

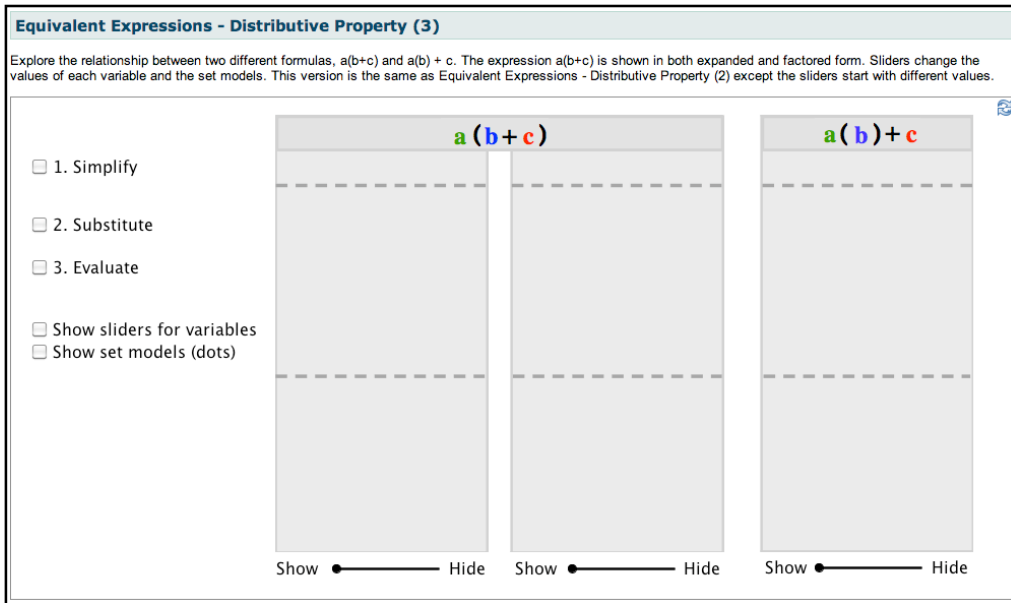
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## Exploration: Distributive Property (3)

Two algebraic expressions are **equivalent** if they always lead to the same result when you evaluate them, no matter what values you substitute for the variables.

### Part I.

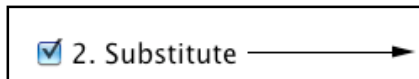
1. Launch the *Distributive Properties (3)* applet.



2. Drag the sliders below the first two columns to the right to **Hide**.

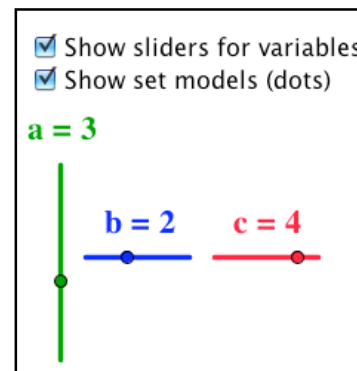


3. Click on the *Substitute* checkbox



4. Click on the *Show sliders for variables* and *Show set models (dots)* then:

- Set the *a* slider to 3
- Set the *b* slider to 2
- Set the *c* slider to 4



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5. Look at the 3<sup>rd</sup> column of the *Distributive Property* Applet.
- Notice the expression  $a(b) + c$  has values substituted to get  $3(2) + 4$

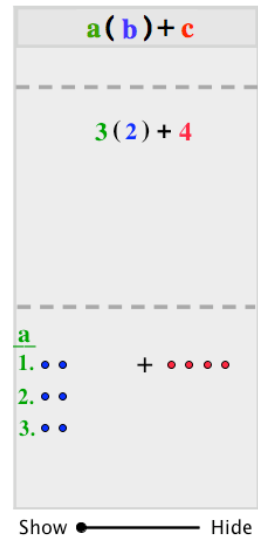
- Look at the rows of dots that represent the expression. How many rows of blue dots are present?

How many rows of red dots are present?  
How many dots are present in all?

- Click on the *Evaluate* check box.

3. Evaluate  $\longrightarrow$

- Review the solution to the expression. How does the total relate to the number of dots shown?



6. Uncheck the *Evaluate* check box.  
Uncheck the *Show set models (dots)* check box.  
Set the sliders so  $a = 5$ ,  $b = 3$ , and  $c = 2$  to make the expression  $5(3)+2$

- Predict the number of dots that will be showing. Sketch what the representation will look like:

- Check your predictions by:  
**Checking** the *Evaluate* check box.  
**Checking** the *Show set models (dots)* check box.
- How does the number of dots relate to their location within or outside of the parentheses?

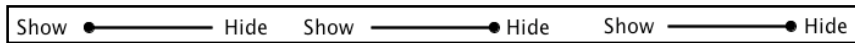


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7. **Uncheck** the *Evaluate* check box.  
**Uncheck** the *Show set models (dots)* check box.

Move the Slider below the 3<sup>rd</sup> column to **Hide** and then move the Slider below the first column to **Show**.



Set the sliders so  $a = 5$ ,  $b = 3$ , and  $c = 2$  to make the expression  $5(3+2)$

- a. Predict the number of dots that will be showing. Sketch what the representation will look like:



- b. Check your predictions by:  
**Checking** the *Evaluate* check box.  
**Checking** the *Show set models (dots)* check box.
- c. How does the number of dots relate to their location within the parentheses?



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**BEFORE Moving On:** Uncheck the *Evaluate* and the *Show set models (dots)* check box.

**Part II.** Predict the number of dots that will be showing. Sketch what the representation will look like:

Ex. #	Set sliders to:	Write the expression: $a(b+c)$	Predict the solution:	Sketch the number of dots:
1.	$a = 5$ $b = 2$ $c = 5$			
2.	$a = 3$ $b = 2$ $c = 1$			
3.	$a = 1$ $b = 2$ $c = 2$			
4.	$a = 1$ $b = 0$ $c = 4$			

When finished check your predictions by moving the slider to *Show*. Make sure to check the *Evaluate* check box and the *Show set models (dots)* check box. (When finished checking, move slider to *Hide*.)

**Part III. Apply your current knowledge to the following problems**

1. Predict whether the following two expressions are equivalent.  $a(b+c)$  and  $a(b) + a(c)$

a) Explain why or why not.

b) Use the example below to assist in your explanation.

Draw a visual representation for each of the expressions below:

$3(2+4)$	$3(2) + 3(4)$

c) Are the expressions above equivalent?

d) Check your predictions by:

- Checking the *Evaluate* check box.
- Checking the *Show set models (dots)* check box.
- Move the two sliders below the first two columns to *Show* and check your prediction.

Show ●———— Hide    Show ●———— Hide



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**BEFORE Moving On: HIDE all the columns**

**Part IV. Predict whether the following expressions are equivalent.**

Substitute the values provided into the expression. Evaluate each expression  
Fill in the chart provided. **Do Not Use the Applet to Complete the Table.**

Ex. #	Set sliders to:	$a(b+c)$	$a(b)+a(c)$	$a(b)+c$
1.	$a = 5$			
	$b = 5$			
	$c = 5$			
2.	$a = 1$			
	$b = 1$			
	$c = 1$			
3.	$a = 3$			
	$b = 2$			
	$c = 4$			
4.	$a = 0$			
	$b = 3$			
	$c = 4$			

When finished check your predictions by moving the sliders to **Show**.

Make sure to **Check** the **Evaluate** check box and the **Show set models (dots)** check box.

5. When, if ever, did  $a(b+c) = a(b)+c$  in the examples above? Why or why not?

6. List all the times  $a(b+c)$  is equal to  $a(b)+c$  if :

- the variable **a** could have a value of {0, 1, 2, 3, 4, 5}
- the variable **b** could have a value of {0, 1, 2, 3, 4, 5}
- the variable **c** could have a value of {0, 1, 2, 3, 4, 5}

7. If these expressions have to be equal all of the time to be equivalent expressions, are  $a(b+c)$  and  $a(b)+c$  equivalent expressions?

