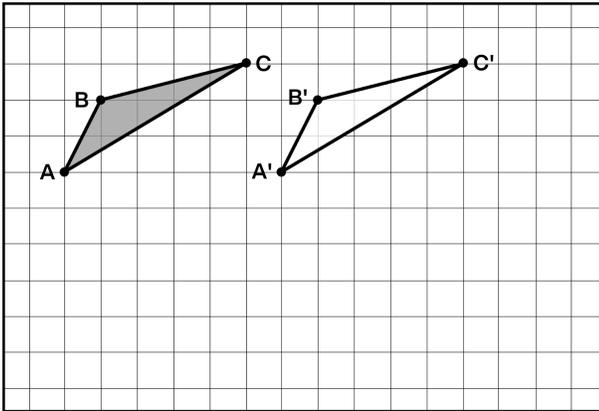


# Science Mom Lesson 3

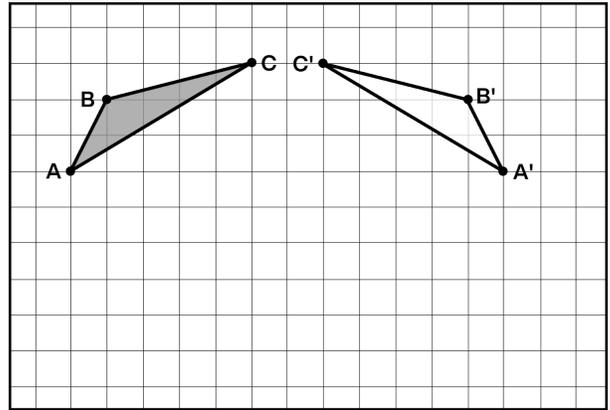
desmos

Unit 8.1, Lesson 4: Transformation Cards

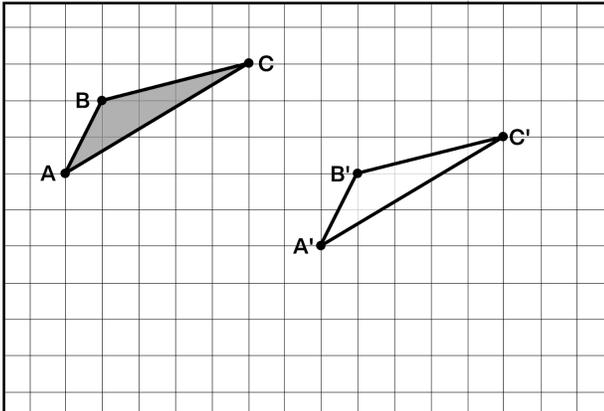
Card A



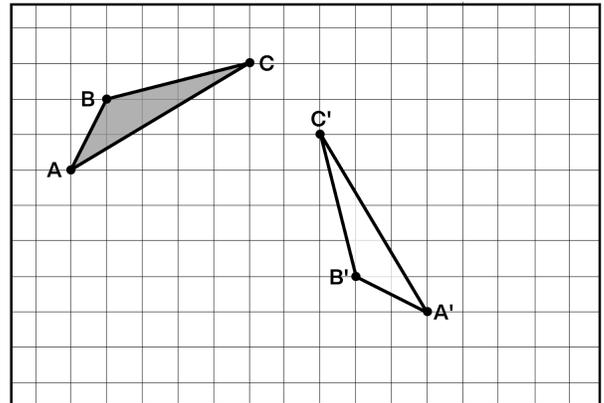
Card B



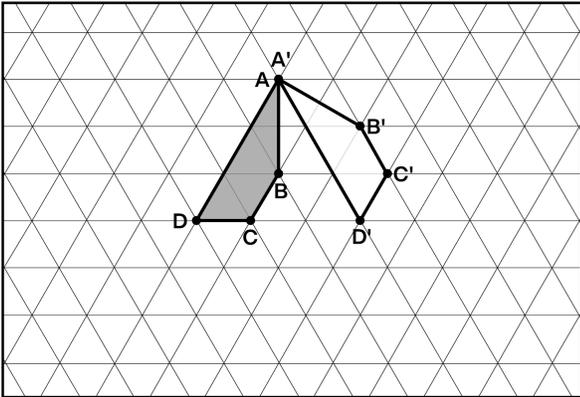
Card C



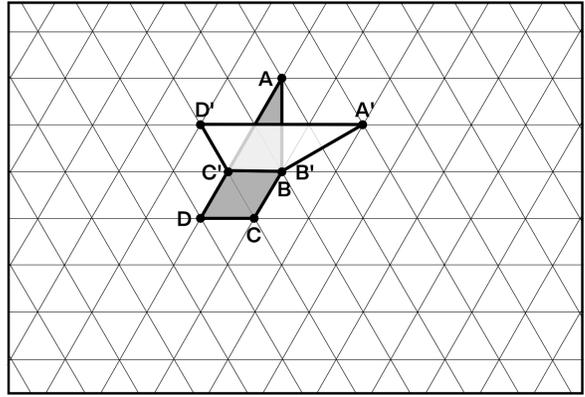
Card D



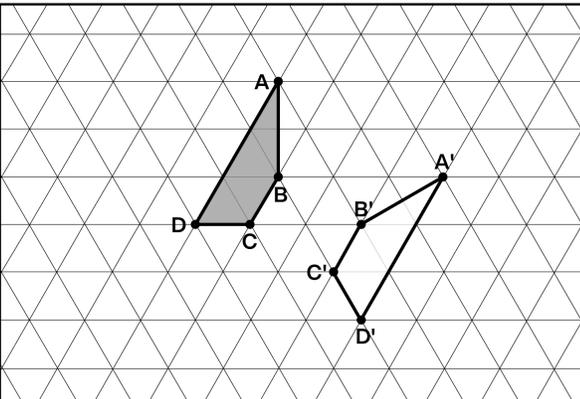
Card E



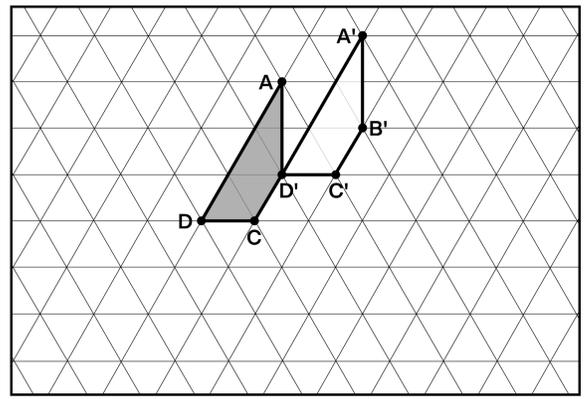
Card F



Card G



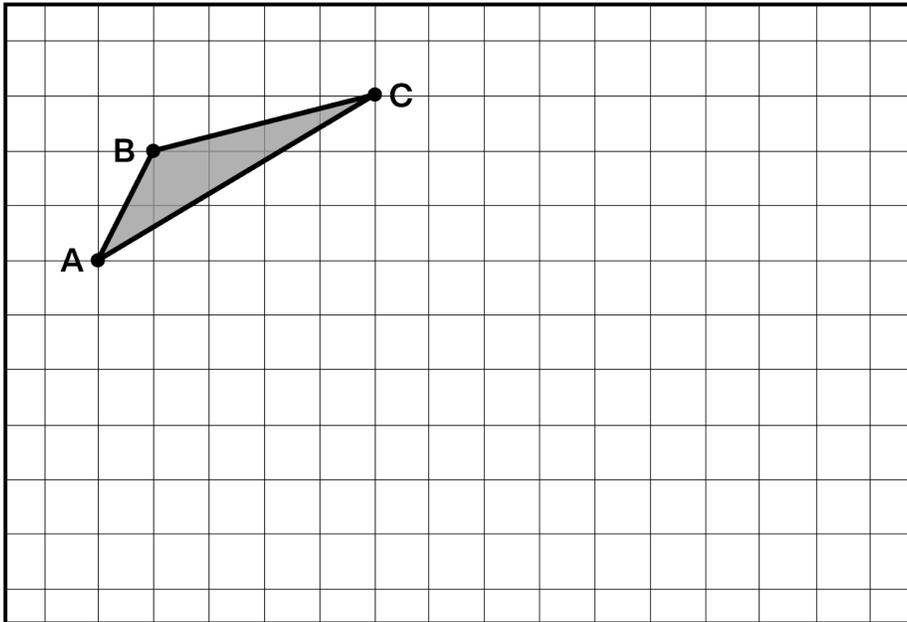
Card H



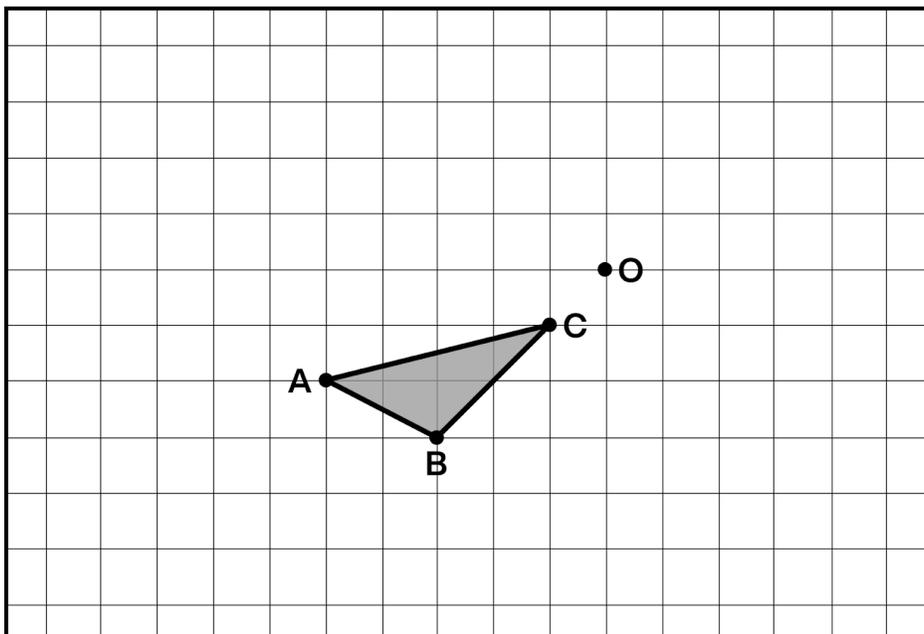
### Activity 1: Move It

Draw each image according to the sequence of transformations. Label points in the image with the letters  $A'$ ,  $B'$ , and  $C'$  to show points that correspond to points  $A$ ,  $B$ , and  $C$  in the pre-image.

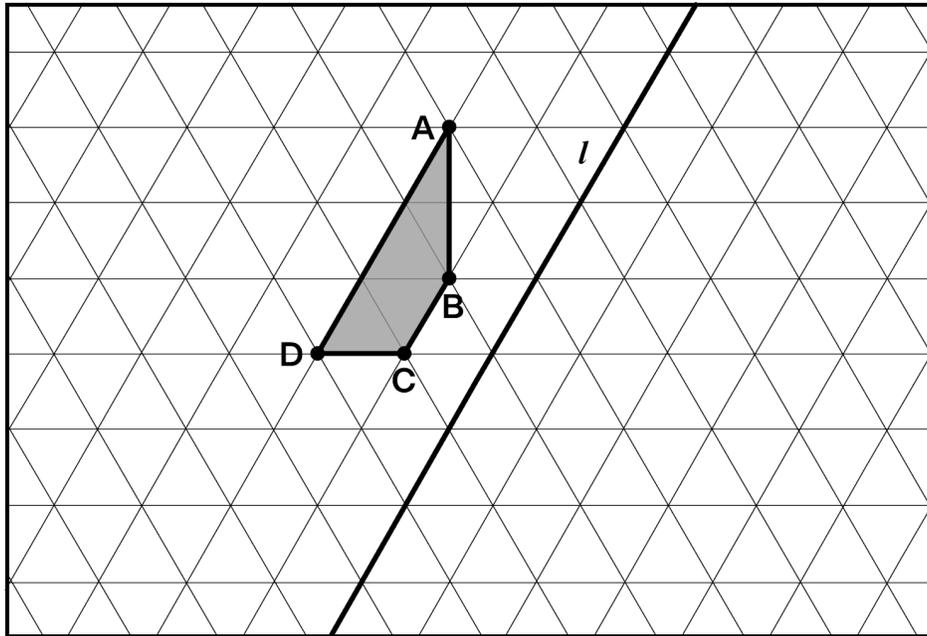
1.  Translate triangle  $ABC$  3 units right and 1 unit down.



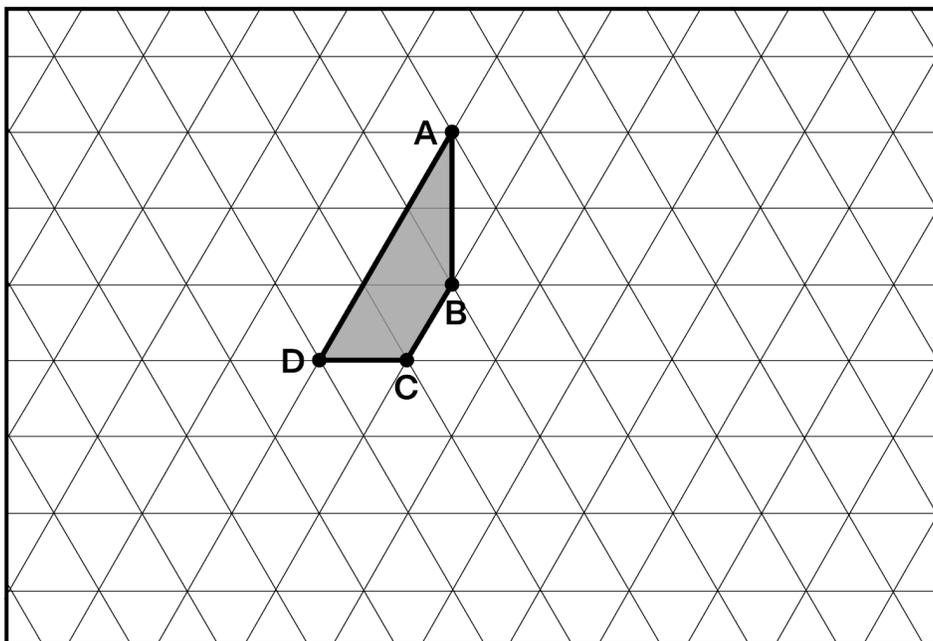
2.  Rotate triangle  $ABC$   $180^\circ$  counterclockwise using center  $O$ .



3.  Reflect quadrilateral  $ABCD$  using line  $l$ .



4.  Rotate quadrilateral  $ABCD$   $60^\circ$  clockwise using center  $C$ .



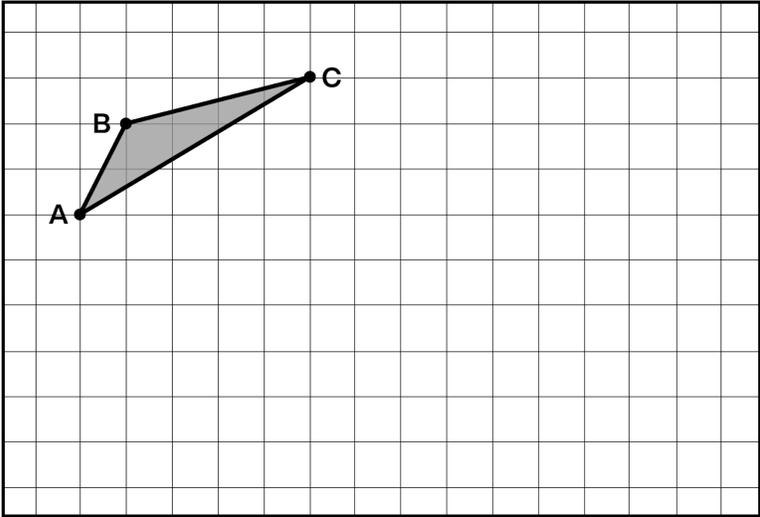
## Activity 2: Make My Transformation

Your partner will describe the image of this triangle after a certain transformation. Sketch it here.

*You can only sketch (no speaking).*

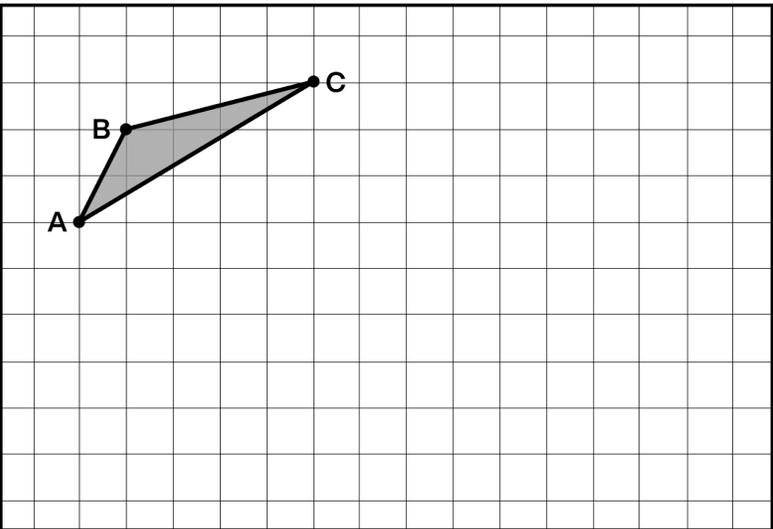
1.

**Card:**



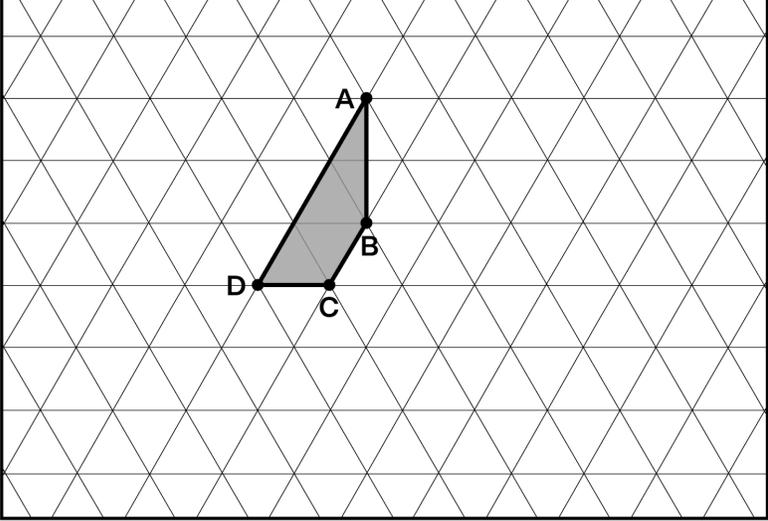
2.

**Card:**



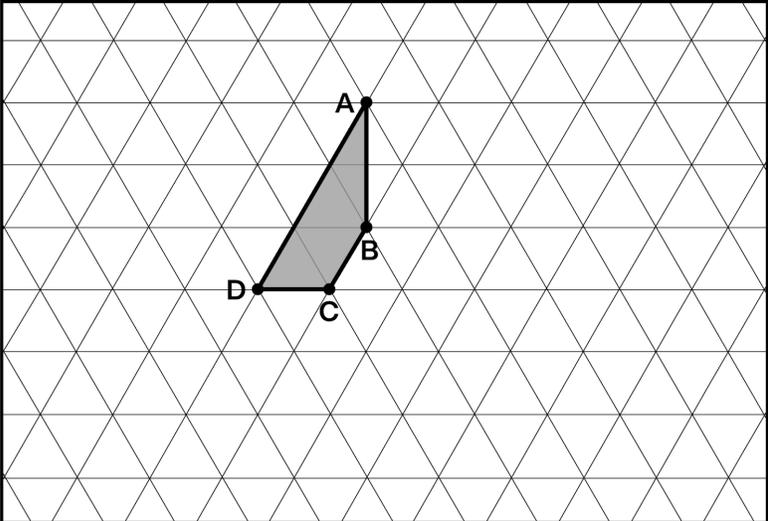
3.

**Card:**



4.

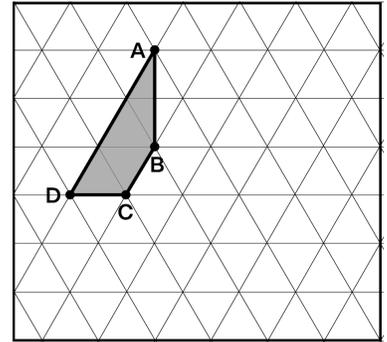
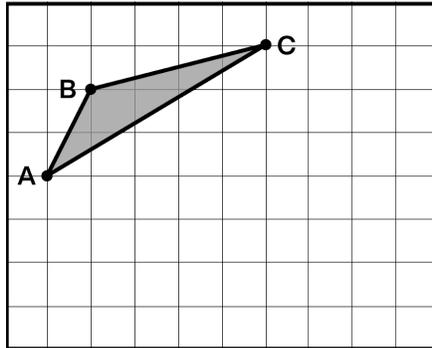
**Card:**



## Lesson Synthesis

Discuss with your partner. Then record your responses.

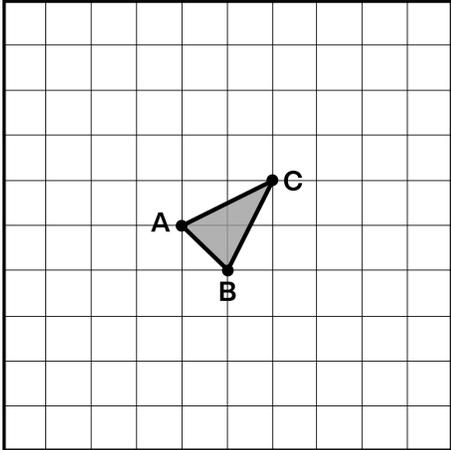
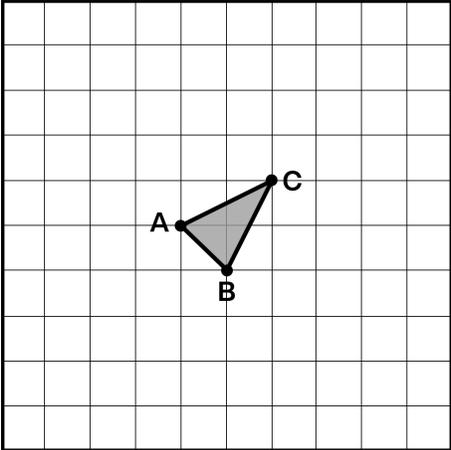
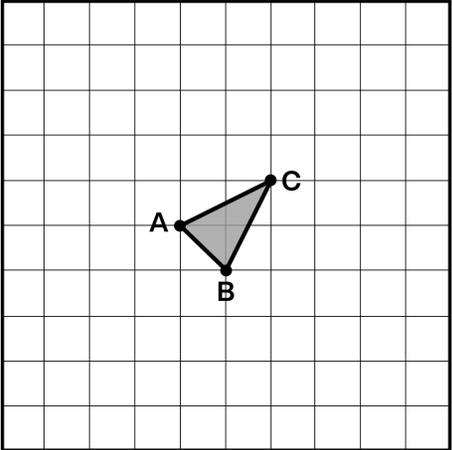
How does a grid help you describe a . . .



<p>A. . . . rotation?</p>	<p>B. . . . translation?</p>	<p>C. . . . reflection?</p>
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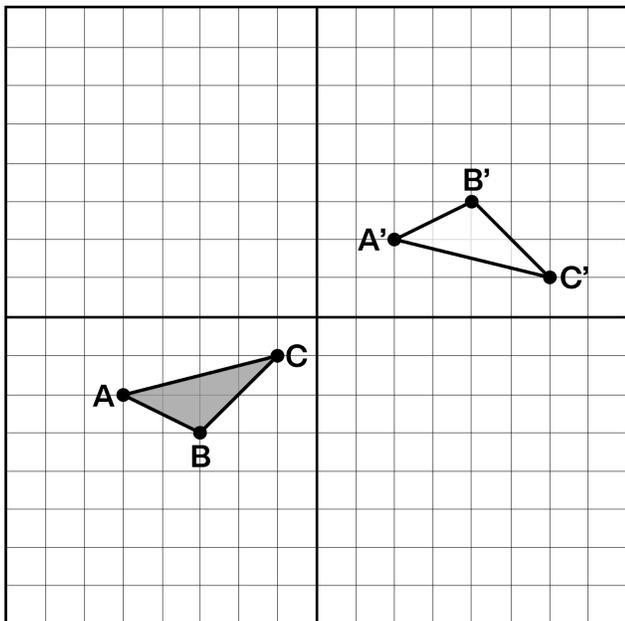
## Cool-Down

Triangle  $ABC$  is drawn on a grid. On each grid, draw and label:

<p>A. A reflection of triangle <math>ABC</math>.</p> 	<p>B. A translation of triangle <math>ABC</math>.</p> 	<p>C. A rotation of triangle <math>ABC</math>.</p> 
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## Activity 1: Transformation Information #1

Describe a sequence of transformations that takes triangle ABC to triangle A'B'C'.



**Pre-Write:**

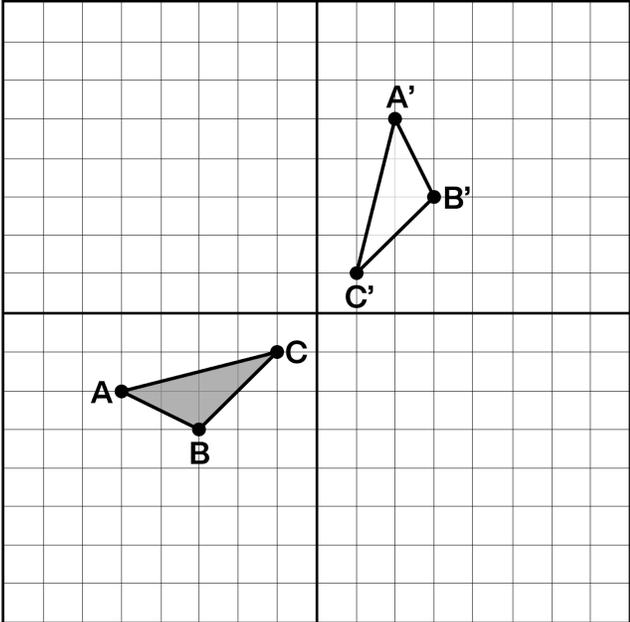
**Share #1 Notes:**

**Share #2 Notes:**

**Final Version:**

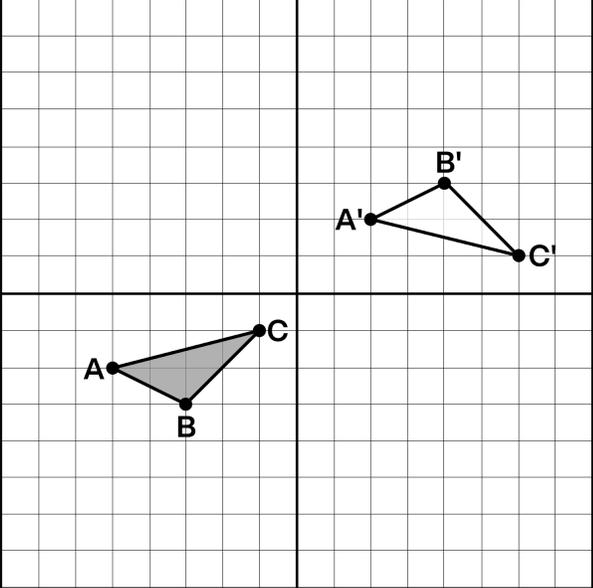
## Activity 1: Transformation Information #2

Describe a sequence of transformations that takes triangle ABC to triangle A'B'C'.

	<p><b>Pre-Write:</b></p>
<p><b>Share #1 Notes:</b></p>	<p><b>Share #2 Notes:</b></p>
<p><b>Final Version:</b></p>	

### Activity 1: Transformation Information #1

Describe a sequence of transformations that takes triangle  $ABC$  to triangle  $A'B'C'$ .

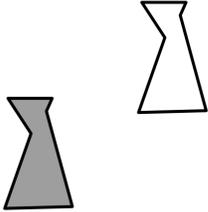
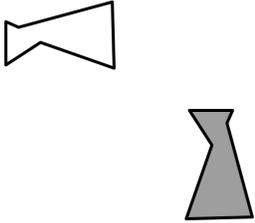
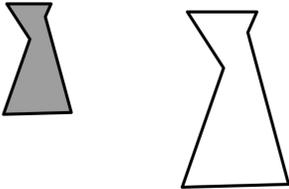
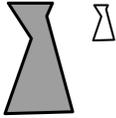
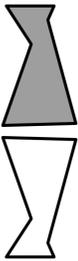
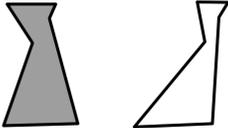
	<p><b>Pre-Write:</b></p>
<p><b>Share #1 Notes:</b></p>	<p><b>Share #2 Notes:</b></p>
<p><b>Final Version:</b></p>	

**Activity 1: Transformation Information #2**

Describe a sequence of transformations that takes triangle  $ABC$  to triangle  $A'B'C'$ .

	<p><b>Pre-Write:</b></p>
<p><b>Share #1 Notes:</b></p>	<p><b>Share #2 Notes:</b></p>
<p><b>Final Version:</b></p>	

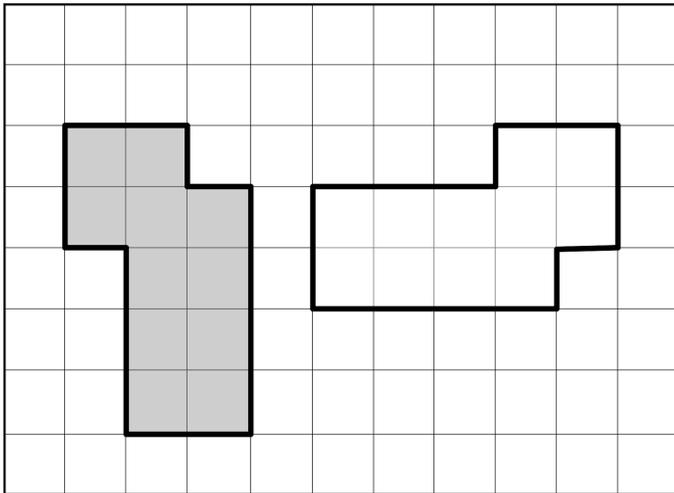
### Activity 1: Transformations Card Sort

### Activity 2: Sides and Angles

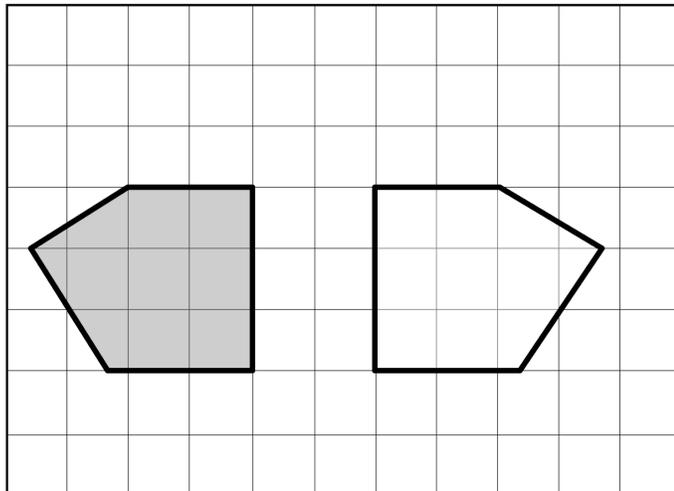
In each set, a polygon has been transformed. The pre-image is shown on the left and the image is on the right.

Pair A



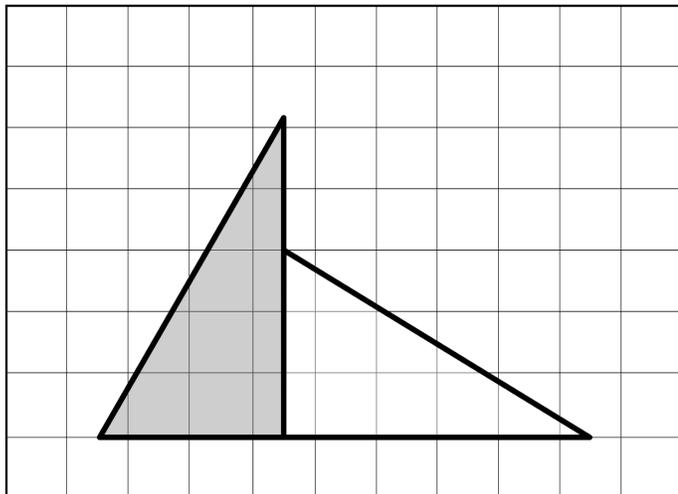
1. Write in the measure of each side length and interior angle. (You may need to make your own ruler with either tracing paper or a blank index card.)
2. What is the same in the pre-image and image?
3. What's different between the pre-image and image?

Pair B



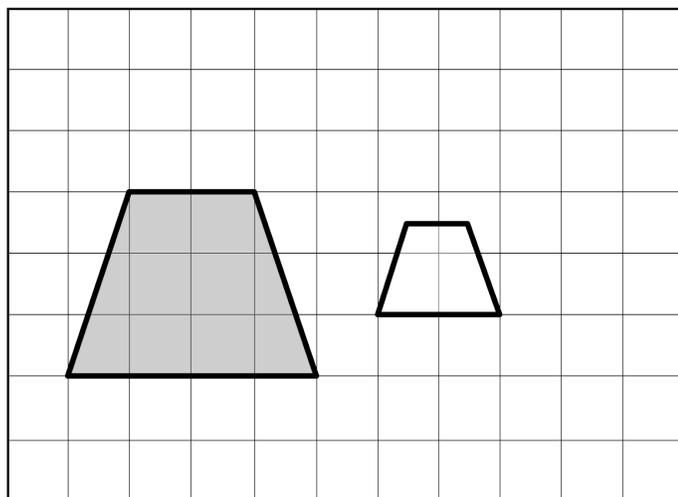
1. Write in the measure of each side length and interior angle.
2. What is the same in the pre-image and image?
3. What's different between the pre-image and image?

Pair C



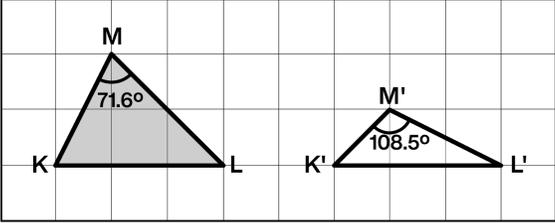
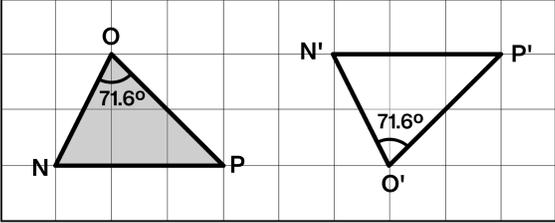
1. Write in the measure of each side length and interior angle.
2. What is the same in the pre-image and image?
3. What's different between the pre-image and image?

Pair D

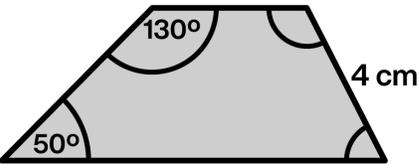
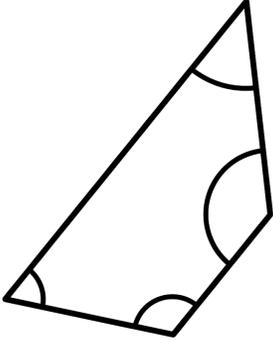


1. Write in the measure of each side length and interior angle.
2. What is the same in the pre-image and image?
3. What's different between the pre-image and image?

### Lesson Synthesis

<p style="text-align: center;">Pair H</p> 	<p>Which pair(s) show a rigid transformation from one figure to the other? Explain your thinking.</p>
<p style="text-align: center;">Pair J</p> 	

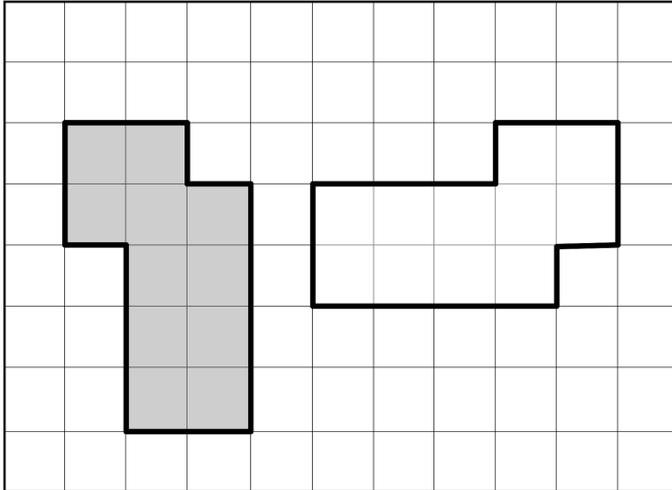
### Cool-Down

<p style="text-align: center;">Trapezoid A</p>  <p style="text-align: center;">Trapezoid B</p> 	<p>Trapezoid <i>B</i> is the image of trapezoid <i>A</i> under a series of rigid transformations.</p> <p>Use the information in trapezoid <i>A</i> to label the measurements of the corresponding parts in trapezoid <i>B</i>.</p>
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### Activity 2: Sides and Angles

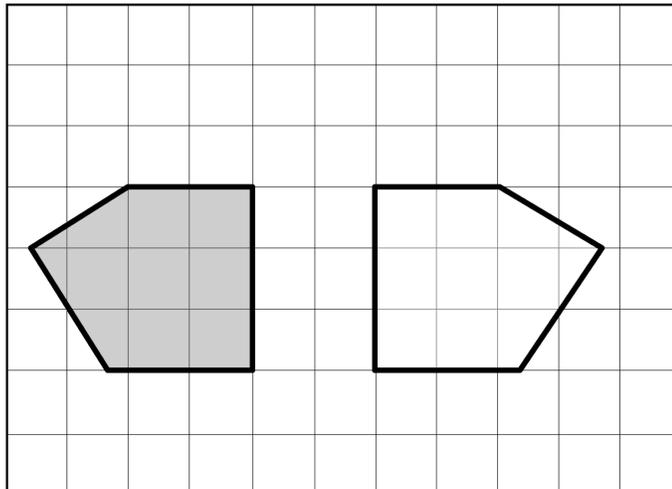
In each set, a polygon has been transformed. The pre-image is shown on the left and the image is on the right.

Pair A



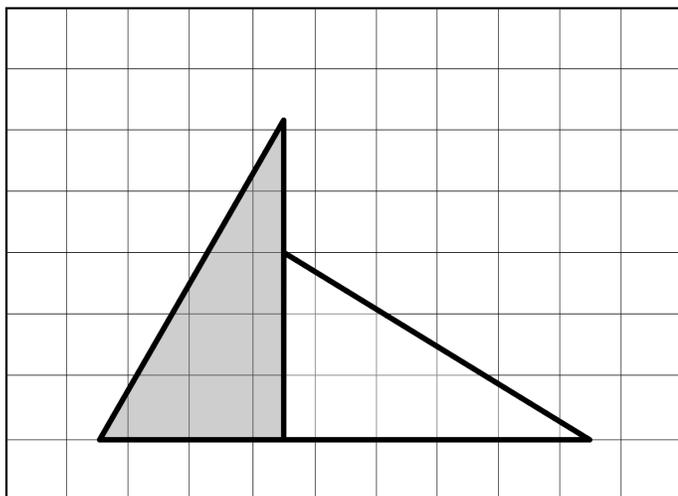
1. Write in the measure of each side length and interior angle. (You may need to make your own ruler with tracing paper or a blank index card.)
  
2. What is the same in the pre-image and image?
  
3. What's different between the pre-image and image?

Pair B



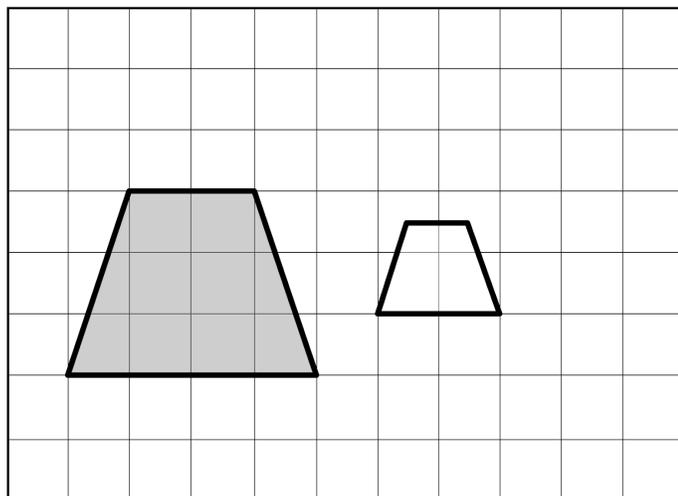
1. Write in the measure of each side length and interior angle.
  
2. What is the same in the pre-image and image?
  
3. What's different between the pre-image and image?

Pair C



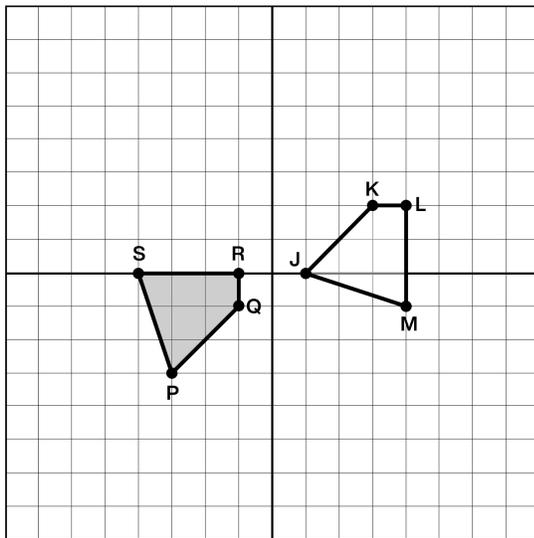
1. Write in the measure of each side length and interior angle.
  
2. What is the same in the pre-image and image?
  
3. What's different between the pre-image and image?

Pair D



1. Write in the measure of each side length and interior angle.
  
2. What is the same in the pre-image and image?
  
3. What's different between the pre-image and image?

**Pair A**



Notes:

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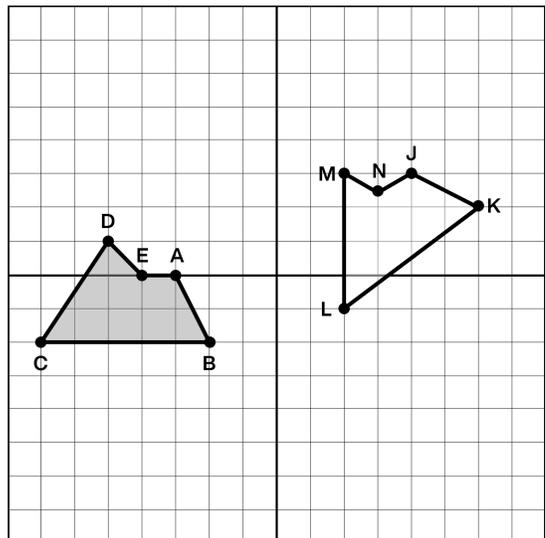


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**Pair B**



Notes:

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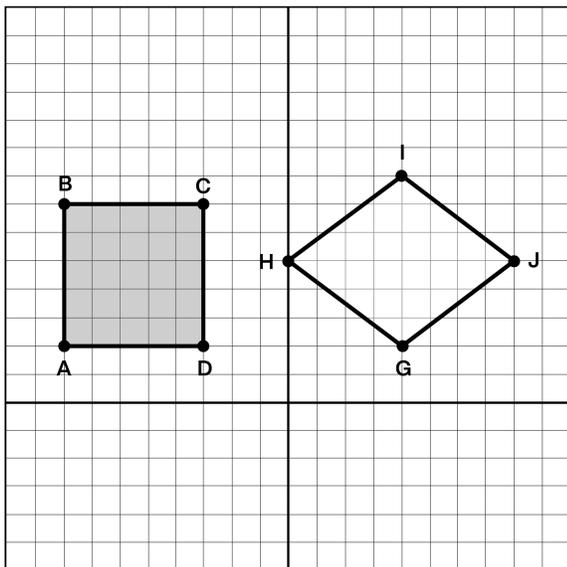


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**Pair C**



Notes:

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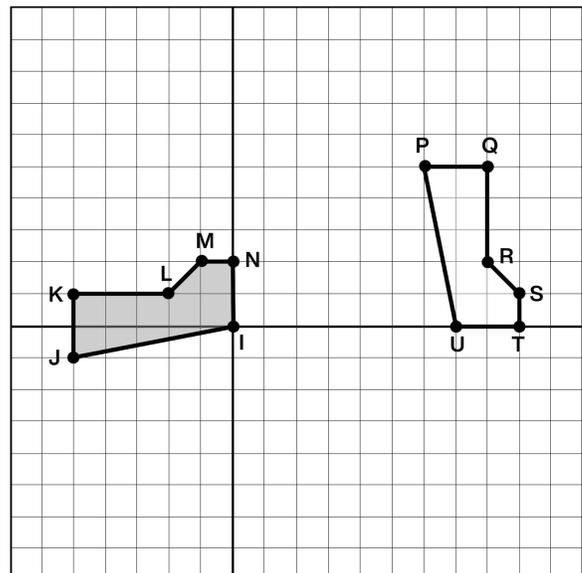


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**Pair D**



Notes:

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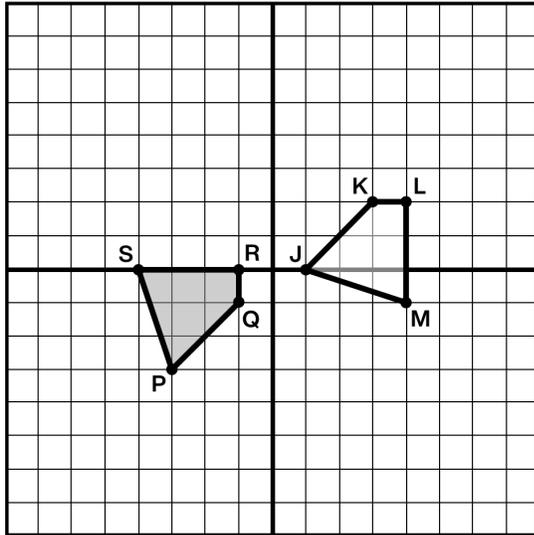


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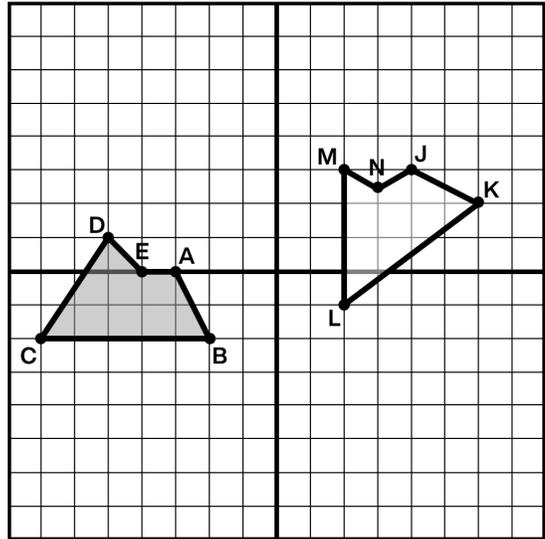
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Pair A



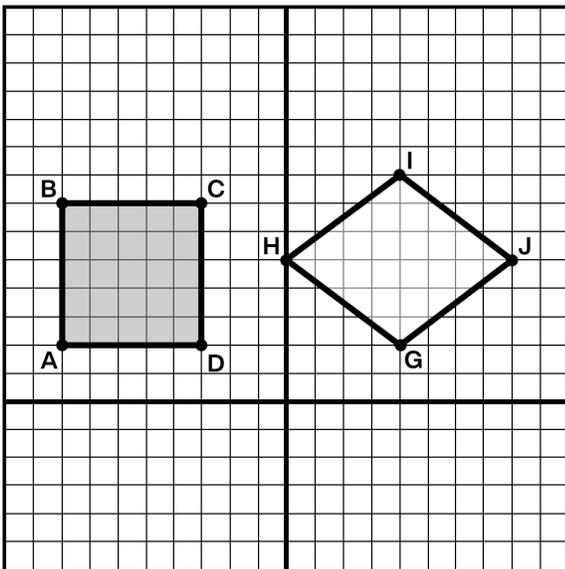
Notes:

Pair B



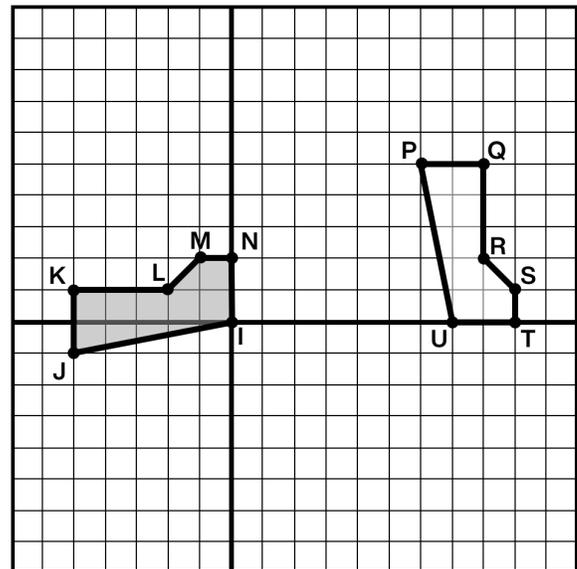
Notes:

Pair C



Notes:

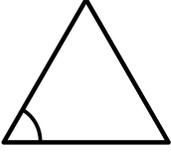
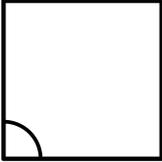
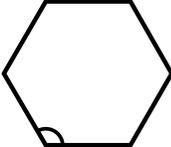
Pair D



Notes:

### Activity 1: Mystery Measures

1. Determine as many angle measures as you can by creating different designs in the Desmos activity. You can also use the workspace below. Then record each angle measure below.

 _____	 _____	 _____	 _____  _____	 _____  _____
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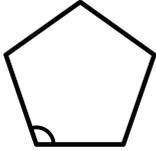
Workspace:

2. Select two angles. Describe how you determined their measures.



## Are You Ready for More?

1. Determine as many angle measures as you can by creating different designs in the Desmos activity. You can also use the workspace below. Then record each angle measure below.

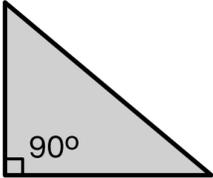
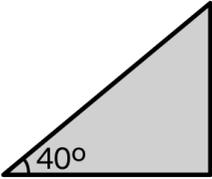
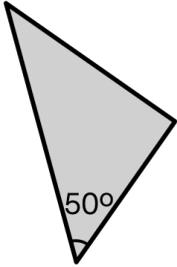
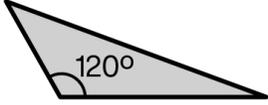
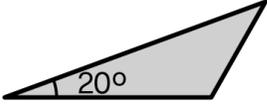
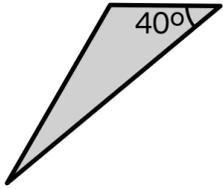
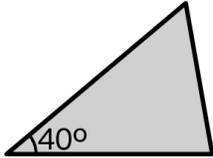
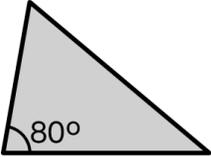
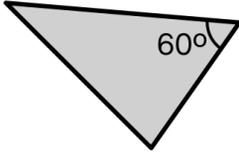
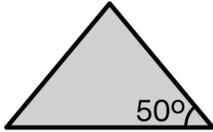
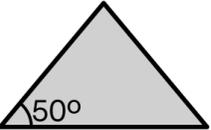
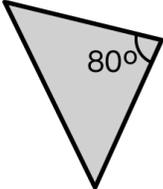
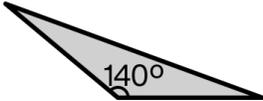
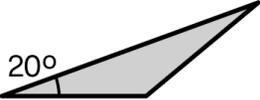
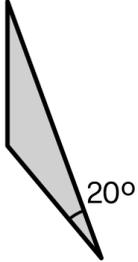
 _____	 _____  _____	 _____  _____
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Workspace:

2. Select two angles. Describe how you determined their measures.

|

Activity 1: Find All Three

### Activity 1: Find All Three

Your teacher will give you a card with a picture of a triangle.

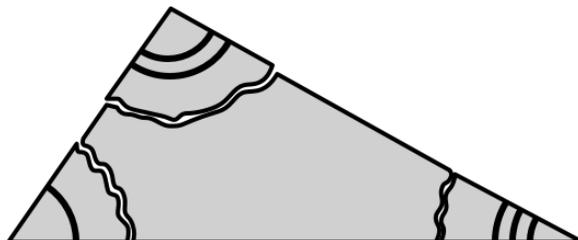
1. The measurement of one of the angles is labeled. Estimate the measures of the other two angles.
2. Find two other students with triangles congruent to yours but with a different angle labeled.
3. Confirm that:
  - All three triangles are congruent.
  - Each card has a different angle labeled.
  - The angle measures look like they could all be in the same triangle.
4. Enter the three angle measures for your triangle in the table.

Student Names	Angle 1	Angle 2	Angle 3	Angle Sum

5. How did you know that you found a correct partner?
6. Look at other groups' tables. What do you notice about the combination of the three angle measures?

**Activity 2: Tear It Up**

1. On a blank sheet of paper, use a straightedge to draw two very different triangles.
2. Mark the vertices of each triangle and cut the triangles out. Then rip the three vertices off of the triangle.



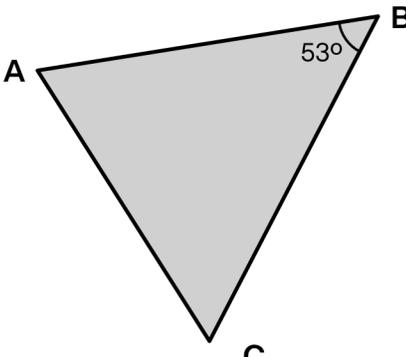
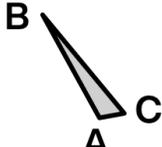
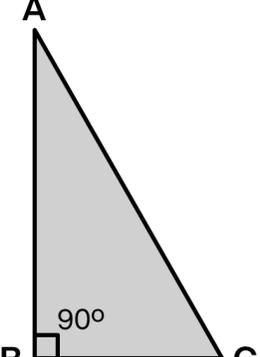
3. Arrange the vertices of each triangle so that the three vertices meet with no overlap.



4. Compare your results with your classmates' results. What do you notice about the sum of the angles in a triangle?

### Lesson Synthesis

In each triangle  $ABC$ , the measure of angle  $C$  is  $60^\circ$ . For each triangle, determine a possible value for the measure of angle  $A$ .

Triangle 1	Triangle 2	Triangle 3
 <p style="text-align: center;"><math>A = \underline{\quad}^\circ</math></p>	 <p style="text-align: center;"><math>A = \underline{\quad}^\circ</math></p>	 <p style="text-align: center;"><math>A = \underline{\quad}^\circ</math></p>

### Cool-Down

Select three angle measures that could be angles in the same triangle. Explain how you know.

- A.  $42^\circ$
- B.  $180^\circ$
- C.  $35^\circ$
- D.  $90^\circ$
- E.  $18^\circ$
- F.  $120^\circ$

## Warm-Up

### Activity 1: Complete the Triangles

Three students are drawing triangles based on these descriptions:

#### Description #1

A triangle with sides that are 3 cm, 2 cm, and 4 cm.

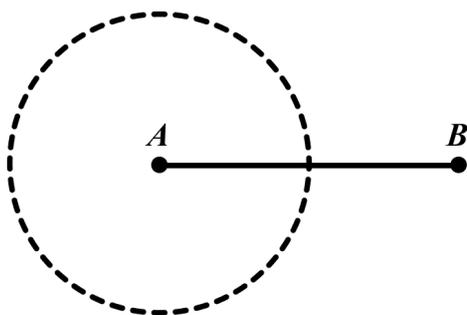
#### Description #2

A triangle with one 3 cm side, one 4 cm side, and one  $60^\circ$  angle.

#### Description #3

A triangle with one  $45^\circ$  angle, one  $75^\circ$  angle, and one 3 cm side.

- Sadia is working on Description #1. Here are the steps she took so far.
  - Step 1: Draw a 4 cm line segment  $AB$ .
  - Step 2: Use a compass to draw a circle around point  $A$  with radius 2 cm.

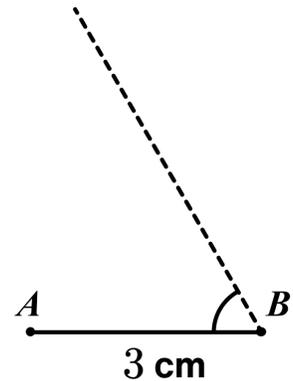


Describe or show how Sadia can finish drawing a triangle that fits Description #1.

2. Nekeisha is working on Description #2.  
Here are the steps she took so far.

- Step 1: Draw a 3 cm line segment.
- Step 2: Use a protractor to draw a  $60^\circ$  angle at the end of the segment.

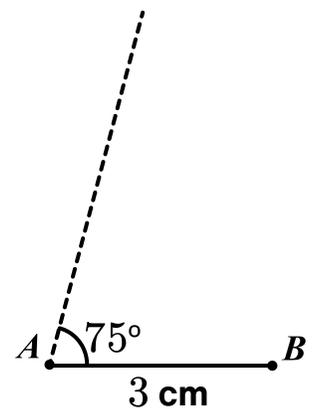
Describe or show how Nekeisha can finish her drawing.



3.1 Ahmed is working on Description #3.  
Here are the steps he took so far.

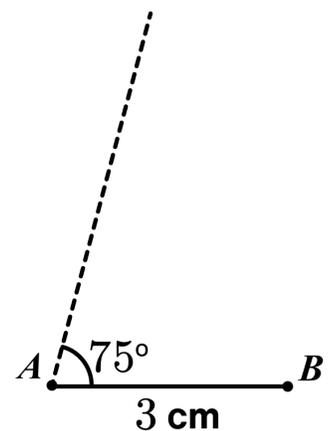
- Step 1: Draw a 3 cm line segment.
- Step 2: Use a protractor to draw a  $75^\circ$  angle.

Describe or show how Ahmed can finish his drawing.



3.2 Is it possible for Ahmed to draw a different triangle that matches this description?

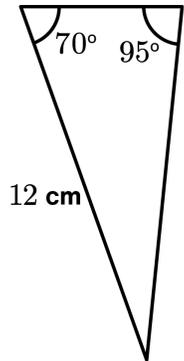
Use the diagram on the right to show or explain your reasoning.





## Lesson Synthesis

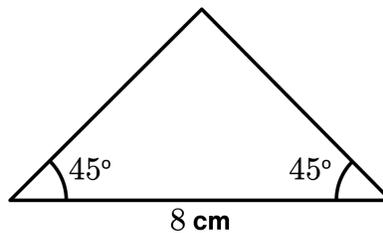
Describe how you can draw two different triangles given one side length and two angle measures.



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## Cool-Down

Alejandro was asked to draw a triangle with two  $45^\circ$  angles and a side length of  $8\text{ cm}$ . He drew this:

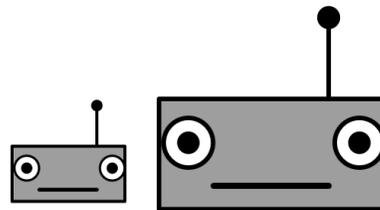


Is it possible for Alejandro to draw a different triangle with the same measurements?

Show or explain your reasoning.

## Warm-Up

How might you know if the large robot is a scaled copy of the small robot?



## Activity 1: Scaling a Robot

1.1 Complete the table with the lengths of the original robot and its scaled copy from the warm-up.

Scaled copies always have a *scale factor*. Here, the scale factor from the original to the scaled copy is 2.

1.2 Show or describe where you see a scale factor of 2.

	Original	Scaled Copy
Height (in.)	2	4
Width (in.)	4	
Eye distance (in.)	3	
Antenna (in.)	1.5	

## Activity 2: Analyzing Robots

Imani built a robot and made a copy.

They recorded their thinking in the table on the right.

1. Do you think the copy robot will be a scaled copy?

Yes      No      Not enough information

Explain your thinking.

	Original	Copy
Height (in.)	2	8
Width (in.)	6	12
Eye distance (in.)	4	10
Antenna (in.)	3	9

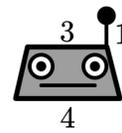
2.1 Create your own measurements that make a scaled copy of Imani's original.

	Original	Scaled Copy
Height (in.)	2	
Width (in.)	6	
Eye Distance (in.)	4	
Antenna (in.)	3	

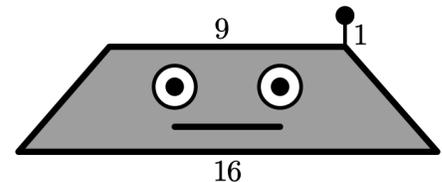
2.2 What is another way to create a scaled copy of this robot?

Anushka built a robot and made a copy that is not a scaled copy.

3.1 Explain what Anushka's strategy might have been.



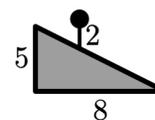
3.2 Describe how you could help Anushka revise her work.



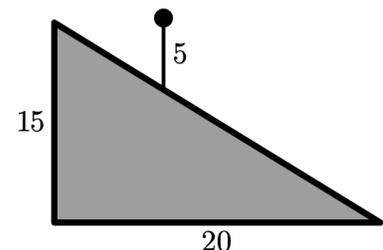
All measurements are in grid units.

Na'ilah started to draw a small and a large robot.

4.1 Show or describe how you would change the lengths on the larger robot to make them scaled copies.



4.2 What is the scale factor from the small robot to your updated large robot?

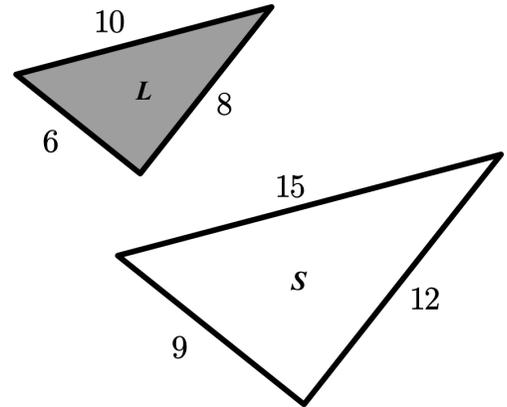


All measurements are in grid units.

### Lesson Synthesis

How can you use proportional thinking to decide if one figure is a scaled copy of the other?

Use figures  $L$  and  $S$  to help with your explanation.

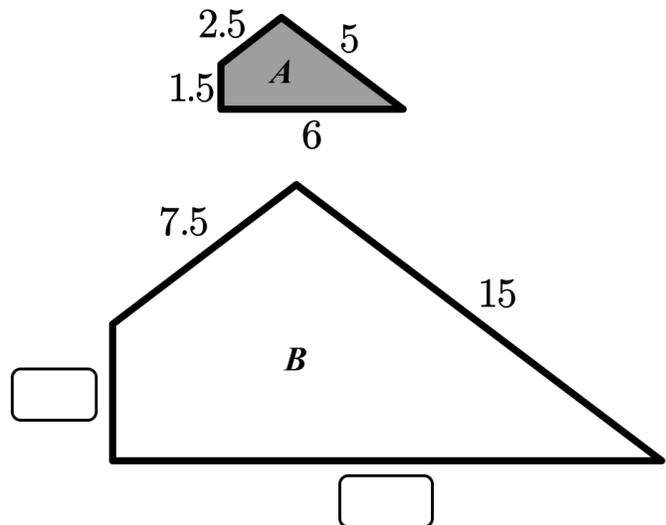


All measurements are in grid units.

### Cool-Down

Figure  $B$  is a scaled copy of figure  $A$ .

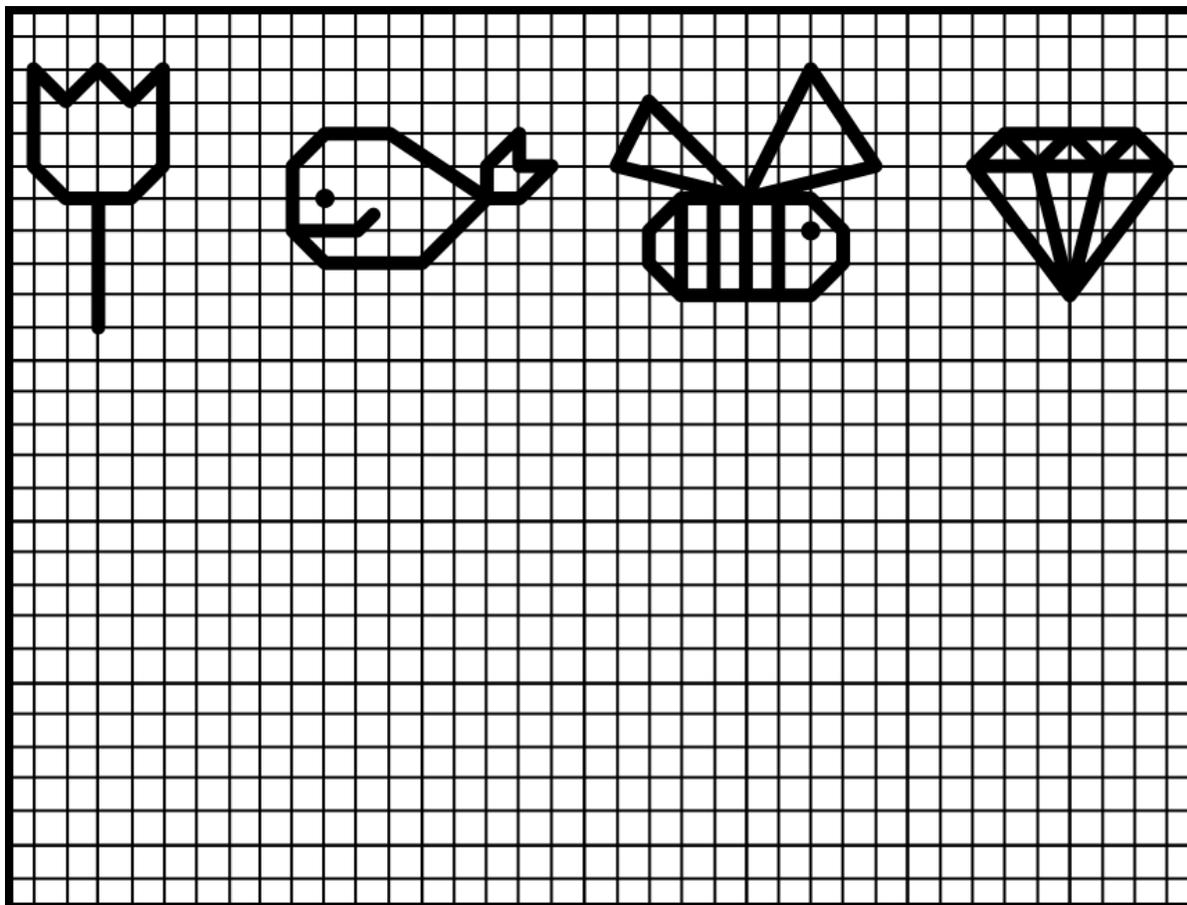
Label the missing side lengths of figure  $B$ .



All measurements are in grid units.

## Activity 1: Drawing Scaled Copies on a Grid

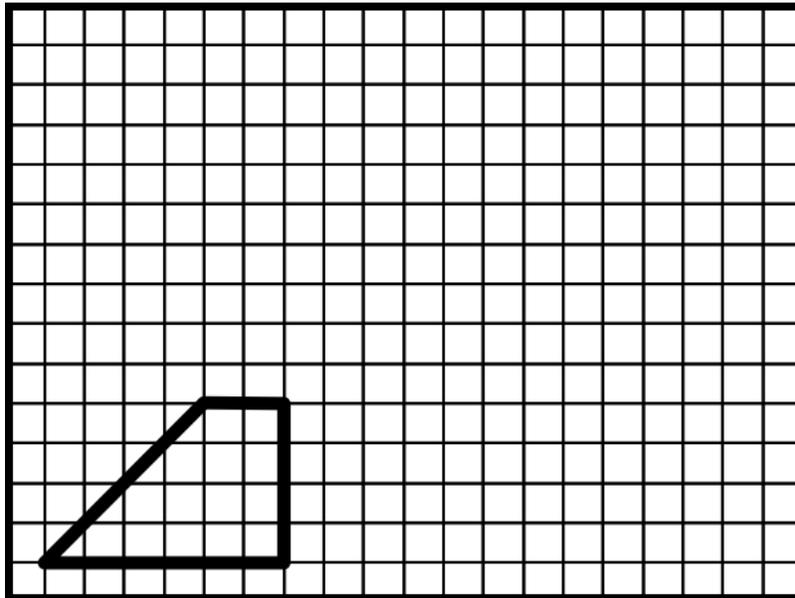
1. Select one image and create a scaled copy of that image using a scale factor of 2.



2. Trade your drawing with a partner. After you exchange, offer the following feedback:
  - Determine if their copy is a scaled copy.
  - Suggest one way they could make the drawing stronger or clearer.
3. Explain your strategy for creating the scaled copy.

### Activity 2: Did It Scale?

1. Choose a scale factor between 0.5 and 4. **Scale factor:** \_\_\_\_\_
2. Use the scale factor you chose to create a scaled copy of the figure below.

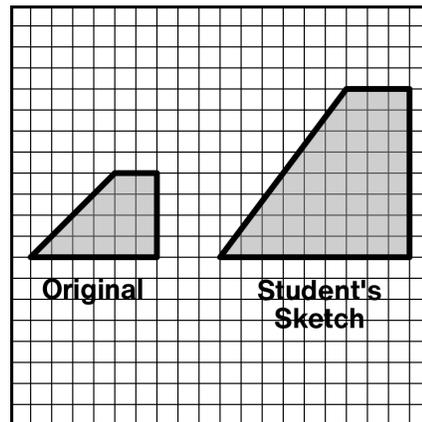


3. Here is one student's work for Problem 1. Sasha thinks the student used a scale factor of 2. Randy thinks the student used a scale factor of 1.5.

Who is correct?

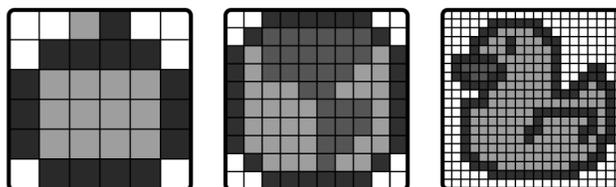
- A. Sasha
- B. Randy
- C. Both
- D. Neither

Explain your thinking.



### Are You Ready for More?

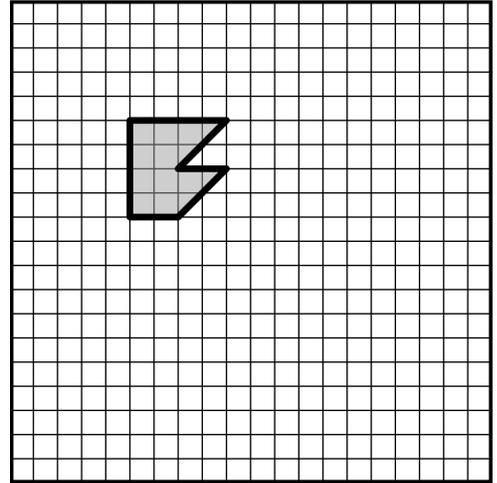
On a separate piece of graph paper, draw a scaled copy of the one of the images below (or create your own) using a scale factor of 1.5.



## Lesson Synthesis

Describe how to draw a scaled copy.  
Include a few important things to remember.

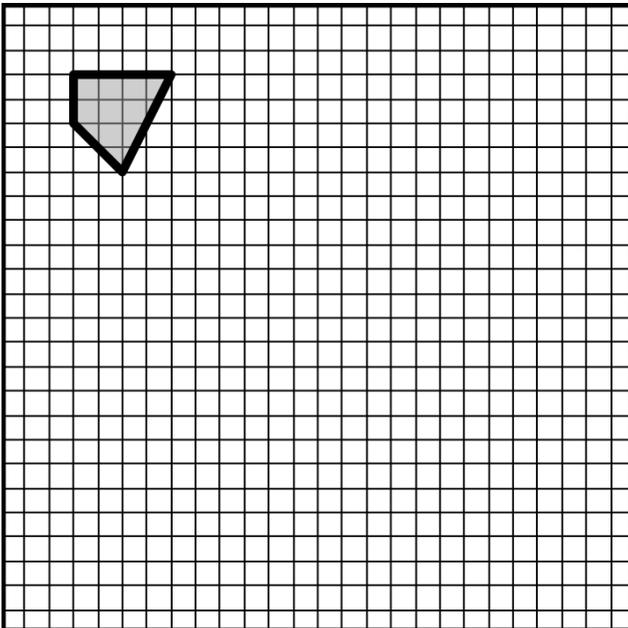
Use the figure if it helps you with your thinking.



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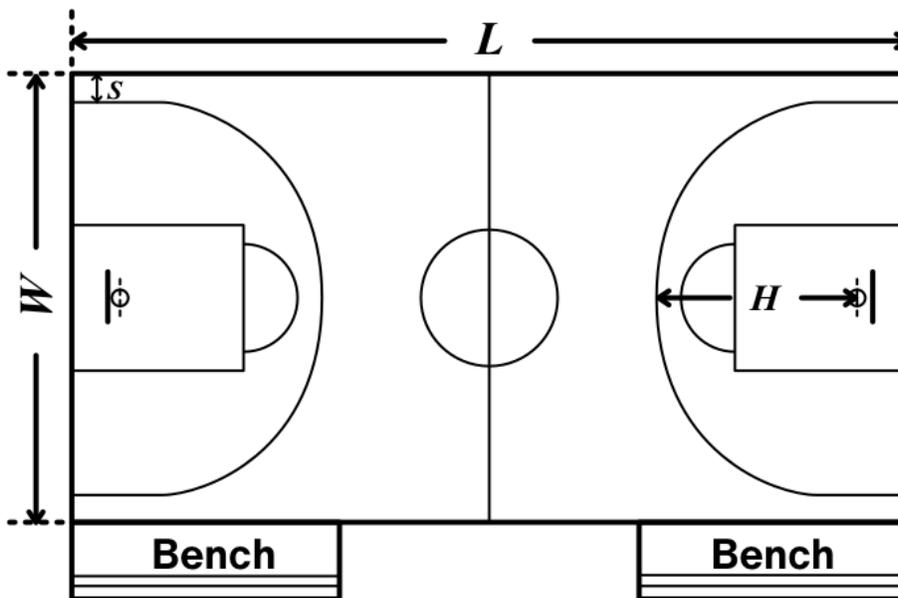
## Cool-Down

Sketch a scaled copy of the polygon using a scale factor of 3.



### Activity 1: Will It Fit?

Here is the scale drawing that Karima presented to her neighborhood park’s board of directors.



- The scale for Karima’s drawing is 2 cm to 5 m. Explain what this means in your own words.
- Will Karima’s court fit in the 20 -by- 20 -meter square area the park directors designated for the court? Use your measuring tools and the table below to help you with your thinking.

Round each measurement to the nearest tenth of a centimeter.

	Length of Court (L)	Width of Court (W)	Hoop to 3-pt. Line (H)	3-pt. Line to Side Line (S)
Scale drawing				
Actual court				

Explain how you know whether or not the court will fit.



## Lesson Synthesis

How could you use Karima's scale drawing to calculate the actual diameter of the center court circle? Describe your strategy.

	Diameter of Center Court Circle
Scale drawing	1.8 cm
Actual court	?

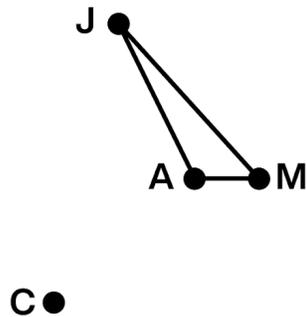
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## Cool-Down

A scale drawing of a school bus has a scale of  $\frac{1}{2}$  in. to 5 ft. If the length of the school bus is 4 inches on the scale drawing, what is the actual length of the bus? Explain or show your reasoning.

**Activity 3: Dilate It!**

1. The triangle  $JAM$  is dilated using  $C$  as the center of dilation with a scale factor of 2. Use your geometry tools to create the triangle you saw animated on screen 10 below.



2. Choose at least one more scale factor. Circle the one(s) you choose.

3

1.5

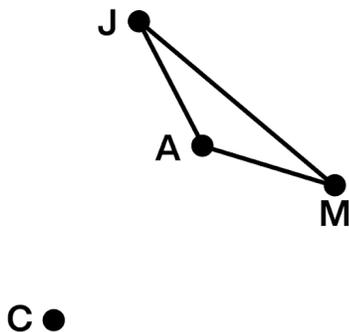
 $\frac{3}{4}$ 

Other: \_\_\_\_\_

3. On the same diagram, dilate triangle  $JAM$  using center  $C$  and each scale factor you chose.
4. List everything that appears to be the same for ALL of the triangles you see.

**Activity 3: Dilate It!**

1. The triangle  $JAM$  is dilated using  $C$  as the center of dilation with a scale factor of 2.  
Use your geometry tools to create the triangle you saw animated on Screen 9 below.



2. Choose at least one more scale factor. Circle the one(s) you choose.

3                      1.5                       $\frac{3}{4}$                       Other: \_\_\_\_\_

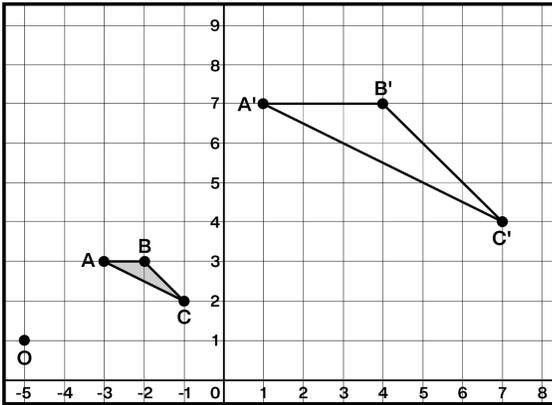
3. On the same diagram, dilate triangle  $JAM$  using center  $C$  and each scale factor you chose.
4. List everything that appears to be the same for **all** of the triangles you see.

# Science Mom Lesson 25

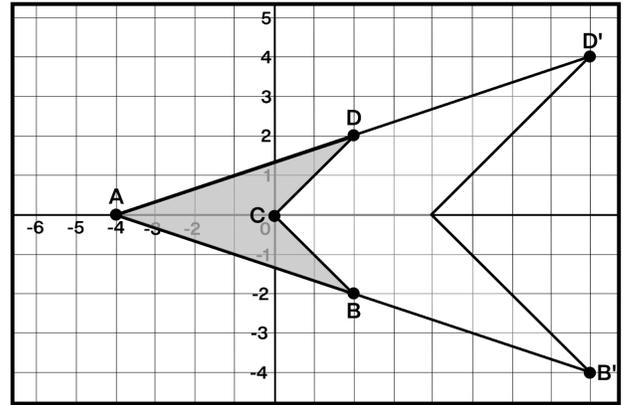
desmos

Unit 8.2, Lesson 4: Dilation Cards

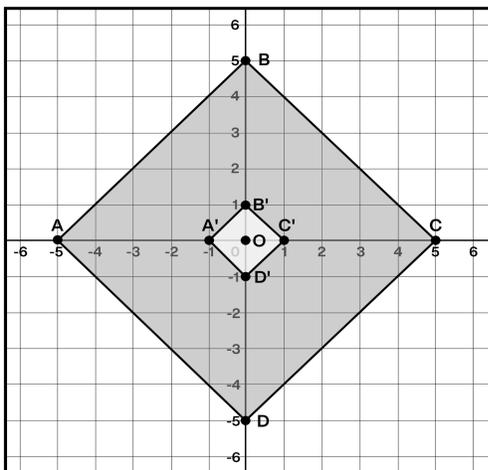
Card 1



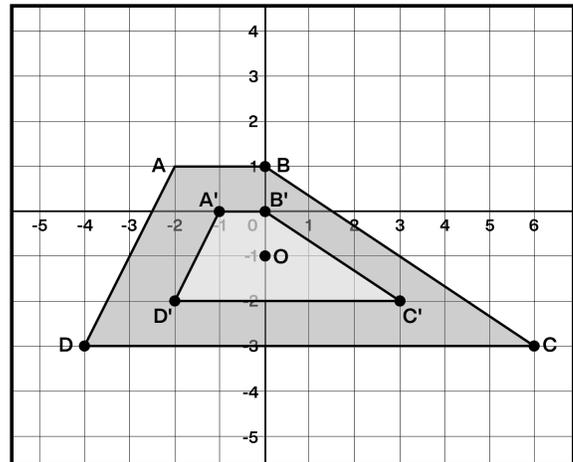
Card 2



Card 3



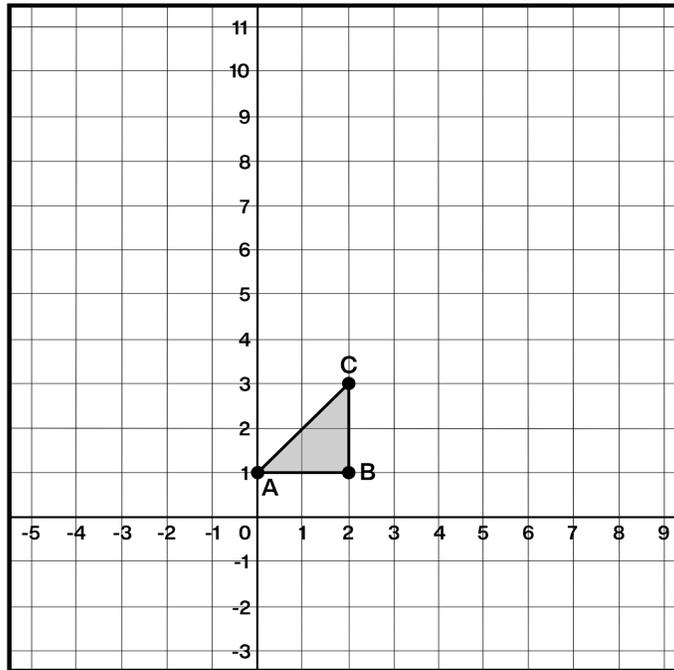
Card 4



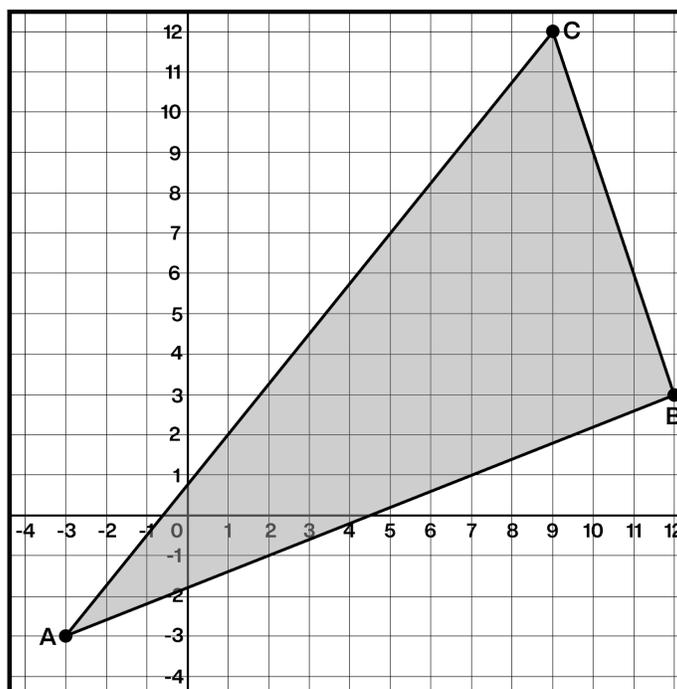
### Activity 1: Dilate It!

Use whatever tools you'd like to carry out the dilations specified.

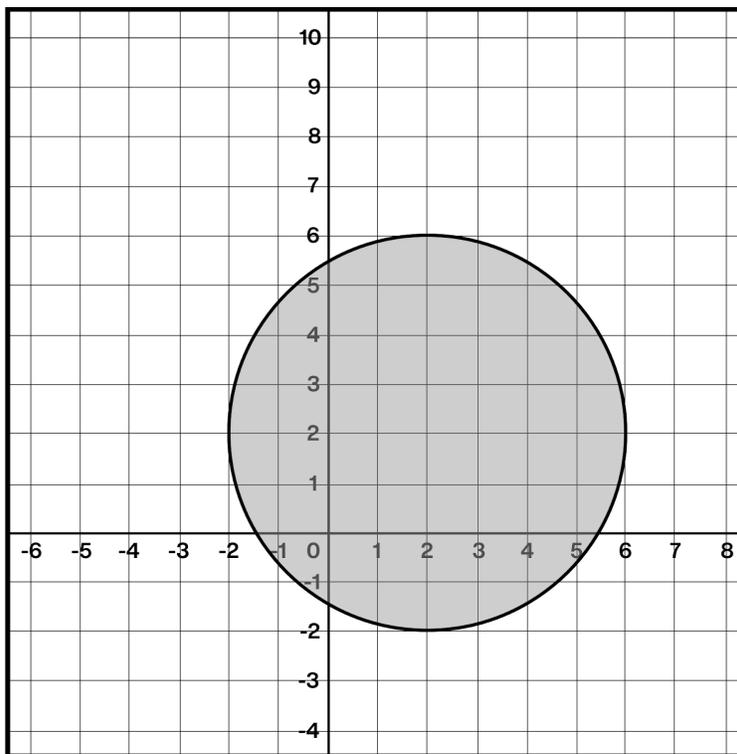
- Dilate this triangle with vertices  $(0, 1)$ ,  $(2, 1)$ , and  $(2, 3)$  using center  $(-4, -2)$  and a scale factor of 2.



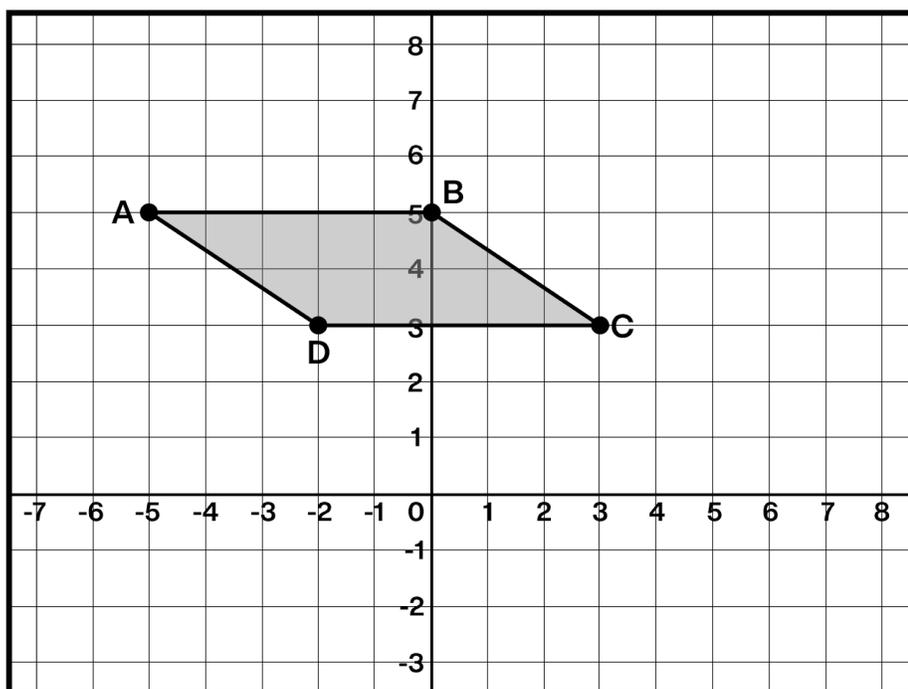
- Dilate this triangle with vertices  $(-3, -3)$ ,  $(12, 3)$ , and  $(9, 12)$  using center  $(0, 0)$  and a scale factor of  $\frac{1}{3}$ .



3. Dilate this circle with radius 4 using center (2, 2) and a scale factor of  $\frac{3}{4}$ .



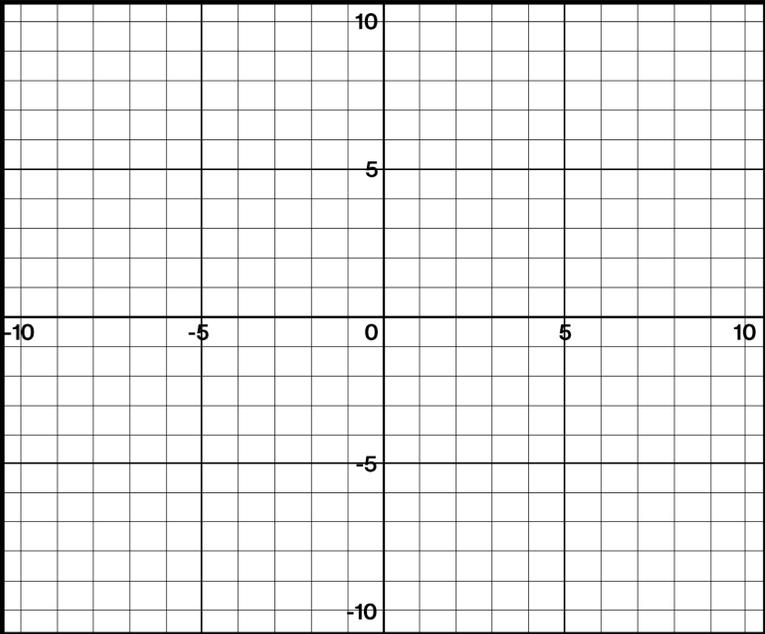
4. Dilate this parallelogram with vertices at (-5, 5), (0, 5), (3, 3), and (-2, 3) using center (-5, 5) and a scale factor of  $\frac{1}{2}$ .



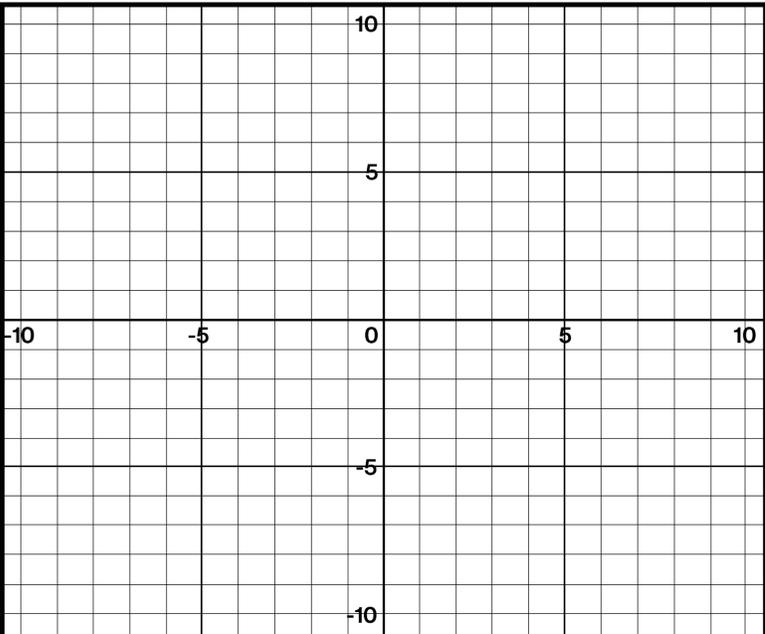
### Activity 2: Make My Dilation

Your partner will describe a figure after a certain transformation. Sketch it here. You can only sketch (no speaking).

1.

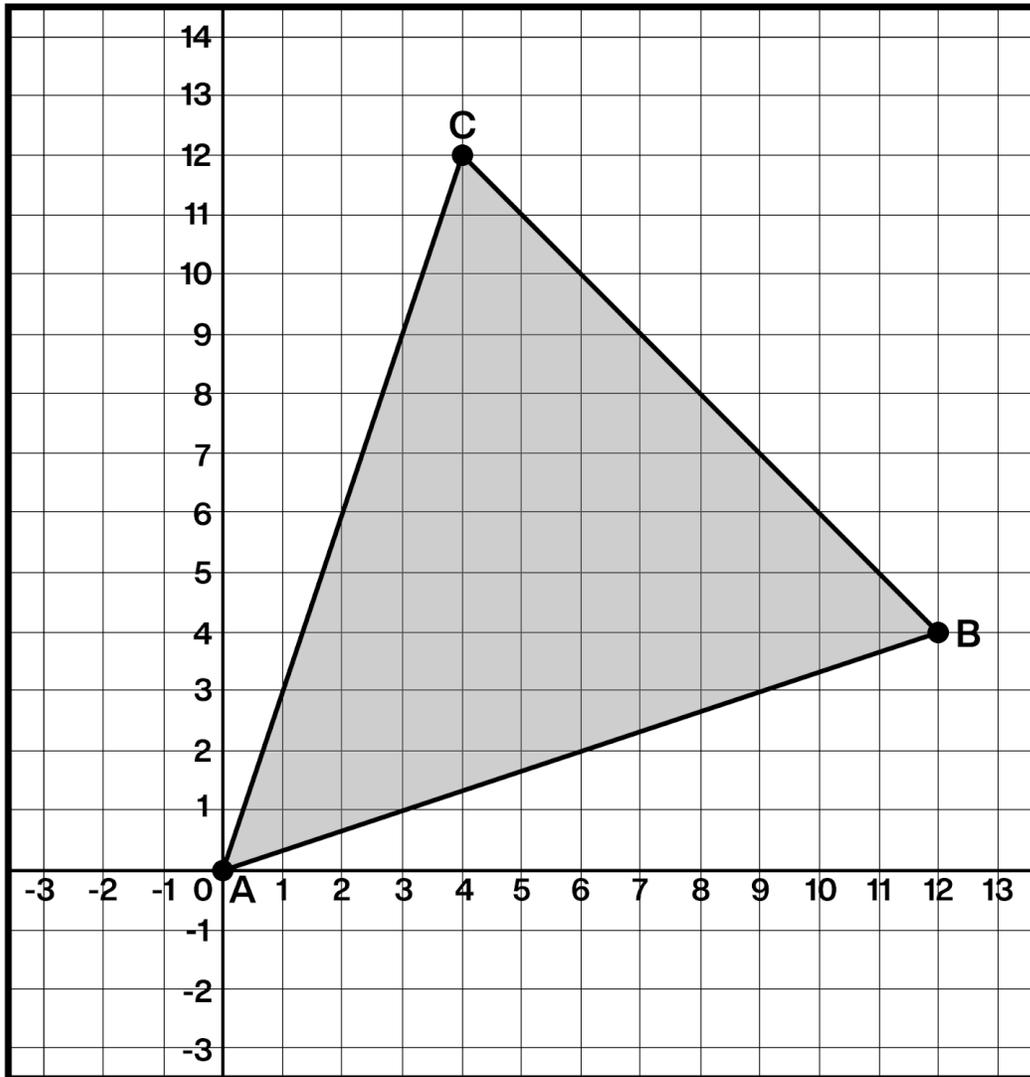
Card:	Center:	Scale Factor:
		

2.

Card:	Center:	Scale Factor:
		

### Are You Ready for More?

Here is triangle  $ABC$ .



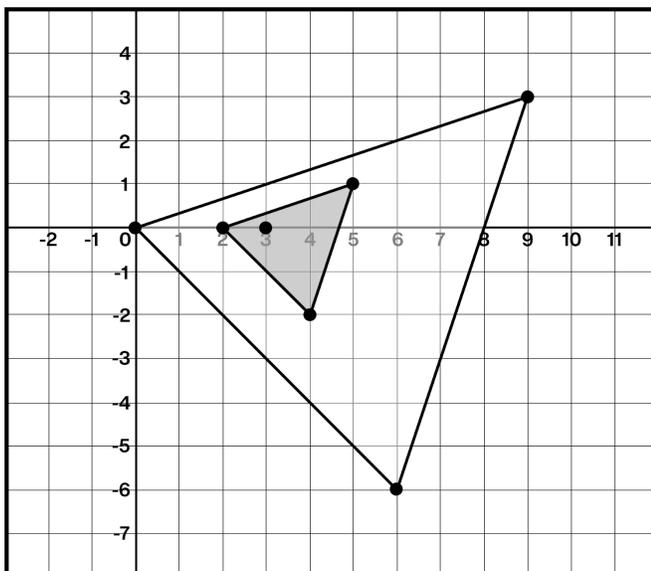
- Dilate triangle  $ABC$  using center  $(0, 0)$  and a scale factor of  $\frac{3}{4}$ . Label the vertices  $A'B'C'$ .
- Dilate triangle  $ABC$  using center  $(12, 4)$  and a scale factor of  $\frac{1}{4}$ . Label the vertices  $A''B''C''$ .
- Explain why  $A''$  and  $B'$  must be at the same coordinates.

## Lesson Synthesis

How are coordinates useful when describing and drawing dilations?

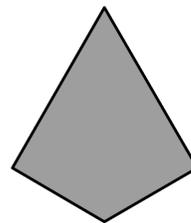
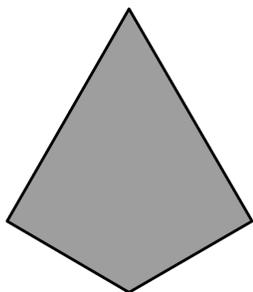
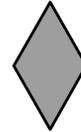
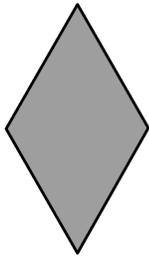
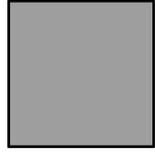
### Cool-Down

The smaller triangle is dilated to create the larger triangle. The center of dilation is plotted but not labeled.

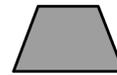
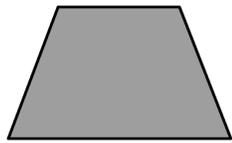
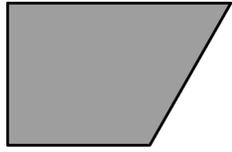


Describe this dilation. Be sure to include all of the information someone would need to perform the dilation.

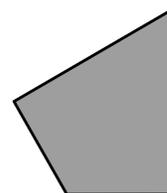
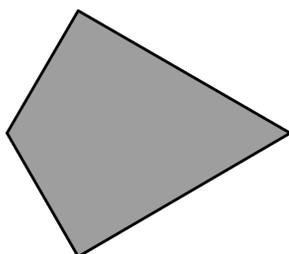
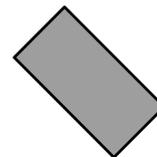
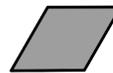
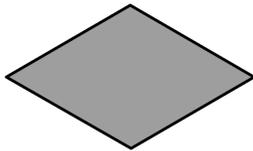
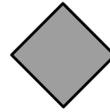
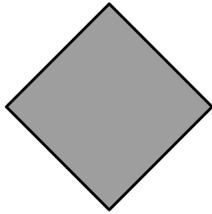
Cards 1-8



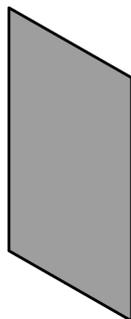
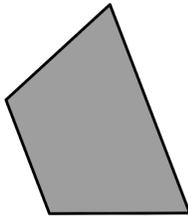
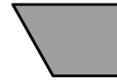
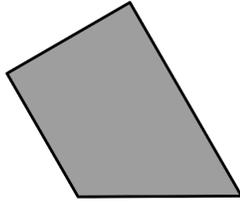
Cards 9–16



Cards 17–24

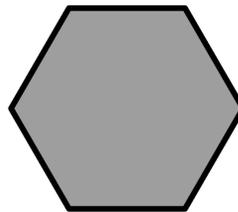
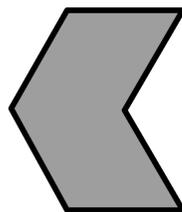
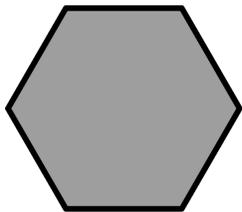
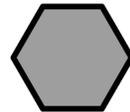
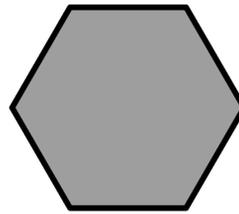
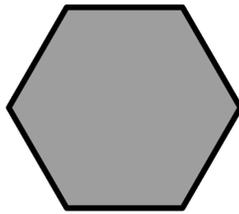
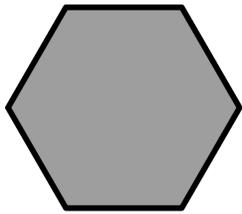


Cards 25–32



### Warm-Up

Which one doesn't belong?



## Social Scavenger Hunt

Your teacher will give you instructions for how to find a partner in each round. Once you have a partner, look carefully at your figures and answer the four questions.

To compare side lengths and angle measures, use whatever tools would be helpful. That may include using a ruler or a protractor, or holding two figures on top of one another to compare directly.

### Round 1

Questions	Yes	No
Are corresponding sides congruent?		
Are corresponding angles congruent?		
Are the figures similar?		
Are the figures congruent?		

### Round 2

Questions	Yes	No
Are corresponding sides congruent?		
Are corresponding angles congruent?		
Are the figures similar?		
Are the figures congruent?		

### Round 3

Questions	Yes	No
Are corresponding sides congruent?		
Are corresponding angles congruent?		
Are the figures similar?		
Are the figures congruent?		

### Round 4

Questions	Yes	No
Are corresponding sides congruent?		
Are corresponding angles congruent?		
Are the figures similar?		
Are the figures congruent?		

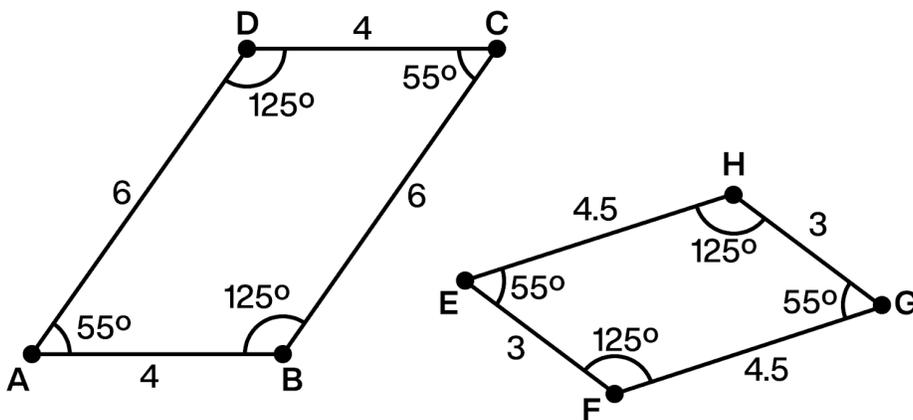
## Lesson Synthesis

Are the following statements **always** true, **sometimes** true, or **never** true?

Statements	Always	Sometimes	Never
1. If two figures are congruent, then they are similar.			
2. If two figures are similar, then they are congruent.			
3. If two figures have congruent corresponding angles, then the figures are similar.			
4. If two figures have congruent corresponding angles and a common scale factor between corresponding sides, then the figures are similar.			

## Cool-Down

Is  $ABCD$  similar to  $EFGH$ ? Explain how you know.



### Warm-Up

A. $100 = 8(x + 9)$	D. $9x + 63 = 100$
B. $9(x + 7) = 100$	E. $100 = 72 + 8x$
C. $100 = 8x + 72$	F. $(x + 7) \cdot 9 = 100$

1. Select two equations that have something in common. How are the two equations alike?

2. Create two groups so that the equations in each group have something in common.

Group 1 equations: \_\_\_\_\_  
(List the letters representing the equations.)

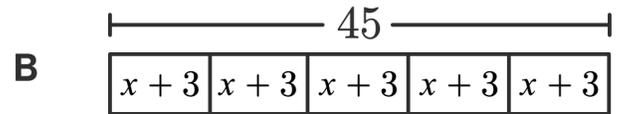
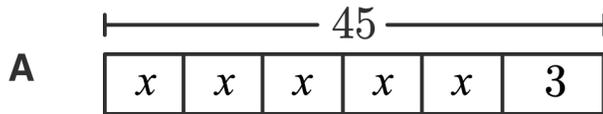
All the equations in this group . . .

Group 2 equations: \_\_\_\_\_  
(List the letters representing the equations.)

All the equations in this group . . .

### Activity 1: Which Diagram?

For each situation, choose the diagram that best represents it. Then write an equation, determine the solution, and explain what the solution means in the situation.



1. A postal worker weighs 5 identical cardboard packages and a 3 -pound plastic box. Altogether, they weigh 45 pounds.

**Which diagram?**

A or B

**Equation**

**Solution**

**Meaning of Solution**

2. Tyani is making 5 gift bags. Each bag contains  $x$  pencils. Tyani adds 3 more pencils to each bag. Altogether, the gift bags contain 45 pencils.

**Which diagram?**

A or B

**Equation**

**Solution**

**Meaning of Solution**

3. A national park charges \$3 for each car that enters and also a fee for each person that enters. A family of 5 enters the park in 1 car and pays a total of \$45 .

**Which diagram?**

A or B

**Equation**

**Solution**

**Meaning of Solution**

**Activity 2: Write Your Own**

Natalia's family wants to inflate a total of 60 balloons for a party. Yesterday, they inflated 24 balloons. Today, they want to split the remaining balloons equally between 4 family members.

- 1.1 Write a question that you could figure out using this information and whose answer is not already given.
  
- 1.2 Answer the question you wrote above. Make a tape diagram if it is helpful.
  
- 1.3 Write an equation for this situation and use it to check your solution.

An art class charges each student \$15 to attend, plus a fee for supplies. The instructor hopes to collect \$240 total from the 12 students who attend the class.

- 2.1 Write a question that you could figure out using this information and whose answer is not already given.
  
- 2.2 Answer the question you wrote above. Make a tape diagram if it is helpful.
  
- 2.3 Write an equation for this situation and use it to check your solution.

**Are You Ready for More?**

Write your own problem that can be solved with a tape diagram. Then swap problems with a classmate and solve your classmate's problem.

## Lesson Synthesis

1. Sketch a tape diagram for each equation.

$$3x + 15 = 90$$

$$3(x + 15) = 90$$

2. Describe how the tape diagrams are similar and different.

## Cool-Down

Deiondre bought a keychain for \$6.75 and 3 shirts that cost  $x$  dollars each. Altogether, the items cost \$31.50. Complete each section below.

Tape Diagram	Equation
Solution	Meaning of Solution

A.

$$x - (-4) = -6$$

E.

$$-\frac{1}{2}(2x - 6) = -2$$

B.

$$2(x - 1) = -200$$

F.

$$50x + 200 = 1700$$

C.

$$900 = -100(x - 3)$$

G.

$$8.6 = 3x - 3.4$$

D.

$$-3x + \left(-\frac{1}{6}\right) = \frac{5}{6}$$

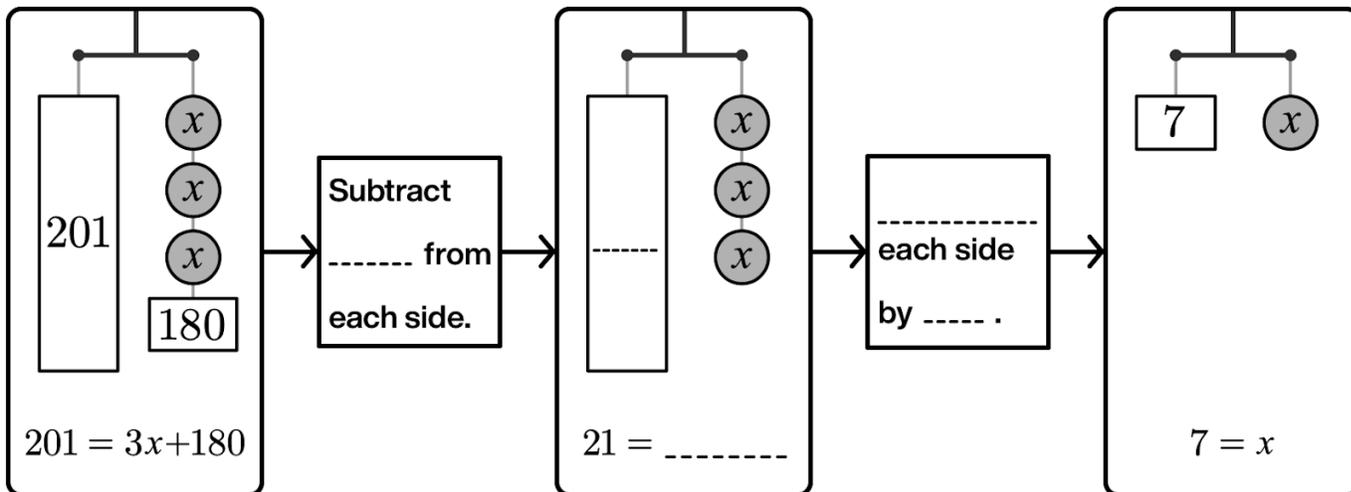
H.

$$3(x + 4.5) = 36$$

### Activity 1: Keep It True

Solve each equation by filling in the blanks in the hangers, equations, and descriptions.

1.



2.

$$5 = 2x + 8$$

.....

.....

each side.

$$..... = 2x$$

.....

each side .....

.....

$$..... = x$$

3.

$$2(x - 5) = -6$$

.....

each side .....

.....

$$x - 5 = -3$$

.....

.....

.....

$$..... = .....$$

4. How could you check that the solutions to the equations in Problems 1–3 are correct?



### Activity 2: Less and More Difficult

Look through the equation cards. Without solving, select three equations that you think would be **less difficult to solve** and three equations that you think would be **more difficult to solve**.

**Less Difficult to Solve**

**More Difficult to Solve**

Explain how you decided which equations would be more difficult to solve.

### Activity 3: Solve 'em

Select four equations to solve. At least one should be from your "less difficult" list and one should be from your "more difficult" list. Show or explain your reasoning for each equation.

Card \_\_\_\_

Card \_\_\_\_

Card \_\_\_\_

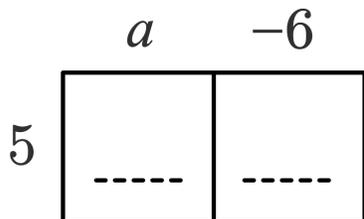
Card \_\_\_\_



### Activity 1: Factoring Puzzles

Complete the missing information in each puzzle.

**Puzzle 1**



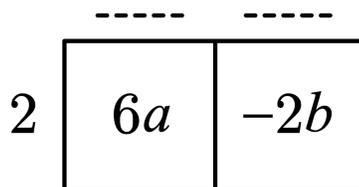
**Factored**

$5(a - 6)$

**Expanded**

\_\_\_\_\_

**Puzzle 2**



**Factored**

\_\_\_\_\_

**Expanded**

$6a - 2b$

**Puzzle 3**



**Factored**

\_\_\_\_\_

**Expanded**

$-25x + 15$

**Puzzle 4**

**Factored**

$-(2c + 3)$

**Expanded**

\_\_\_\_\_

### Activity 2: Step by Step by Step by Step

Here is an equation and the first steps that Sadia and Amir wrote to solve it.

**Sadia**

$2(x - 9) = 10$

$x - 9 = 5$

**Amir**

$2(x - 9) = 10$

$2x - 18 = 10$

- Are each of their first steps correct? Explain your reasoning.

- Finish solving each equation.





## Lesson Synthesis

1. What are two possible first steps you could use when solving an equation like  $6(x + 4) = 30$ ?

2. What are some advantages of having different ways to solve an equation?

---

## Cool-Down

Solve the equation. Show or explain your thinking.

$$8.88 = 4.44(x - 7)$$

## Activity 1: Roundtable

### Set 1

1.

2.

3.

4.

### Reflection

What advice would you give to yourself or others when solving these types of equations?

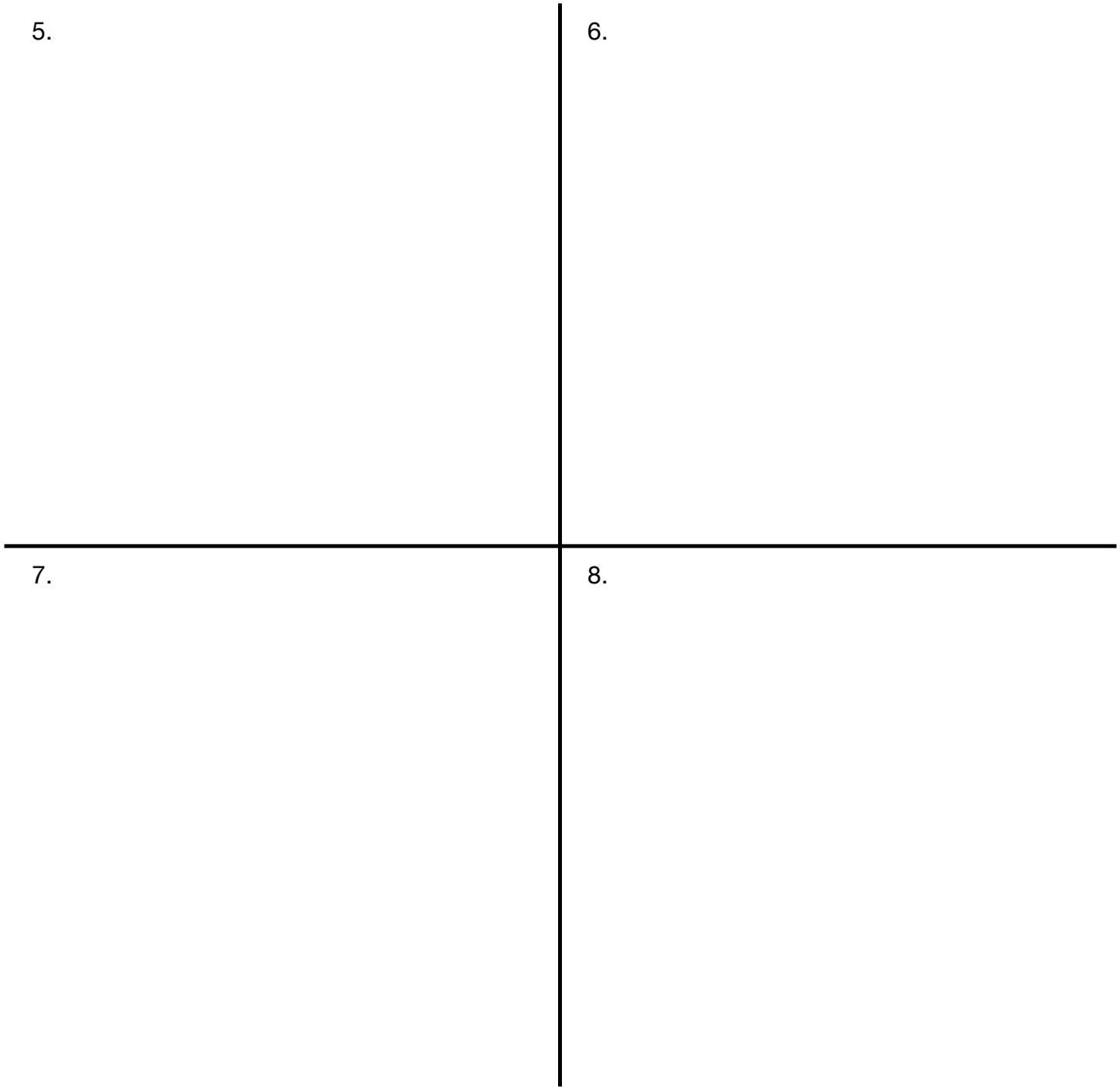
**Set 2**

5.

6.

7.

8.





## Activity 1: Three Reads

Kyrie is making  $\blacksquare$  invitations to their school's Community Day.

They have already made  $\blacksquare$  invitations, and they want to finish the rest of them within a week.

Kyrie plans to spread out the remaining work so that they make the same number of invitations each day.

1. With a partner, discuss what this situation is about.
2. Draw a tape or hanger diagram to represent this situation.

3. Given the values your teacher shares, adjust your diagram.

Then use your diagram to figure out how many invitations Kyrie should make each day.

## Activity 2: Similar Problems

1. Each set has two related situations. Circle **one** set to explore.

<b>Set 1</b>	<p>A. 6 members of the Martinez family are going to their school’s Community Day. They have a coupon for \$4.50 off each ticket. If they pay \$40.50 for all their tickets, how much does one ticket cost without the coupon?</p> <p>B. 6 members of the Benton family are going to their school’s Community Day. They have a coupon for \$4.50 off their total. If they pay \$40.50 for all their tickets, how much does one ticket cost without the coupon?</p>
<b>Set 2</b>	<p>A. Kwabena and Trevon are working together tossing bean bags to one side of a scale in order to balance a giant 15 lb. stuffed animal.</p> <p>They’re successful after Kwabena tosses 13 bean bags and Trevon tosses 8 bean bags onto the scale. How much does each bean bag weigh?</p> <p>B. Adah and Ivan are working together tossing bean bags to one side of a scale in order to balance a giant 15 lb. stuffed animal.</p> <p>They’re successful after Adah tosses 13 small bean bags and Ivan tosses one giant 8-pound bean bag onto the scale. How much does each small bean bag weigh?</p>
<b>Set 3</b>	<p>A. Marquis and Yolanda plan to sell T-shirts at their school’s Community Day. They make 25 shirts and each costs \$15 to make. If they would like to make \$320 in profit, how much should they sell each T-shirt for?</p> <p>B. Melissa and Cameron plan to sell T-shirts at their school’s Community Day. They spend \$25 on supplies and make 15 shirts. If they would like to make \$320 in profit, how much should they sell each T-shirt for?</p>

2. Create a poster. Here is what your poster should include:

- Your question set.
- Two visual representations, one for each problem (tape diagram, hanger diagram, etc.).
- Two equations with solutions, each representing your chosen diagram and the problem.
- The answer to each of your questions (with units).
- Highlighting that shows the connections between the visual representations, equations, and problems.

### Activity 2 Synthesis

<p>How were your two problems alike? How were they different?</p>	<p>Which representations did you find most useful for answering the questions?</p>
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### Activity 3: Gallery Tour

<p>What features of your classmates' posters helped you understand their thinking?</p>	<p>Describe something you would change about your poster now that you have seen other groups' work.</p>
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### Activity 4: Revisions and Reflection

1. Use your thinking from the gallery tour to make your poster stronger and clearer.
2. Add to your poster a way to check whether each of your solutions is correct.
3. Individually, answer the questions below.

<p>What clues do you look for in a situation to know what kind of equation might represent it?</p>	<p>How can visual representations and equations help solve problems about a situation?</p>
--	--



## Lesson Synthesis

What do you think is important to remember when solving problems using visual representations and equations?

---

## Cool-Down

Noe is hiking in a canyon.

At one point during the hike, Noe is at an elevation of 453 feet. After descending at a rate of 50 feet per minute, she reaches an elevation of 146 feet.

How long does the descent take?

### Activity 1: Step by Step by Step by Step

Here is an equation and all the steps Sadia wrote to solve it:

$$\begin{aligned}
 12x + 3 &= 3(5x + 9) \\
 3(4x + 1) &= 3(5x + 9) \\
 4x + 1 &= 5x + 9 \\
 1 &= x + 9 \\
 -8 &= x
 \end{aligned}$$

Here is the same equation and all the steps Amir wrote to solve it:

$$\begin{aligned}
 12x + 3 &= 3(5x + 9) \\
 12x + 3 &= 15x + 27 \\
 12x &= 15x + 24 \\
 -3x &= 24 \\
 x &= -8
 \end{aligned}$$

1. Are both of their solutions correct? Explain your reasoning.
2. Describe some ways the steps they took are alike and different.
3. Caleb and Roberto also solved the equation, but they made some errors. Find an incorrect step in each solution and explain why it is incorrect.

**Caleb:**

$$\begin{aligned}
 12x + 3 &= 3(5x + 9) \\
 7x + 3 &= 3(9) \\
 7x + 3 &= 27 \\
 7x &= 24 \\
 x &= \frac{24}{7}
 \end{aligned}$$

**Roberto:**

$$\begin{aligned}
 12x + 3 &= 3(5x + 9) \\
 12x + 3 &= 15x + 27 \\
 27x + 3 &= 27 \\
 27x &= 24 \\
 x &= \frac{24}{27}
 \end{aligned}$$

**Activity 2: Make Your Own Steps**Solve these equations for  $x$ .

1.  $\frac{12+6x}{3} = -2$

2.  $x - 4 = \frac{1}{3}(6x - 54)$

3.  $-3x + 12 = 9x - 4$

**Are You Ready for More?**

I have 24 pencils and 3 cups. The second cup holds one more pencil than the first cup. The third cup holds one more pencil than the second cup. How many pencils does each cup contain?

## Lesson Synthesis

Consider the equation  $2x - 6 = 4 - 8x$ . There are several ways to solve this equation. What are some different first steps that you could use to solve this equation? Explain your thinking.

---

## Cool-Down

Nyanna solved the equation  $8(x - 3) + 7 = 2x(4 - 17)$  incorrectly.

**Nyanna's solution:**

$$8(x - 3) + 7 = 2x(4 - 17)$$

$$8(x - 3) + 7 = 2x(13)$$

$$8x - 24 + 7 = 26x$$

$$8x - 17 = 26x$$

$$-17 = 34x$$

$$-\frac{1}{2} = x$$

1. Find an error in her solution.
2. Find the correct solution to the equation.

A.

$$2(2q + 1.5) = 18 - q$$

E.

$$-\frac{1}{2}(t + 3) - 10 = -6.5$$

B.

$$\frac{10-v}{4} = 2(v + 17)$$

F.

$$2r + 49 = -8(-r - 5)$$

C.

$$\frac{n}{7} - 12 = 5n + 5$$

G.

$$3(c - 1) + 2(3c + 1) = -(3c + 1)$$

D.

$$\frac{4m - 16}{4} = -\frac{8 + 4m}{8}$$

H.

$$p - 5(p + 4) = p - (8 - p)$$

### Activity 1: Predicting Solutions

Without solving, identify whether each equation has a solution that is positive, negative, or zero.

A. $7x = 3.25$	B. $7x = 32.5$	C. $\frac{x}{6} = \frac{3x}{4}$	D. $-8 + 5x = -20$
E. $9 - 4x = 4$	F. $3x + 11 = 11$	G. $-\frac{1}{2}(-8 + 5x) = -20$	

Select one problem and explain how you decided if the solution was positive, negative, or zero.

### Activity 2: Least and Most Difficult

Your teacher will give you a set of equations. Look through the equations, and without solving, find three equations that you think would be the least difficult to solve and three equations that you think would be the most difficult to solve. Write the letter of each of the equations below.

<b>Least Difficult Cards</b>	<b>Most Difficult Cards</b>
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Explain how you decided which equations would be the least difficult to solve.



### Activity 3: Solve 'em

Look through the equations and choose three to solve. At least one should be from your "least difficult" list and one should be from your "most difficult" list.


## Lesson Synthesis

1. Write an equation that you would consider difficult to solve.
  2. What makes your equation difficult to solve?
  3. What are some strategies that we know for solving equations that have this feature?
- 

## Cool-Down

1. Without solving, identify whether this equation has a solution that is positive, negative, or zero:

$$3x - 5 = -3$$

2. Solve the equation:

$$x - 5(x - 1) = x - (2x - 3)$$

## Activity 1: Maia's Magazines

Maia has a job where she earns \$19 per week, plus \$3 for every magazine subscription that she sells. She wants to use the money she earns to buy soccer equipment.

This week, Maia wants to buy a new ball. The cheapest ball she wants costs \$43 .

1. Write and solve an equation to determine how many magazine subscriptions Maia needs to sell to make \$43 .
2. List other numbers of magazine subscriptions Maia could sell and still buy the ball.
3. Write an inequality to represent **all** the number of subscriptions Maia could sell and still buy the ball.

The following week, Maia earns \$37 . She wants to use it to buy soccer shorts and 5 pairs of socks. The shorts she wants cost \$22.05 . Each pair of socks cost the same amount.

4. What is the price of each pair of socks if Maia spends **exactly** \$37 on the socks and shorts? (In Maia's city, there is no sales tax.) Write and solve an equation if it is helpful.
5. Write an inequality to represent **all** the sock prices that Maia could afford.

## Activity 2: Bao's Budgeting

Bao has \$175 saved in a bank account. He wants to know how much money he can take out each month if he wants to have at least \$25 in the account a year from now.

1. Circle the inequality that represents Bao's situation.

A.  $175 - 12x \leq 25$

B.  $175 + 12x \leq 25$

C.  $175 - 12x \geq 25$

D.  $175 + 12x \geq 25$

2. What does 12 represent?

3. What does  $x$  represent?

4. Bao and his friend try to solve the inequality. Bao's answer starts with  $x \leq$ . His friend's answer starts with  $x \geq$ . Which symbol makes sense for this situation?

Explain your thinking.

5. Solve the inequality you chose and explain what it means.

Bao is considering getting a part-time job. Instead of taking money **out** of his account each month, he would put money **in**. His account still has \$175, and his goal is to have \$1000 in the account a year from now.

6. Write an inequality where  $x$  represents how much Bao should put in each month to reach his goal.

7. Solve the inequality you wrote and explain what the solutions mean.

## Lesson Synthesis

Tay has a \$30 gift card to CoffeeBucks. They spend \$2.50 on a tasty beverage every school day. Tay wants to know how many beverages they can buy using the gift card.

Explain why Tay's inequality  $30 - 2.50x \geq 0$  represents this situation.

---

## Cool-Down

It is currently  $14^{\circ}\text{C}$  outside and the temperature is dropping 4 degrees every hour. Zahra will only stay outside if it is  $-10^{\circ}\text{C}$  or warmer.

1. Solve the inequality  $14 - 4h \geq -10$ .
  
  
  
  
  
  
  
  
  
  
2. Explain what the solutions to the inequality mean.

## Unit 7.6, Lesson 17: Cards

**Problem Card #1**

The school marching band has a \$750 budget. The band has \$300 in competition fees and they need 15 new uniforms.

How much could the marching band spend on each uniform?

**Problem Card #2**

LaShawn is a farmer in a city and needs to cover their plants when the temperature gets below  $0^{\circ}\text{C}$ .

At noon, the temperature was  $5^{\circ}\text{C}$  and dropped at a steady rate of 0.6 degrees per hour.

When do LaShawn's plants need to be covered?

**Problem Card #3**

Rudra is taking himself and his three friends out to dinner. He has a coupon for \$5 off each meal.

If Rudra has \$65, how much can each person spend?

**Problem Card #4**

Adriana's apartment building has a washing machine that uses a card for payment. The card automatically reloads when the balance falls below \$15.

If her family's card balance is currently \$50 and a load of laundry costs \$1.65, how many loads can Adriana's family do before the card reloads?

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### Support Card #2

#### After reading the problem:

1. What is the problem about?
2. What information is important?

#### After your partner writes an inequality:

3. What does each number represent?

#### After your partner solves the inequality:

4. Is the endpoint included in the solution?
5. What does your solution mean?

### Support Card #1

#### After reading the problem:

1. What information is important?

#### After your partner writes an inequality:

2. How could you start solving?

#### After your partner solves the inequality:

3. What does your solution mean?
4. Do you need to round your solution?

### Support Card #4

#### After reading the problem:

1. What is the problem about?
2. What information is important?

#### After your partner writes an inequality:

3. How is each load's cost represented?
4. How could you start solving?

#### After your partner solves the inequality:

5. What does your solution mean?

### Support Card #3

#### After reading the problem:

1. What information is important?

#### After your partner writes an inequality:

2. How is Rudra's total amount represented?
3. How could you start solving?

#### After your partner solves the inequality:

4. Is the endpoint included in the solution?
5. What does your solution mean?

### Support Card #2

#### After reading the problem:

1. What is the problem about?
2. What information is important?

#### After your partner writes an inequality:

3. What does each number represent?

#### After your partner solves the inequality:

4. Is the endpoint included in the solution?
5. What does your solution mean?

### Support Card #1

#### After reading the problem:

1. What information is important?

#### After your partner writes an inequality:

2. How could you start solving?

#### After your partner solves the inequality:

3. What does your solution mean?
4. Do you need to round your solution?

### Support Card #4

#### After reading the problem:

1. What is the problem about?
2. What information is important?

#### After your partner writes an inequality:

3. How is each load's cost represented?
4. How could you start solving?

#### After your partner solves the inequality:

5. What does your solution mean?

### Support Card #3

#### After reading the problem:

1. What information is important?

#### After your partner writes an inequality:

2. How is Rudra's total amount represented?
3. How could you start solving?

#### After your partner solves the inequality:

4. Is the endpoint included in the solution?
5. What does your solution mean?





## Activity 2: Solve It!

For this activity, you need either a problem card or a support card.

If you have a **problem card**:

1. Read the problem aloud.
2. Write an inequality that describes the problem.
3. Solve your inequality.
4. Answer the question on your card using the solution to the inequality you wrote.

If you have a **support card**:

- Your goal is to help your partner by asking the questions on the card.
- You may also add questions of your own.

**Workspace:**



## Lesson Synthesis

Sahana gets paid \$9.50 per hour at her job at the pet store. She needs to make at least \$235 each week in order to pay her bills.

Describe how to write an inequality that represents Sahana's situation.

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## Cool-Down

Wey Wey is trying to figure out how many movies she can download to her hard drive. Each movie is 8 gigabytes. The hard drive is supposed to hold 500 gigabytes of data, but 58 gigabytes are already taken up by other files.

Wey Wey wrote the inequality  $8x + 58 \geq 500$  and solved it to find the solution  $x \geq 55.25$ .

1. Describe the mistake that Wey Wey made.
2. Fix Wey Wey's inequality.
3. What would you tell Wey Wey if she asked, "How many movies can I download?"