TOPIC 8

LESSON 8.2

Expressions That Play Together...

7.EE.4a

Objective

Solving Equations on a Double Number Line

Warm-Up

Explain whether or not Expression B is equivalent to Expression A. If the expressions are not equivalent, determine an expression equivalent to Expression A.

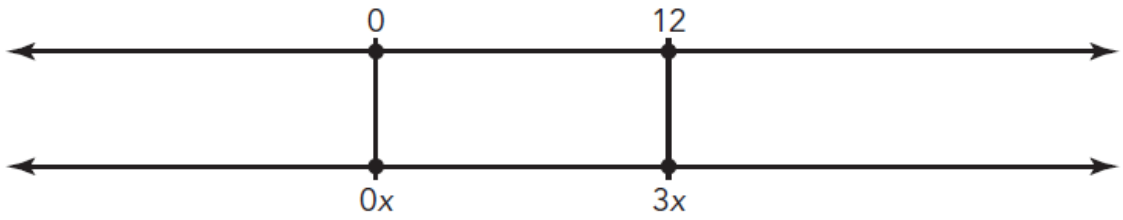
1. A: $2(x - 5)$ B: $2x - 5$

2. A: $8 - 2(n + 3)$ B: $6(n + 3)$

3. A: $-(x - 4)$ B: $-x + 4$

. . . Stay Together

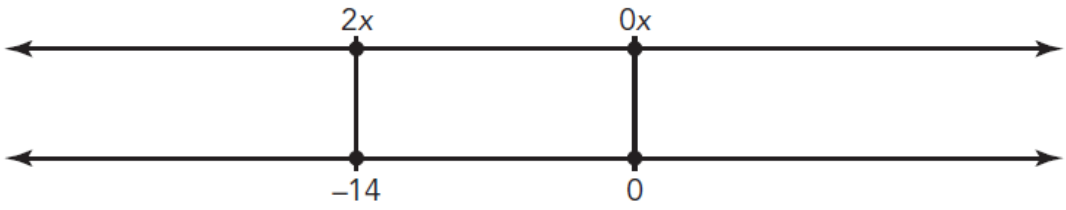
Consider this double number line. The expressions 12 and 3x have the same location, so they have the same value.



1. Write an equation to show that 3x and 12 have the same value.

2. Extend each number line in both directions by identifying and labeling additional equivalent relationships. Explain the reasoning you used to place each relationship.

3. Consider this double number line.



a. Write an equation to show that −14 and 2x have the same value.

b. Extend each number line in both directions by identifying and labeling additional equivalent relationships. Explain the reasoning you used to place each relationship.

EXPLORE 1

Solving a Two-Step Equation

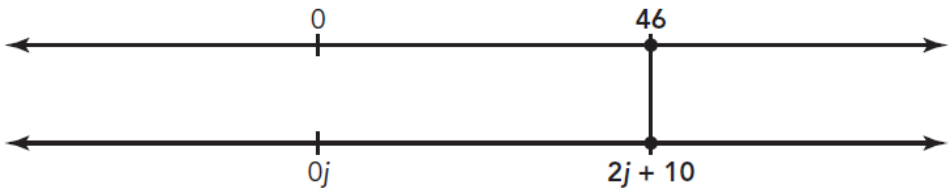
In the previous lesson, you modeled a problem in which Fido and Jet are two small dogs. Fido weighs exactly 10 pounds more than Jet. Together, they weigh exactly 46 pounds.

This situation can be represented by the equation 2j + 10 = 46, where j represents Jet's weight. You can also represent this situation and solve the equation using a double number line.

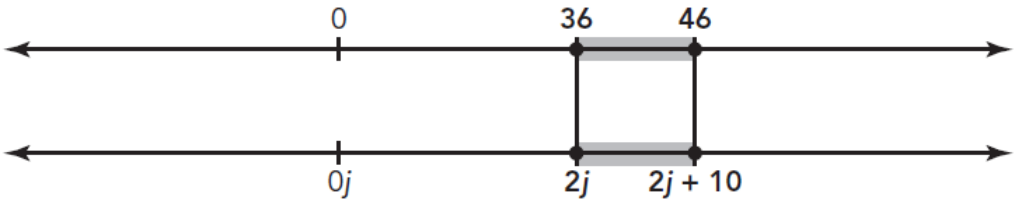
WORKED EXAMPLE

Solve the equation 2j + 10 = 46.

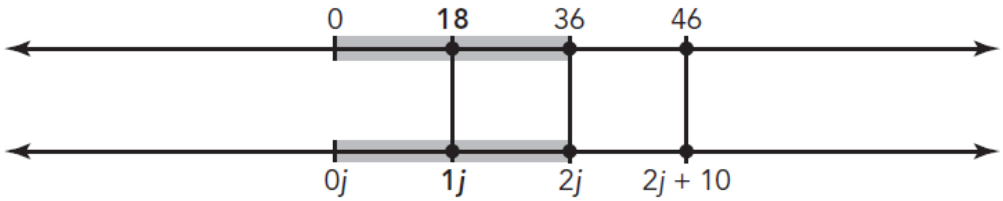
First, draw a model to set up the equation.



Next, start decomposing the variable expression. Place 2j in relationship to 2j + 10. The expression 2j is 10 to the left of 2j + 10. To maintain equality, place a number that is 10 to the left of 46. So, 2j = 36.



The expression 1j, or j, is halfway between 0j and 2j. And 18 is halfway between 0 and 36. So, j = 18.



1. How can you check to see if j = 18 is the solution to the original equation.

2. What does the solution j = 18 represent in terms of this problem situation?

3. What operation is used in each step to move toward the solution?

EXPLORE 2

Practice Solving Two-Step Equations

In this activity, you will use double number lines to solve equations.

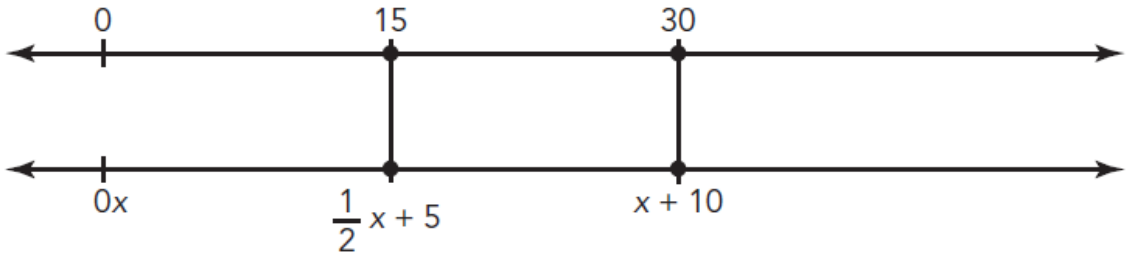
1. Model each equation on the double number line given. Then use the model to solve the equation. Describe the steps and operations you used and explain your reasoning.

a. $\frac{1}{2}x + 5 = 15$

b. $52.5 = t - 3.1$

c. $4(b + 1) = 20$

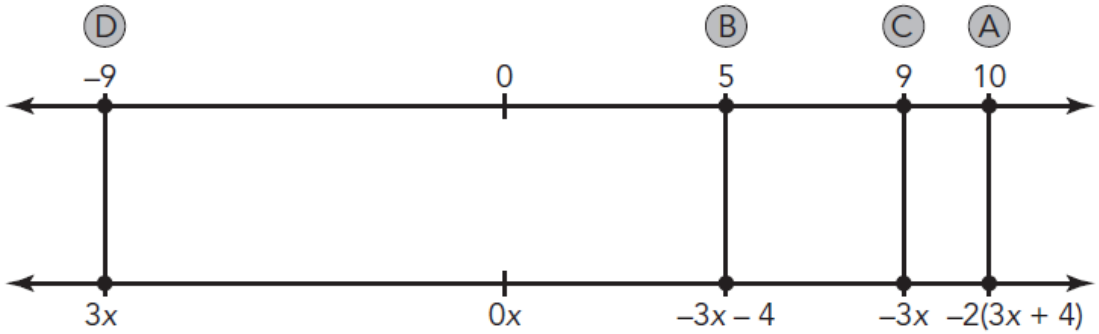
2. Brent showed how he started to solve the equation $\frac{1}{2}x + 5 = 15$. Describe his method. Then complete his process to solve the equation.



EXPLORE 3

Reasoning with Negatives to Solve Equations

The double number line shows one way to start to solve the equation $-2(3x + 4) = 10$. A through D represent the order in which the steps were completed.



1. Describe each step used to solve the equation. List the operation used at each step.

From Step A to Step B:

From Step B to Step C:

From Step C to Step D:

2. What is the solution to the equation?

4. Solve each equation using a double number line. Describe your solution steps.

a. $-x + 10 = 40$

b. $-\frac{3}{4}x - 4 = 11$

c. $-3x + 4 = 10$

Show You KNOW

Keeping It Together

You have solved a lot of different equations in this lesson and the previous lesson. Now it's your turn.

1. Start with a solution and create an equation by either multiplying both sides by a constant and then add or subtract a different constant. Describe the process you use to compose your equation. Then give your equation to a classmate to solve.

2. Record the steps your partner uses to solve your equation.

3. Compare the steps you used to create the equation with the steps your classmate used to solve your equation. What do you notice?

4. How do you keep the expressions equal as you solve the equation?

Name: _____ Date: _____ Class: _____

Homework HW

LESSON 8.2

Expressions That Play Together...

Objective

Solving Equations on a Double Number Line

Practice

Solve each equation using a double number line.

1. $4x + 12 = 24$

2. $-8x + 25 = -15$

3. $-5x - 12 = 18$

4. $40x + 55 = 695$

5. $-8 = 2x - 14$

6. $11x + 13 = -9$