Today's Learning Objective:

Name: _____ 1.26.15

We will solve and model equations in one variable.

Common Core Standard 7.EE.1
Apply properties of operations as strategies to add, subtract, factor and expand linear expressions with rational coefficients.

Common Core Standard 7.EE.2
Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

Activating Prior Knowledge

Consider the following expression:

$$(3x + 6)$$

This expression is a statement.

$3x$ and 6 are called *terms*.

Checking for Understanding (CFU)

What are we going to do today?

Today, we:

_____
_____.

Checking for Understanding 2 (CFU2)

What is an expression (Pair-Share)?

An expression is:

_____
_____.

Recall from Previous Lessons (CFU3)

In the expression $3x + 6$

The term 3 is called a/an:

_____

The term x is called a/an:

_____

The term 6 is called a/an:

_____

Concept Development

An expression such as **x + 3** describes two quantities.

One quantity (x) is unknown. It is added to a constant of 3.

In a tape diagram, we can show these terms separately as:

As we evaluate this expression, we are left wondering about the value of x. Without any further information given, we cannot solve for x. We have an incomplete statement.

Checking for Understanding

Why is the expression *x+3* considered incomplete ? (Pair-Share)

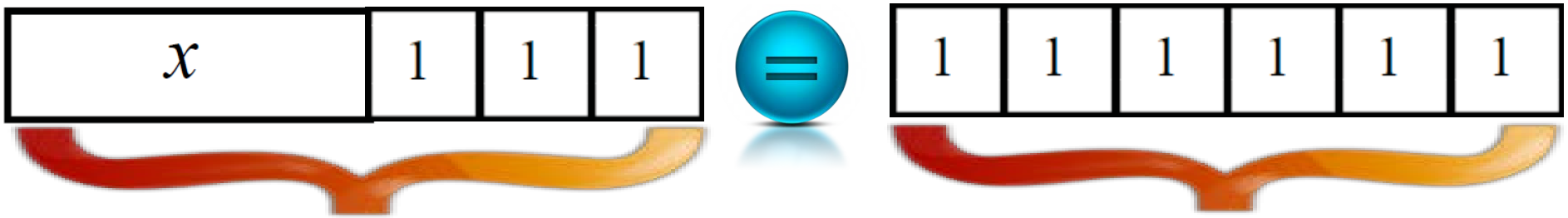
The expression is considered to be an incomplete statement because: _____ _____ _____.

Checking for Understanding 2

How are equations different than expressions? (Pair-Share)

An equation is different than an expression because: _____ _____ _____.

If you were given further information, such as the expression x + 3 has a sum of 6, you would now have a complete sentence or statement.



An **equation** states two **expressions** are ***equal*** in value.

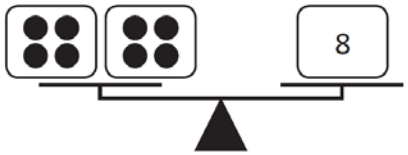
Therefore, the expression x + 3 is equal in value to 6. Since **x + 3 = 6**, the value of **x** must be **3**.

Concept Development / Skill Development

Look at these balanced scales.

In each box on the left there are 4 dots and on the other side is the number 8.

This makes sense because it shows the equation 4 + 4 = 8. An equation is a sum with an equals symbol. One side must equal or balance the other just like these scales.



Checking for Understanding

Why do we call these scales balanced? (Pair-Share)

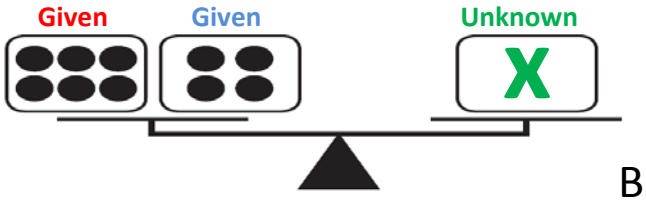
The scales are called balanced because:

_____

_____.

Balancing the Scales / Forming Equations

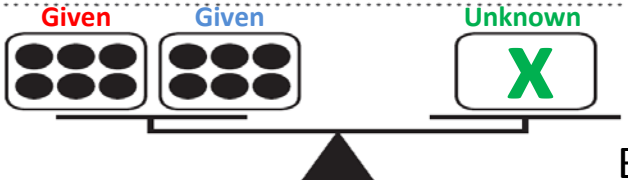
1. Determine what information is given (numbers or symbols).
2. Set a variable (use x) for the unknown / missing quantity.
3. Check and interpret the solution. Justify your solution.



Given Given Unknown

[ ] + [ ] = [ ]

Balancing the equation, *if* **6 + 4** = **x**, **x** *must equal* ____.



Given Given Unknown

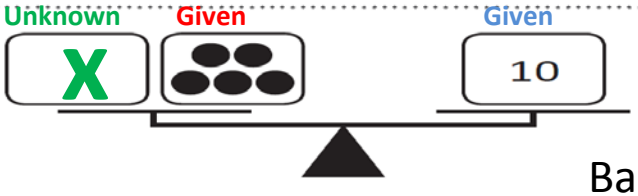
[ ] + [ ] = [ ]

Balancing the equation, *if* **6 + 6** = **x**, **x** *must equal* ____.

Given Unknown Given

[ ] + [ ] = [ ]

Balancing the equation, *if* **4 + x** = **8**, **x** *must equal* ____.



Unknown Given Given

[ ] + [ ] = [ ]

Balancing the equation, *if* **x + 5** = **10**, **x** *must equal* ____.

Skill Development

A **one-step equation** requires one inverse operation to solve for the variable.

- *To keep an equation **balanced**, **inverse operations** must be done on both sides of the equation.*

Operation	Inverse
Addition (+)	Subtraction (-)
Subtraction (-)	Addition (+)
Multiplication (*)	Division (÷)
Division (÷)	Multiplication (*)

$$x + 2 = 5$$
$$-2 \quad -2$$
$$x = 3$$

***QUESTION 1:* What is the original operation being performed?**

***QUESTION 2:* What is the inverse operation to be performed?**

Checking for Understanding

Why are Inverse Operations performed on both sides of an equation? (Pair-Share)

Inverse operations are performed on both sides of an equation

_____

_____.

$3 + 2$ *is equal to* 5

The **solution** is the value of the **variable** that makes the equation true. In this case, x = 3.

A **one-step equation** requires one inverse operation to solve for the variable. This isolates the variable. An inverse operation is the *opposite* of the given operation.

EQUATION GIVEN	What is the operation of the equation?	What inverse operation would be used to solve the equation?
$a + 4 = 7$		
$m - 6 = 13$		
$5x = 25$		
$\frac{k}{2} = 8$		
$f + (-7) = 8$		
$-7y = -49$		

Guided Practice

A **one-step equation** requires one inverse operation to solve for the variable.

- *To keep an equation **balanced**, **inverse operations** must be done on both sides of the equation.*

Solve one-step equations.

1. Look at the equation. Determine what operation is being performed.
2. In order to solve for the variable, identify the inverse operation to be performed.
3. Perform the inverse operation (on both sides of the equation).
4. Determine the value of the variable. Complete the sentence below.

$$r \boxed{+ 1} = -5$$

Step 1: What operation is being performed? _____

Step 2: What is the inverse operation needed? _____

In the equation r + 1 = -5, the value of the variable r is _____, because ____ + 1 = -5

$$h + 3 = 10$$

Step 1: What operation is being performed? _____

Step 2: What is the inverse operation needed? _____

In the equation h + 3 = 10, the value of the variable h is _____, because _____ + 3 = 10.

$$s \boxed{- 8} = -1$$

Step 1: What operation is being performed? _____

Step 2: What is the inverse operation needed? _____

In the equation s – 8 = -1, the value of the variable s is _____, because _____ - 8 = -1.

$$r - 1 = -3$$

Step 1: What operation is being performed? _____

Step 2: What is the inverse operation needed? _____

In the equation r – 1 = -3, the value of the variable r is _____, because _____ - 1 = -3.

Guided Practice

A **one-step equation** requires one inverse operation to solve for the variable.

- *To keep an equation **balanced**, **inverse operations** must be done on both sides of the equation.*

Solve one-step equations.

1. Look at the equation. Determine what operation is being performed.
2. In order to solve for the variable, identify the inverse operation to be performed.
3. Perform the inverse operation (on both sides of the equation).
4. Determine the value of the variable. Complete the sentence below.

$$\boxed{9}d = -9$$

Step 1: What operation is being performed? _____

Step 2: What is the inverse operation needed? _____

In the equation 9d = - 9, the value of the variable d is _____, because the product 9 and _____ is equal to -9.

$$-4g = -20$$

Step 1: What operation is being performed? _____

Step 2: What is the inverse operation needed? _____

In the equation -4g = -20, the value of the variable g is _____, because the product of -4 and _____ is equal to -20.

$$\frac{r}{\boxed{-5}} = 15$$

Step 1: What operation is being performed? _____

Step 2: What is the inverse operation needed? _____

In the equation $\frac{r}{-5} = 15$, the value of the variable r is _____, Because the quotient of _____ and -5 is equal to 15.

$$\frac{p}{4} = -3$$

Step 1: What operation is being performed? _____

Step 2: What is the inverse operation needed? _____

In the equation $\frac{p}{4} = -3$, the value of the variable p is _____, because the quotient of _____ and 4 is equal to -3.

Skill Closure

A **one-step equation** requires **one inverse operation** to solve for the variable.

- *To keep an equation **balanced**, **inverse operations** must be done on both sides of the equation.*

Solve one-step equations.

1. Look at the equation. Determine what operation is being performed.
2. In order to solve for the variable, identify the inverse operation to be performed.
3. Perform the inverse operation (on both sides of the equation).
4. Determine the value of the variable. Check your solution.

$$x \boxed{+2} = 3$$

Inverse Operation

Inverse Operation

$$\boxed{\frac{x}{4}} = 1$$

Checking for Understanding 1

Which inverse operation would be used to solve the one-step equation $x - 4 = 6$?

How do you know?

A **Addition**
B **Subtraction**

Checking for Understanding 2

Which inverse operation would be used to solve the one-step equation $4x = 8$?

How do you know?

A **Multiplication**
B **Division**

Summarize What You Learned Today

QUESTION: (Pair – Share)
What did you learn today about solving and modeling equations?
Use the words to the right.

Today, I learned:

_____
_____
_____
_____
_____
_____

WORD BANK (VOCABULARY)

Expression	Opposite	Balance
Equation	Isolate	Expression
Inverse	Variable	Coefficient

Independent Practice

A **one-step equation** requires one inverse operation to solve for the variable.

- *To keep an equation **balanced**, **inverse operations** must be done on both sides of the equation.*

Solve one-step equations.

1. Look at the equation. Determine what operation is being performed.
2. In order to solve for the variable, identify the inverse operation to be performed.
3. Perform the inverse operation (on both sides of the equation).
4. Determine the value of the variable. Complete the sentence below.

$$w + 12 = -4$$

Step 1: What operation is being performed? _____

Step 2: What is the inverse operation needed? _____

In the equation w + 12 = -4, the value of the variable w is _____ , because ____ + 12 is equal to -4.

$$-4r = -12$$

Step 1: What operation is being performed? _____

Step 2: What is the inverse operation needed? _____

In the equation -4r = -12, the value of the variable r is _____, because the product of -4 and _____ is equal to -12.

$$v - 3 = -7$$

Step 1: What operation is being performed? _____

Step 2: What is the inverse operation needed? _____

In the equation v - 3 = -7, the value of the variable v is _____, Because _____ - 3 is equal to -7.

$$\frac{w}{4} = 12$$

Step 1: What operation is being performed? _____

Step 2: What is the inverse operation needed? _____

In the equation $\frac{w}{4} = 12$, the value of the variable w is _____, because the quotient of _____ and 4 is equal to 12.

One Step Addition Example

The Opposite of Addition is Subtraction

$$y + 14 = 20$$
$$-14 \quad -14$$
$$y = 6 \checkmark$$

The value which makes the equation true is 6.

ONE STEP SUBTRACTION EXAMPLE

The Opposite of Subtraction is Addition

$$x - 120 = 80$$
$$+120 \quad +120$$
$$x = 200 \checkmark$$

The value which makes the equation true is 200.

Multiplication Example

The Opposite of Multiplication is Division

$$3n = 12$$

$$\frac{\cancel{3}n}{\cancel{3}} = \frac{12}{3}$$

3/3 cancels down to become 1/1 =1

$$n = 4 \checkmark$$

1n is simply "n"

The value which makes the equation true is 4.

One Step Division Example

The Opposite of Division is Multiplication.

$$\frac{k}{2} = 16$$

K is divided by 2, so we need to multiply both sides by 2

$$\frac{k}{\cancel{2}} \times \cancel{2} = 16 \times 2$$

2/2 cancels down to become 1/1 =1

$$k = 32 \checkmark$$

1k is simply "k"

The value which makes the equation true is 32.