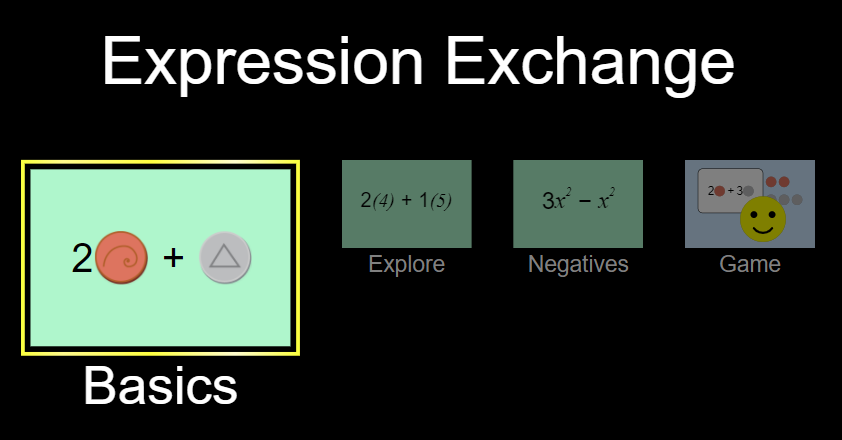
\*This work packet is for students to work through as they use the Expression Exchange Simulation\*

**Introduction to Variables and Coefficients**

**Computer Simulation using Expression Exchange on PhET website**

1. Important Questions - think about these as you go through the lesson.
   1. What are coefficients?
   2. What are variables?
   3. What are the steps to figuring out the value of a variable?
2. Instructions
   1. Keep the above questions in mind as you work through the following activities.
   2. Complete the steps below. Answer all questions completely and fill in all blank spaces with information.
3. Steps
   1. Click this link: <https://phet.colorado.edu/sims/html/expression-exchange/latest/expression-exchange_en.html> (Expression Exchange on PhET website)
   2. Your screen should look like this:



1. Explore (5 min)
   1. On the “Basics” tab, spend some time exploring what each button does.
   2. Move objects around.
   3. When you move an object near the **side** of another one, what happens?

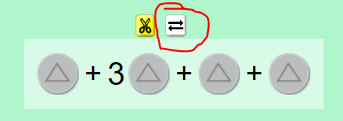
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* 1. When you move an object **on top** of an object, what happens?

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* 1. What happens when you click the scissors above a selected group of coins? The arrows? 

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* 1. Check and uncheck these boxes. What happens?

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* 1. What happens when you switch this? 

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* 1. Find and use the reset button in the bottom right corner.

1. Explain (20 minutes)
   1. Put some coins on the green area. Check the “All Coefficients” box and try combining some coins together by placing them one on top of another.
   2. What do the coefficients tell you?

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* 1. Can you combine two different coins together to get a coefficient?

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* 1. Why do you think you are unable to combine two different coins together to get a coefficient?

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* 1. On the “Basics” tab, put some coins in the area. Put the slider on the *x*, go to the top left corner and open the “variable” tab. What happens to your total as you change the value of the variables?

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* 1. Reset the activity. What combination(s) of coins gets you a value of 20 cents?

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* 1. Click the “Game” tab. Complete Levels 1-4 by dragging your answers to the matching box on the right.
  2. Record your **correct** answers below.

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| **Level 1** | **Coins you used** | **Expression w/ variables (step 2)** |
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| **Level 2** |  |  |
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| **Level 3** |  |  |
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| **Level 4** | **Coins you used** | **Expression w/ variables (step 2)** |
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1. Apply (10 minutes)
   1. Under the “Expressions with Variables” column, replace the coin image with the following variables: =x =y =z
   2. Calculate the value of the following coins (*THEY ARE DIFFERENT FROM THE SIMULATION*)
      1. 3 = 24 = \_\_\_\_\_
      2. 4 = 36  = \_\_\_\_\_
      3. = 2 8= \_\_\_\_\_
      4. \*Using the values above\*
         1. + 2 = \_\_\_\_\_
         2. 2 + 2 +  = \_\_\_\_\_
   3. If you have time, create some problems of your own and trade them with a partner. See if you can solve each other’s problems!
2. Closure (10 minutes - answer independently and discus your answer with the class)
   1. Now you will go back to the questions presented at the beginning of the activity. Answer them as completely and detailed as possible:
      1. What are coefficients? What do they represent?

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* + 1. What are variables? What do they represent?

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* + 1. What can you do to find out the value of a variable?

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