TOPIC 8

LESSON 8.2

Bar None

Objective Solving One-Step Addition Equations

Warm-Up

Determine each sum or difference.

1. 5.67 + 8.73

2. 8.73 – 5.67

3. $\frac{3}{7} + \frac{4}{5}$

4. $\frac{20}{3} - \frac{15}{4}$

GETTING STARTED

Form of 0

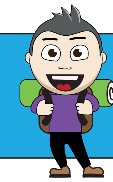
Consider the number 0. What comes to mind?

1. Write five different numeric expressions for the number 0.
Share your numeric expressions with your classmates.

2. Did you and your classmates use common strategies to write your expressions? How many possible numeric expressions could you write for this number?

EXPLORE 1

Reasoning About Addition Equations

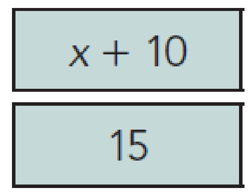


Reasoning about equations and determining solutions with bar models provides a visual representation of the structure of the equations. A bar model uses rectangular bars to represent known and unknown quantities.

WORKED EXAMPLE

Consider the addition equation $x + 10 = 15$.

This equation states that for some value of x, the expression $x + 10$ is equal to 15. This can be represented using a bar model.

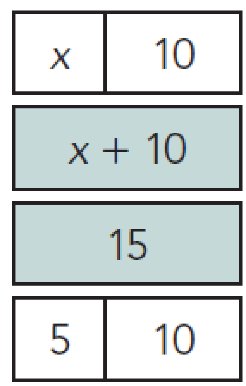


Just like with area models, bar models can be decomposed. The expression $x + 10$ can be decomposed into a part representing x and a part representing 10. The number 15 can be decomposed in a similar way: $15 = 5 + 10$.

The bar model demonstrates that these two equations are equivalent.

$$x + 10 = 15$$
$$x + 10 = 5 + 10$$

By examining the structure of the second equation, you can see that 5 is the value for x that makes this equation true.



1. Why is the number 15 decomposed into the numeric expression 5 + 10?

2. Describe how the model in the worked example would be different for each equation. Copy and complete the bar model for each.

a. $x + 10 = 17$

x	10
$x + 10$	
17	

b. $x + 6 = 15$

x	
$x + 6$	
15	

3. Consider the equation $14 + x = 32$.

a. Copy and complete the bar model.

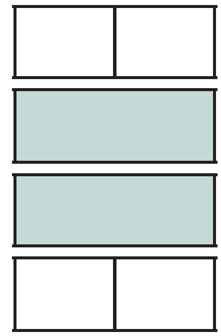
$14 + x$	
32	

b. Write the equation represented by the decomposed expressions in the bar model.

c. Which value for x makes the equation a true statement?

4. Consider the equation 90 = x + 64.

a. Copy and complete the bar model.



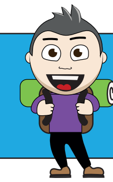
b. Write the expression represented by the decomposed expressions in the bar model.

c. Which value for x makes the equation a true statement?

5. In each bar model, how did you determine how to decompose the given expressions?

EXPLORE 2

Solving Addition Equations



In Activity 2.1, Reasoning About Equations, you used bar models to solve one-step equations. A one-step equation is an equation that can be solved using only one operation. How can you use what you learned from creating bar models to solve any equation?

Now that you understand the bar model, you can write equivalent equations with the same structure. While you can use reasoning to determine the value for the variable that makes an equation true, you can also use the properties and inverse operations to isolate the variable. Inverse operations are pairs of operations that reverse the effects of each other. For example, subtraction and addition are inverse operations.

WORKED EXAMPLE

Solve the equation $h + 6 = 19$.

$h + 6 = 13 + 6$	Write equivalent expressions that mirror structure.
$h + 6 - 6 = 13 + 6 - 6$	Use inverse operations to reverse the addition of 6 to h.
$h + 0 = 13 + 0$	Combine like terms and apply the Additive Identity Property.
$h = 13$	

1. Examine the worked example.

a. What is the solution to $h + 6 = 19$?

b. Are there other solutions to the equation? How do you know?

2. Use the same strategy to solve each equation.

a. $35 = 12 + m$

b. $t + 24 = 85$

3. Analyze Kaniah's strategy to solve the equation $11 = m + 7$.

Kaniah

When solving the addition equation $11 = m + 7$, I can simply subtract 7 from both sides without first writing an equivalent equation.

$$11 = m + 7$$
$$11 - 7 = m + 7 - 7$$
$$4 = m$$

The value for m that makes this equation true is 4.

a. What Property of Equality is Kaniah using in her strategy?

b. How could Kaniah check that her solution is correct?

4. Use Kaniah's strategy to solve each equation. Check to see that your solution makes the original equation a true statement.

a. $120 + y = 315$

b. $5\frac{3}{4} = x + 4\frac{1}{2}$

c. $b + 5.67 = 12.89$

d. $2356 = a + 1699$

e. $\frac{7}{12} = g + \frac{1}{4}$

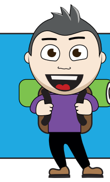
f. $w + 3.14 = 27$

g. $13\frac{7}{8} = c + 9\frac{3}{4}$

h. $19 + p = 105$

EXPLORE 3

Reasoning About More Interesting Addition Equations



1. Braeden thinks that he can use decomposition to reason about more complicated equations, such as $4x = 20 + 3x$. Is Braeden correct? Show your work.

2. Think about each algebraic equation. Use reasoning to describe a relationship between c and d that makes the mathematical sentence true.

a. $c + 23 = d + 14$

b. $45 + c = 66 + d$

c. $c + 3d = 2c$

d. $4c + d + 10 = 8c + 2d$

Name: ______________________ Date: ____________ Class: __________

Homework HW

LESSON 8.2

Bar None

Objective Solving One-Steo Addition Equations

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. $11x + 13 = -9$