightarrow 2x + 6 $\rightarrow -2x - 7$

Solving Equations using the **Distributive Property**

$$3(5x-6) = 12$$

Can we use the addition property of equality to add '6' (left/right)?

$$3(5x - 6) = 12$$

+6 +6
$$3(5x) = 18$$

Why not?
PEMDAS: you must
multiply (to remove the
parentheses) before you
can subtract from the
parentheses.

→
$$15x - 18 = 12$$

+18 +18
 $15x = 30$
÷15 ÷15
 $x = 2$

Another example

3(x-2) = 4(-x+1) $\rightarrow 3x - 6 = 4(-x + 1)$ 7x 3x-6 = -4x+4+ 4x + 4x7x - 6X = +6 +6 7x #

10

÷7

 $\frac{10}{7}$

Solve

2(x+3) = 2(2x-1)

-5(x + 2) = (2x - 7)

(x+3)-3(3x-2)=1

Solve the following equations

$$2x - 3 = 4 - 3(1 + 2x)$$

$$2(2x+4) = 5 - (2x-5)$$

3x - (2x - 3) = 5(2x - 3) - 3x

Solve for 'x'

$$4 + 2x + 4y = 6$$

$$-4 - 4$$

$$2x + 4y = 2$$

$$-4y - 4y$$

$$2x = 2 - 4y$$

$$\div 2$$

$$x = \frac{2 - 4y}{2}$$

$$x = \frac{2 - 4y}{2}$$

$$x = \frac{2 - 4y}{2}$$

$$x = 1 - 2y$$

Solve for the specified variable: Use properties of equality to rewrite the equation as an <u>equivalent</u> equation with the <u>specified</u> variable on one side of the equal sign and all other terms on the other side.

Another way to Solve for 'x'

$4 + 2x + 4y = \frac{2}{2}$	= 6 ÷2
2 + x + 2y = - 2y	= 3 - 2y
	- 2
<i>X</i> =	=1-2y

Solve for the variable: Use properties of equality to rewrite the equation as an <u>equivalent</u> equation with the <u>specified</u> variable on one side of the equal sign and all other terms on the other side.

'2' is a <u>common</u> <u>factor</u> of each term

> yx – 2 +2

> > УХ

÷y

Solve for "x"

+2

6

÷y

У

Your turn: Solve for 'k'

$$2k - 3m = 5$$

$$\frac{7k - 3y}{2} = 4x$$

$$4m - 3ky = 7$$