

Comparing Equivalent Expressions

Content Objectives

- Model situations with symbolic statements.
- Recognize when two or more symbolic statements represent the same context.
- Determine if different symbolic expressions are mathematically equivalent.

Common Core standards (even though these are algebra 1 standards, this lesson is really more for 7th or 8th grade)

- A-SSE.A.1a Interpret parts of an expression, such as term, factors and coefficients.
- A-SSE.A.2 Use the structure of an expression to identify ways to rewrite it.
- A-SSE.B.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

Materials

- Technology for each student with access to the Phet Sim Expression Exchange
- Handout
- Expression and equation cards (need to be cut out and shuffled before the lesson)
- T chart written on the board with two columns: Equation and Expression

The Plan (50 minute class period)

5 minutes

- As students walk in, hand them a card with either an expression or equation on it.
- Students will then place their card on a T chart (written on the whiteboard or chart paper), putting their card in the Equation or Expression column
- Discuss the vocabulary of mathematical expressions
 - How do you differentiate between an **equation** and an **expression**?
 - What is a **term** of the expression?
 - What is a **variable**?
 - Students will explore the vocabulary coefficient, equivalent and like-terms with the sim.

5 - 10 minutes

- Students access Expression Exchange and have open play time
- Have students share out their discoveries about the site.
- The teacher will guide students toward any features that the students may have missed.
 - What happens when you try to stack the coins?
 - What does the number in front of the coin mean?
 - How can you break apart a stack?
 - What are the two different ways you can combine coins? Are there any restrictions on the coins that can be combined in either of these two ways?
 - How can you calculate the value of each coin?
 - What happens when you click on the  and then click on the yellow box with the scissors?

25 to 30 minutes

- Give students the handout and have them work in groups of 3, using the Sim to fill out the answers. Each student will have their own computer.

- Teacher will circulate and check in with students. When students have questions, teacher will redirect the students to explore their ideas with the sim.

10 minutes

- Summary - Students look at the expression cards from the beginning of class and decide which expressions are equivalent and explain why.
- Teacher could do this as a whole class or students do this in their small groups and then share.

$3xy + 5z + 11$	$3x + 2y = 12$
$5x + 6x$	$24 - 3x = 36$
$11x$	$11x - 5y = 14$
$8xyz + 11$	$7 + 5p - p = 11p$
$12 + 3x^2y - 5x^2y$	$10 - 5x = 8$
$-2x^2y + 12$	$3 = 5x + 8$
$3(x + 9) + 5x$	$3(x + 9) + 5x = 39$

$$8x + 27$$

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

$$7 + 5p - p$$

$$x^2 + 5x + 6 = 12$$

$$4p + 7$$

$$4p + 7 = 19$$

$$2x^2y + 12$$

$$2xy + 12 = 0$$

$$11x^2$$

$$11 = 11x^2$$

$$10 - 5x$$

$$10 - 5x = 50$$

$$5x - 10$$

$$50 = 5x - 10$$

Website <https://phet.colorado.edu/sims/html/expression-exchange/>

1.) Using the **explore screen** of the sim Expression Exchange, can you make 89 cents? Write or draw your solution below.

2.) Can you show another way to make 89 cents? Write your solution below.

3.) Compare how you wrote your solution to question 1 and 2 with the other students in your group. Who had the most efficient way to write the expression? Why was that expression best?



Given the pictorial representation above, write an expression using coefficients, variables, and addition.

5.) What is a **coefficient** and what does it represent in an expression? Give an example from the sim.

Use the sim Expression Exchange to help you answer the following. You may use any of the screens.

6.) Jamie says that $3x + 5y + 6x$ is equivalent to $\square\square x^\square y$.

Explain why this is incorrect and give the correct simplified expression.

7.) Rama says that $3x + -x$ is equivalent to 3

Explain why this is incorrect and give the correct simplified expression.

8.) Jon says $x^2 + x^2$ is equivalent to x^4

Explain why this is incorrect and give the correct simplified expression.

9.) Helen says that $3y + 1z$ is equivalent to $4yz$.

Explain why this is incorrect.

10.) $3xy$ and $5xy$ are called "like terms." $3xy$ and $5y$ are not like terms. Can you give a definition of like terms and how we combine like terms?