LESSON 15

Write Equivalent Expressions Involving Rational Numbers

Dear Family,

This week your student is learning how to write equivalent expressions that have both variables and rational numbers.

Many situations can be represented with mathematical expressions. For example, suppose the price of a movie ticket is x dollars, and the price of a bag of popcorn is y dollars. The expression $x + y$ represents the cost of 1 ticket and 1 bag of popcorn. You can represent the cost of 2 tickets and 2 bags of popcorn with different expressions.

Three possible expressions are $x + y + x + y$, $2x + 2y$, and $2(x + y)$. These expressions are equivalent, or represent the same value.

$x + y + x + y$ $\qquad$ $2x + 2y$ $\qquad$ $2(x + y)$

Expand $2(x + y)$ $\qquad$ **Factor** $2x + 2y$

Your student will be solving problems like the one below.

> Are $24x - 27 - 15x + 18 - 21x + 27$ and $-3(4x - 6)$ equivalent expressions?

➤ **ONE WAY** to check if the expressions are equivalent is to write both expressions without parentheses and then combine like terms.

$24x - 27 - 15x + 18 - 21x + 27$ $\qquad$ $-3(4x - 6)$

$(24x - 15x - 21x) + (-27 + 18 + 27)$ $\qquad$ $-12x + 18$

$-12x + 18$

➤ **ANOTHER WAY** is to write the first expression using parentheses, or factor.

$24x - 27 - 15x + 18 - 21x + 27$ $\qquad$ $-3(4x - 6)$

$(24x - 15x - 21x) + (-27 + 18 + 27)$

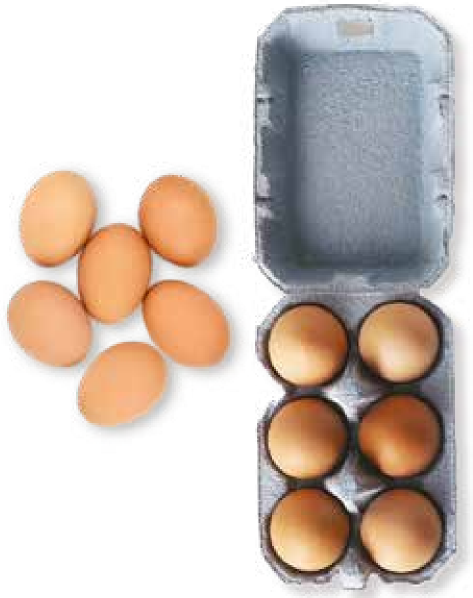
$-12x + 18$

$-3(4x - 6)$

Both ways show $24x - 27 - 15x + 18 - 21x + 27$ and $-3(4x - 6)$ are equivalent expressions.

Use the next page to start a conversation about equivalent expressions.

Activity Thinking About Equivalent Expressions



Do this activity together to investigate equivalent expressions.

Have you and a friend ever said things differently, but meant the same thing? Often expressions look or sound different but mean the same thing.

Some examples include:

- Six of one, or half a dozen of the other
- A mix of red and blue, or purple
- Quarter past 1, or 1:15

What are other situations where you can express the same thing in different ways?

LESSON 16

Understand Reasons for Rewriting Expressions

Dear Family,

This week your student is exploring how rewriting an expression in an equivalent form can help them look at a situation in a different way.

Your student has already learned what it means for two expressions to be equivalent and how to represent a real-world situation with an expression.

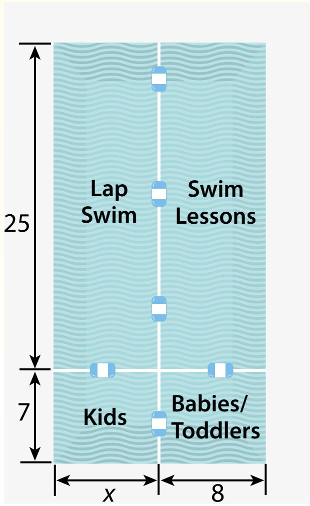
You can often represent a situation with multiple equivalent expressions. The expression that you write depends on how you interpret the situation.

Your student will be modeling problems like the one below.

A swimming pool is being designed so that different sections can be used for different activities. The diagram of the pool gives the dimensions in meters.

You can model the total area of the pool with the expression $25(8) + 25x + 7(8) + 7x$. You can also model the area of the pool with the expression $(25 + 7)(8 + x)$.

What information does each expression provide?



ONE WAY to think about the total area is as the sum of the areas of the sections.

$25(8) + 25x + 7(8) + 7x$

This expression shows how the areas of the different sections make up the area of the whole pool. It shows that if the value of x changes, only the *Lap Swim* area and *Kids* area change. The *Swim Lessons* and *Babies/Toddlers* areas do not change.

ANOTHER WAY to think about the total area of the pool is as a large rectangle.

$(25 + 7)(8 + x)$

This expression shows that the area of the whole pool is the product of the length and the width.

It shows that when x changes, both the width and the total area change.

Use the next page to start a conversation about equivalent expressions.

Activity Thinking About Equivalent Expressions

➤ **Do this activity together to investigate reasons for rewriting expressions.**

Each situation below is represented with a pair of equivalent expressions.

Which expression do you like best for each situation? What question could that expression help you answer?

SITUATION 1

Four friends go to a fair. Each spends \$25 for admission and \$8.50 for lunch. These expressions show the total cost.

$4(25 + 8.50)$

$4(25) + 4(8.50)$

SITUATION 2

At a grocery store, each \$3.75 box of cereal is on sale for \$1.25 off. These expressions show the cost of b boxes.

$3.75b - 1.25b$

$2.5b$

What are some other ways to think about these situations?

LESSON 17

Understand Multi-Step Equations

Dear Family,

This week your student is exploring multi-step equations.

You can use a variable to represent an unknown quantity and write an equation with the variable to represent a situation. Then you can use reasoning to find the value of the unknown quantity. You can use a hanger diagram to reason about the value of an unknown quantity.

Your student will be reasoning about situations like the one below.

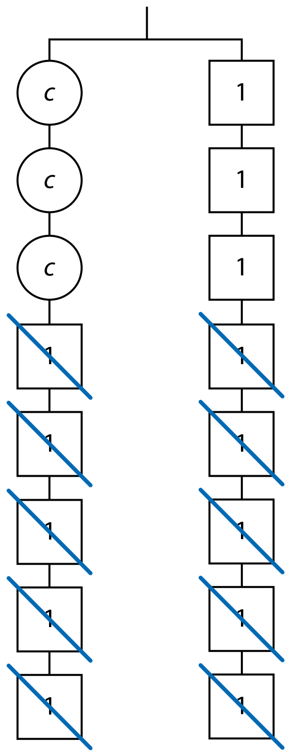
> For a party, Mr. Díaz buys 3 packs of confetti and a banner. He spends a total of $8. He knows that the banner cost $5, but does not remember the cost, *c*, of each pack of confetti. How can you represent this situation? How can you reason about the cost of each pack of confetti?

ONE WAY is to use a hanger diagram.

The hanger diagram models this situation. The bar at the top is not tilted, showing the sides are balanced, or equal.

One way to reason about the cost, *c*, of each pack of confetti, is to cross off the same number of 1s from each side.

Now there are three *c*'s on the left side and three 1s on the right side. That means each *c* is equal to 1.



ANOTHER WAY is to use an equation.

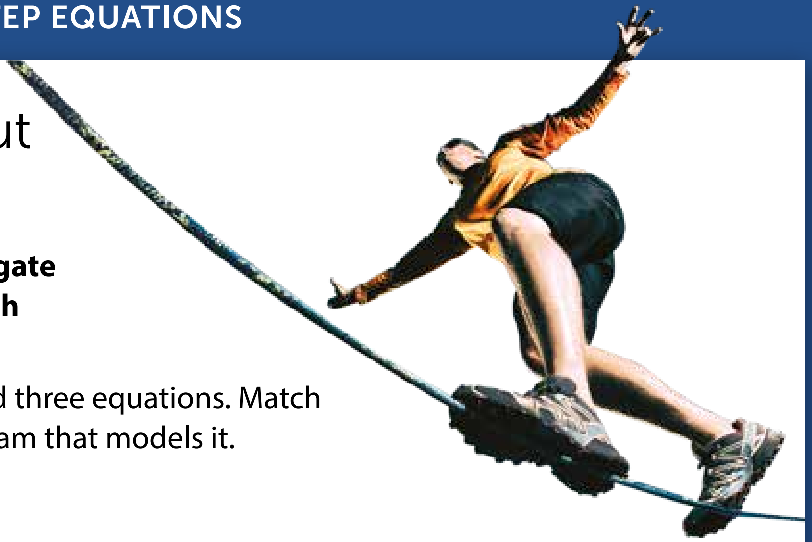
The equation $3c + 5 = 8$ models this situation.

One way to reason about the cost, *c*, of each pack of confetti is to first think about the value of $3c$. This means thinking about what plus 5 equals 8. Since 3 plus 5 equals 8, that means $3c$ equals 3.

You can then use the value of $3c$ to reason about the value of *c*. If 3 times *c* equals 3, then *c* equals 1.

Using either representation, you can reason that the cost of each pack of confetti is $1.

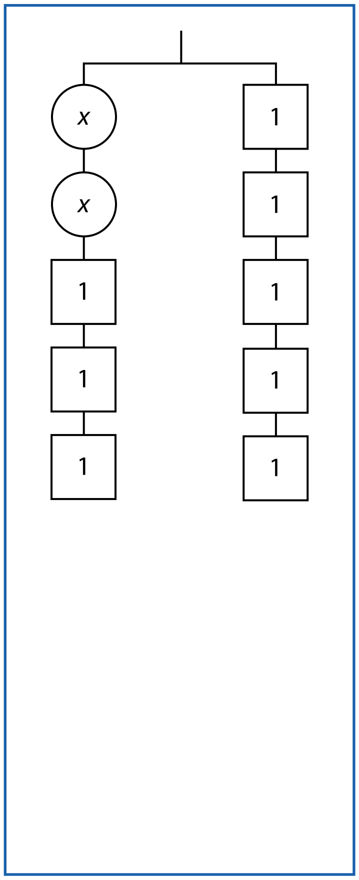
Use the next page to start a conversation about multi-step equations.

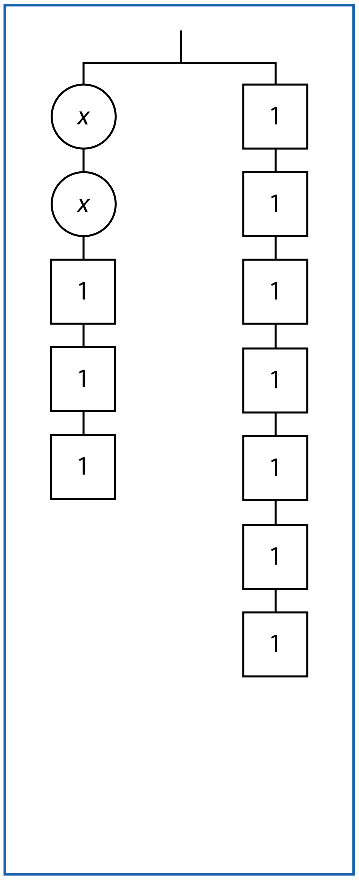


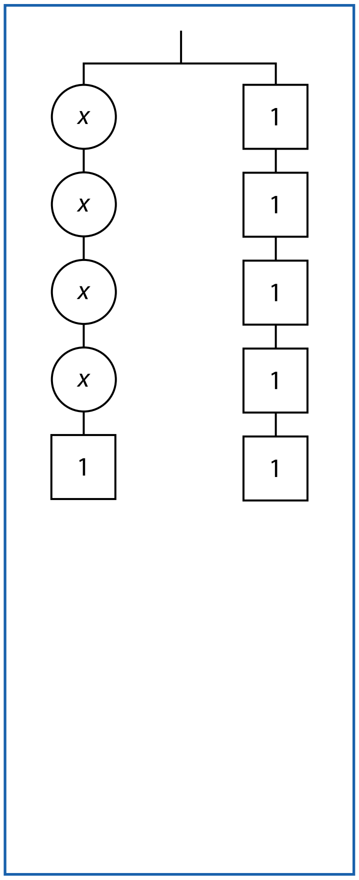
Activity Thinking About Multi-Step Equations

➤ **Do this activity together to investigate modeling multi-step equations with hanger diagrams.**

Below are three hanger diagrams and three equations. Match each equation with the hanger diagram that models it.







$2x + 3 = 7$

$4x + 1 = 5$

$2x + 3 = 5$

How can you match the hanger diagram with the equation that it models?

LESSON 18

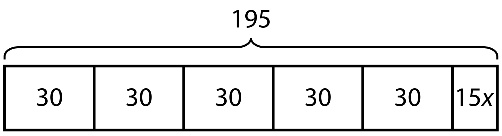
Dear Family,

This week your student is learning about writing and solving multi-step equations using algebraic approaches.

One way to solve word problems is by writing and solving an equation that represents the situation. A bar model may help you make sense of a problem. Then you can use it to write an equation to represent the situation.

A group of 5 friends go to a concert. Each friend buys a ticket that costs \$30 and some buy a T-shirt that costs \$15. In total the friends spend \$195. How many T-shirts, x, did the friends buy?

Bar Model



Equation

$15x + 150 = 195$

There are often multiple ways to approach solving an equation. Your student will be solving problems like the one below.

A family buys 2 adult tickets and 4 child tickets to a high school basketball game. The family spends a total of \$28 on tickets. The adult tickets cost \$7 each. What is the cost, x, of each child ticket?

ONE WAY to start finding the value of x is to subtract 14 from both sides of the equation.

$$4x + 14 = 28$$
$$4x + 14 - 14 = 28 - 14$$
$$4x = 14$$
$$\frac{4x}{4} = \frac{14}{4}$$
$$x = 3.5$$

ANOTHER WAY to start is to divide both sides by 4.

$$4x + 14 = 28$$
$$\frac{4x + 14}{4} = \frac{28}{4}$$
$$x + 3.5 = 7$$
$$x + 3.5 - 3.5 = 7 - 3.5$$
$$x = 3.5$$

Using either method, $x = 3.5$. The cost of each child ticket is \$3.50.

Use the next page to start a conversation about equations.

Write and Solve Multi-Step Equations

Activity Thinking About Multi-Step Equations

➤ **Do this activity together to investigate using an equation to make sense to a situation.**

Have you ever taken a taxi to get somewhere? Many taxi companies charge per mile you travel plus a fee to start the trip! That means how much the ride costs is based on more than just how far you travel.

You can use an equation to think about the relationship between miles traveled and the cost of the taxi ride.

Cost of Taxi ($) = **Cost per Mile ($)** × **Number of Miles** + **Taxi Fee($)**

You can use this equation to figure out much a taxi ride will cost if you know how many miles long the trip is. You can also use this equation to figure out how many miles you can travel for a certain amount.

? What are other situations where a total depends on more than one thing?

