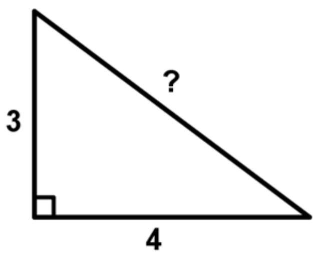
Name: **Transformations and Congruence** **6.1H**

Ready, Set, Go!

Ready
Topic: Pythagorean Theorem

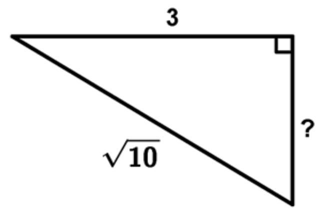
For each of the following right triangles determine the number unit measure for the missing side.

1.



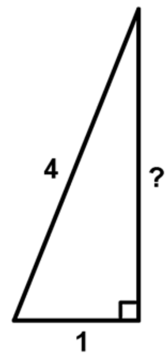
5

2.



1

3.

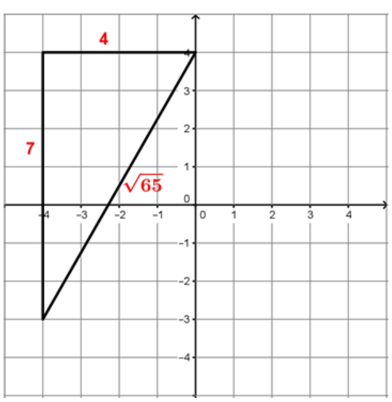


$\sqrt{15}$

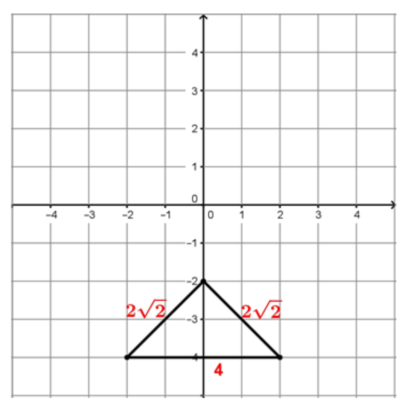
Topic: Finding distance using Pythagorean Theorem

Use the coordinate grid to find the length of each side of the triangles provided.

4.



5.



Set

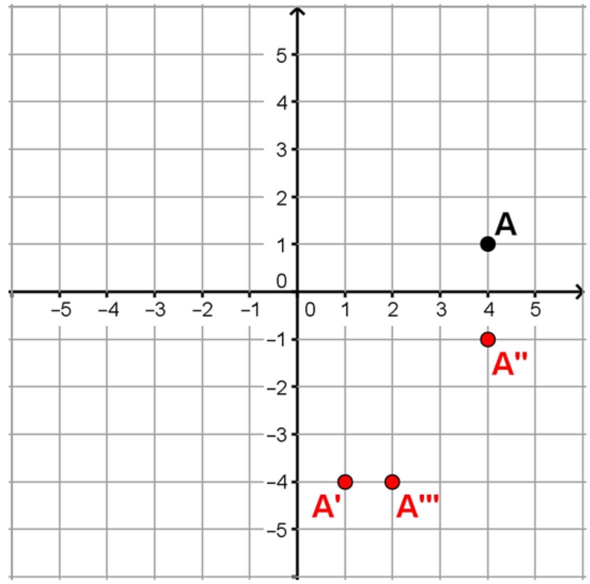
Topic: Transformations

Transform points as indicated in each exercise below.

6. a. Rotate point A around the origin $-90°$ clockwise, label as A'

   b. Reflect point A over the x-axis, label as A''

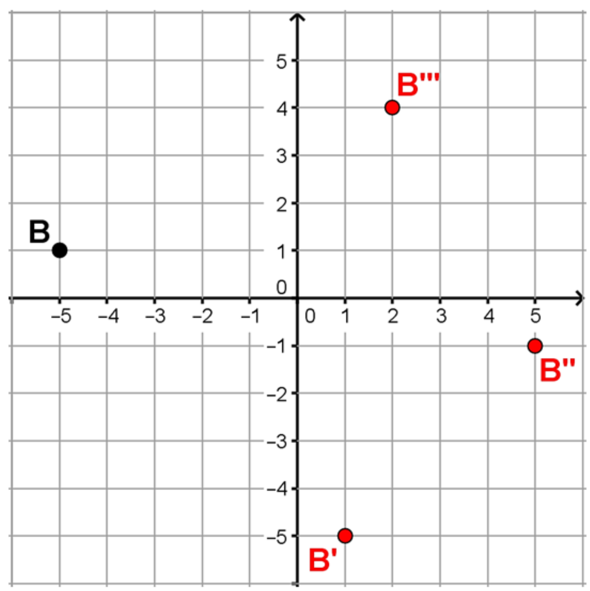
   c. Apply the rule $(x-2, y-5)$, to point A and label A'''



7. a. Reflect point B over the line $y = x$, label as B'

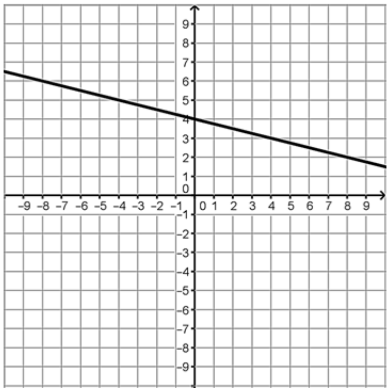
   b. Rotate point B 180° about the origin, label as B''

   c. Translate point B the point up 3 and right 7 units, label as B'''



Topic: Slopes of parallel and perpendicular lines.

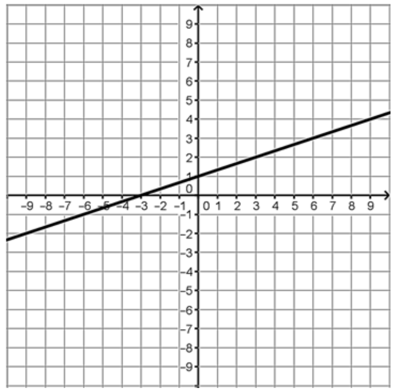
8. Graph a line *parallel* to the given line.



Equation for given line:
$y = -\frac{1}{4}x + 4$

Equation for *new* line:
Answers vary

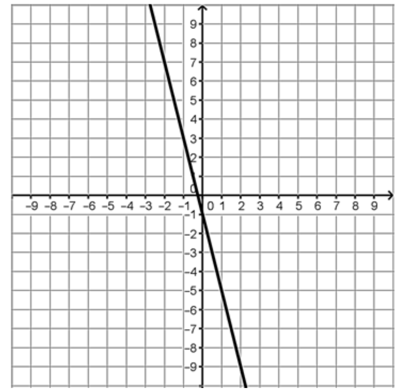
9. Graph a line *perpendicular* to the given line.



Equation for given line:
$y = \frac{1}{3}x + 1$

Equation for *new* line:
Answers vary

10. Graph a line *perpendicular* to the given line.



Equation for given line:
$y = -4x - 1$

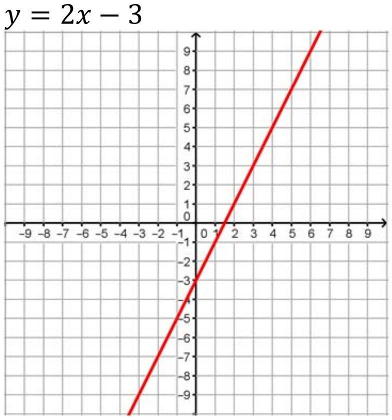
Equation for *new* line:
Answers vary

Go

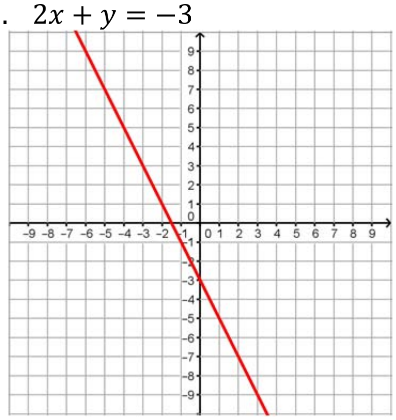
Topic: Graphing linear equations

Graph each equation on the coordinate grid provided. Extend the line as far as the grid will allow.

11. $y = 2x - 3$



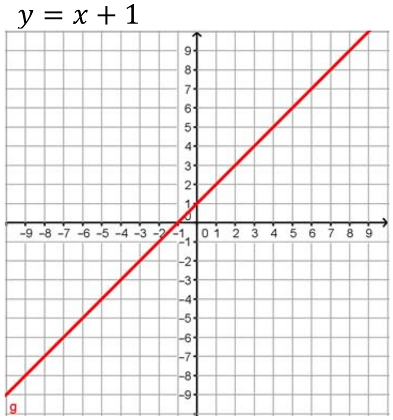
12. $2x + y = -3$



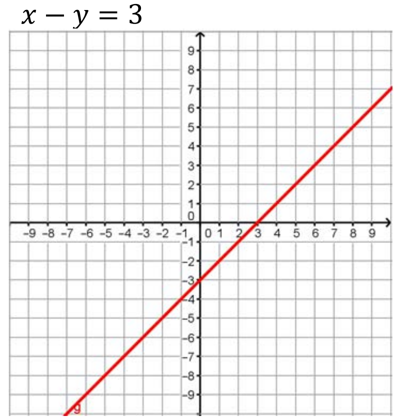
13. What similarities and difference are there between the equations in number 11 and 12?

Same *y*-intercept, opposite slopes

14. $y = x + 1$



15. $x - y = 3$



16. What similarities and difference are there between the equations in number 14 and 15?

Same slopes, different *y*-intercepts

Topic: Solve equations

Solve each equation for the indicated variable.

17. $3(x - 2) = 5x + 8$; Solve for x.

$\boldsymbol{x = -7}$

18. $-3 + n = 6n + 22$; Solve for n.

$\boldsymbol{n = -5}$

19. $y - 5 = m(x - 2)$; Solve for x.

$\boldsymbol{x = \frac{y-5}{m} + 2}$

20. $Ax + By = C$; Solve for y.

$\boldsymbol{y = \frac{C - Ax}{B}}$

Name: **Transformations and Congruence 6.2**

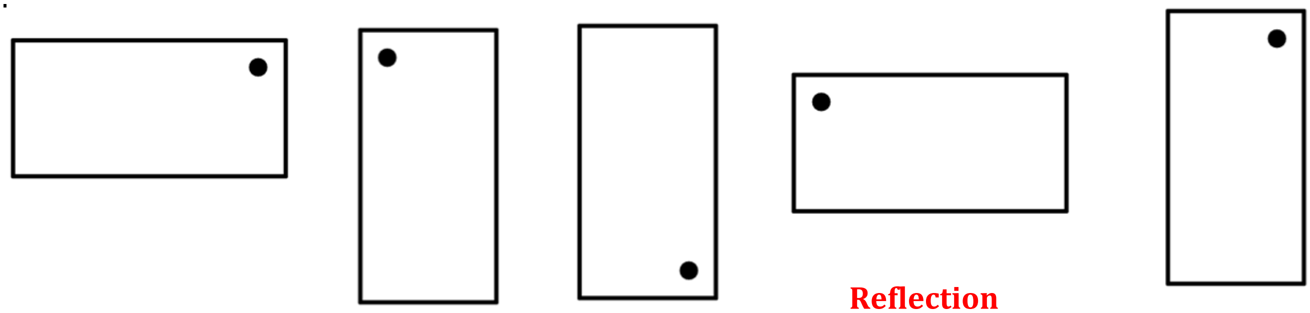
Ready, Set, Go!

Ready

Topic: Basic rotations and reflections of objects

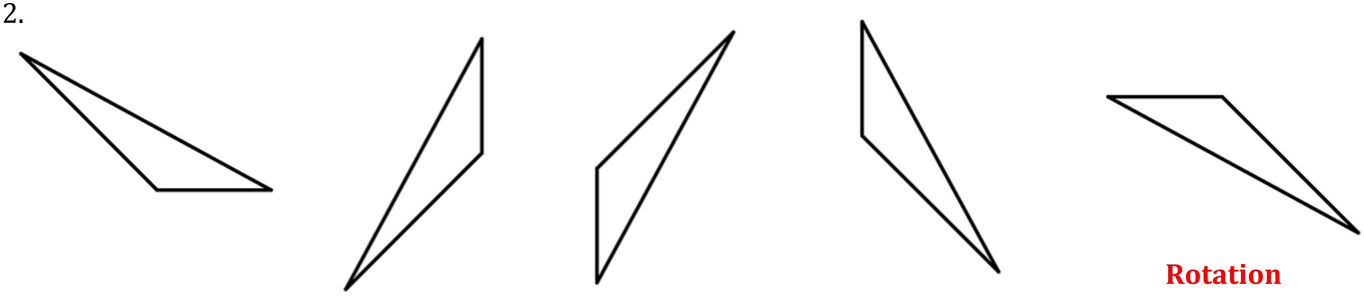
In each problem there will be a pre-image and several images based on the given pre-image. Determine which of the images are rotations of the given pre-image and which of them are reflections of the pre-image. If an image appears to be created as the result of a rotation and a reflection then state both.

1.



Pre-Image	Image A	Image B	Image C	Image D
	Rotation	**Rotation**	**Reflection**	**Rotation & Reflection**

2.



Pre-Image	Image A	Image B	Image C	Image D
	Rotation	**Rotation**	**Rotation & Reflection**	**Rotation**

Topic: Defining geometric shapes and components

For each of the geometric words below write a definition of the object that addresses the essential elements. Also, list necessary attributes and characteristics.

3. Quadrilateral: **Four sided polygon**

4. Parallelogram: **Quadrilateral with two pairs of parallel sides**

5. Rectangle: **Parallelogram with four right angles**

6. Square: **Rectangle with four congruent sides**

7. Rhombus: **Parallelogram with four congruent sides**

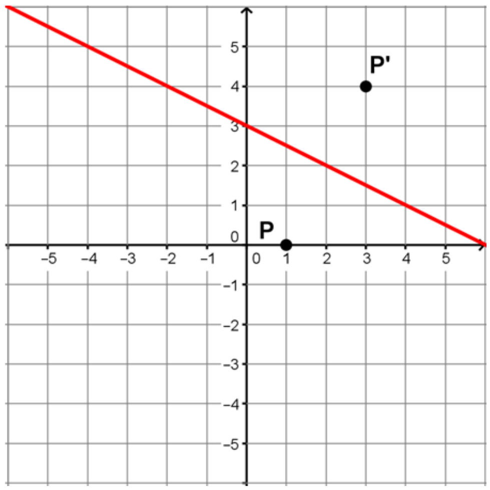
8. Trapezoid: **Quadrilateral with one pair of parallel sides**

Set

Topic: Reflecting and rotating points

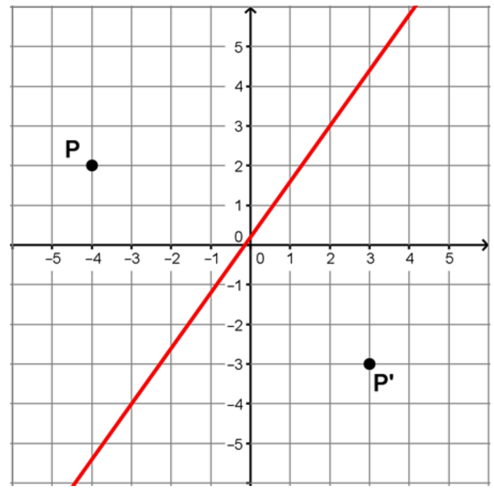
For each pair of point, *P* and *P'*, draw in the line of reflection that would need to be used to reflect *P* onto *P'*. Then find the equation of the line of reflection.

9.



Equation: $\boldsymbol{y = -\frac{1}{2}x + 3}$

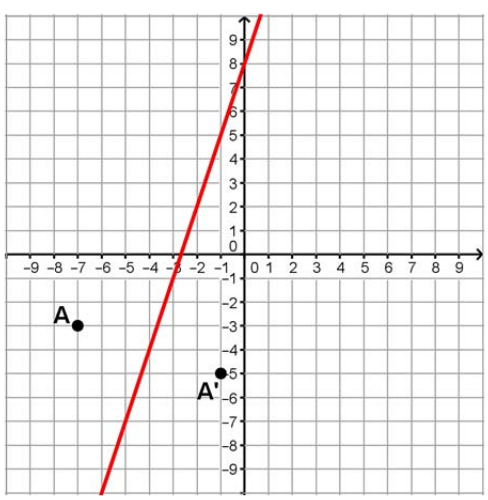
10.



Equation: $\boldsymbol{y = \frac{7}{5}x + \frac{1}{5}}$

For each pair of point, *A* and *A'*, draw in the line of reflection that would need to be used to reflect *A* onto *A'*. Then find the equation of the line of reflection. Also, draw a line connecting *A* to *A'* and find the equation of this line. Compare the slopes of the lines of reflection containing *A* and *A'*.

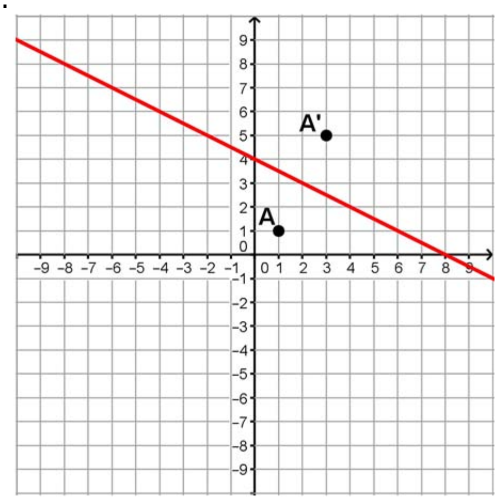
11.



Equation of the Line of Reflection:
$\boldsymbol{y = 3x + 8}$

Equation of the Line $\overleftrightarrow{AA'}$:
$\boldsymbol{y = -\frac{1}{3}x - \frac{16}{3}}$

12.

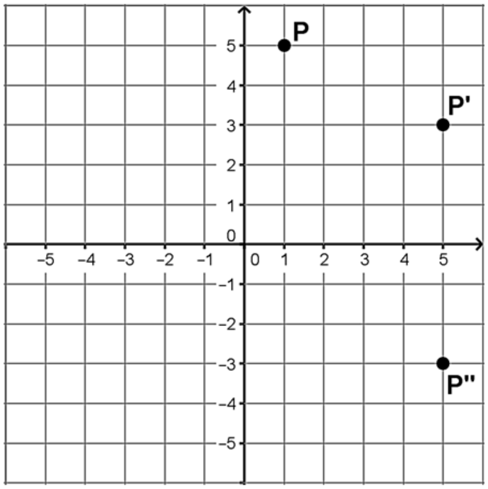


Equation of the Line of Reflection:
$\boldsymbol{y = -\frac{1}{2}x + 4}$

Equation of the Line $\overleftrightarrow{AA'}$:
$\boldsymbol{y = 2x - 1}$

Topic: Reflections and Rotations, composing reflections to create a rotation

13.



a. What is the equation for the line of reflection that reflects point ***P*** onto ***P'*** ?

$\boldsymbol{y = 2x - 2}$

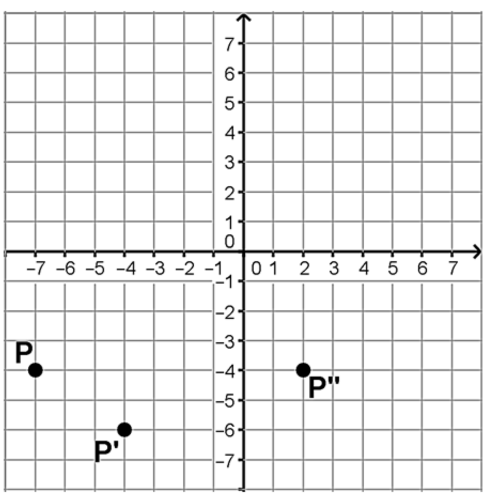
b. What is the equation for the line of reflection that reflects point ***P'*** onto ***P''*** ?

$\boldsymbol{y = 0}$

c. Could ***P''*** also be considered a rotation of point ***P***? If so, what is the center of rotation and how many degrees was point ***P*** rotated?

Yes. The center could be any point on the perpendicular bisector of $\overline{PP'}$

14.



a. What is the equation for the line of reflection that reflects point ***P*** onto ***P'*** ?

$\boldsymbol{y = \frac{3}{2}x + 3.25}$

b. What is the equation for the line of reflection that reflects point ***P'*** onto ***P''*** ?

$\boldsymbol{y = -3x = 8}$

c. Could ***P''*** also be considered a rotation of point ***P***? If so, what is the center of rotation and how many degrees was point ***P*** rotated?

Yes. The center could be any point on the perpendicular bisector of $\overline{PP'}$

Go

Topic: Slopes of parallel and perpendicular lines and finding both distance and slope between two points.

Write the slope of a line parallel to the given line.

15. $y = 7x - 3$

$\boldsymbol{m = 7}$

Write the slope of a line perpendicular to the given line.

16. $y = \frac{1}{5}x - 4$

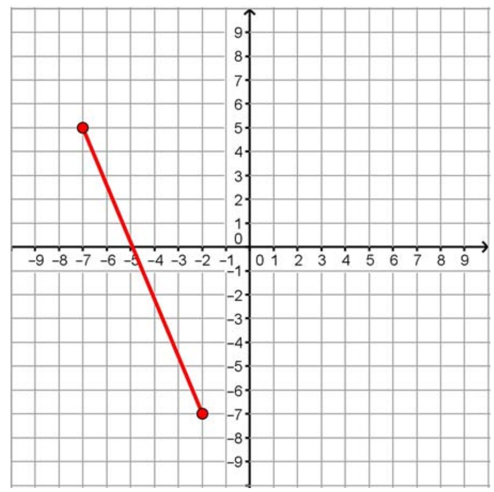
$\boldsymbol{m = -5}$

Find the *slope* between the given pair of points. Then, using the Pythagorean Theorem, find the *distance* between the pair of points. You may use the graph to help you as needed.

17. $(-7, 5)\ (-2, -7)$

a. Slope: $-\frac{12}{5}$

b. Distance: **13**



Topic: Rotations about the origin

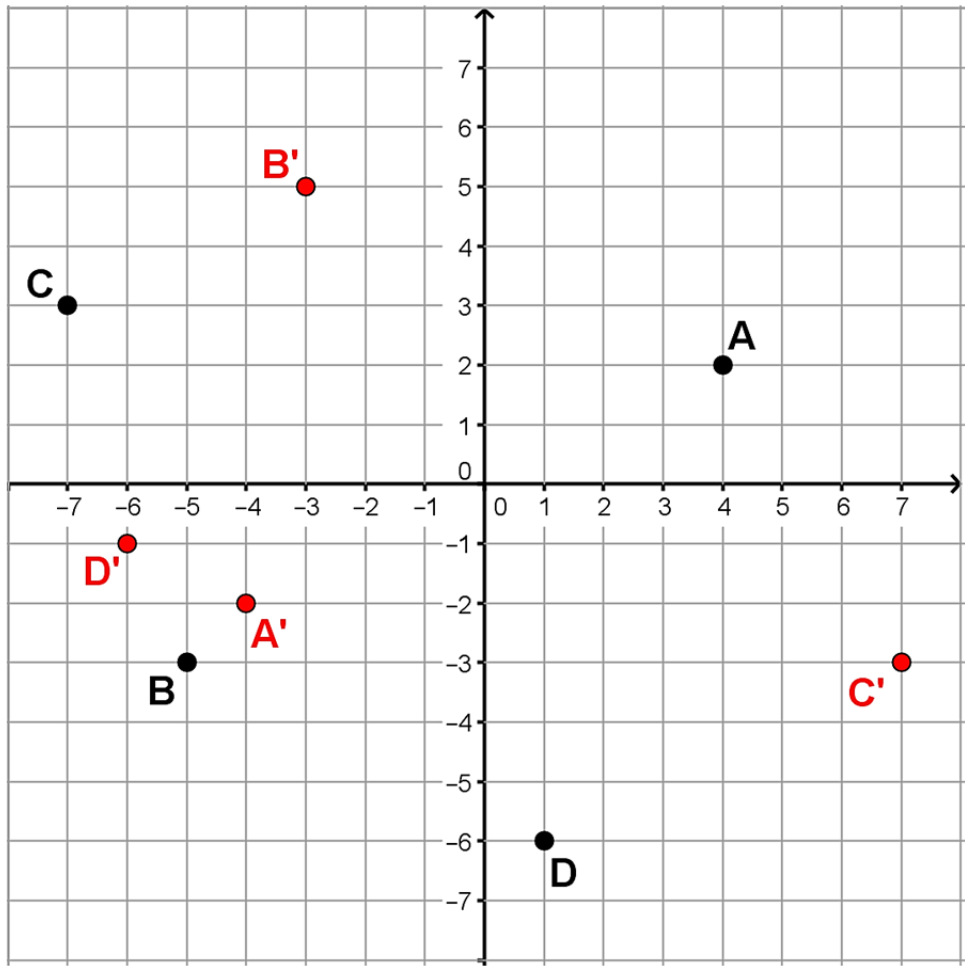
Plot the given coordinate and then perform the indicated rotation around the origin, the point $(\mathbf{0}, \mathbf{0})$, and plot the image created. State the coordinates of the image.

18. Point $A(4, 2)$ rotate $180°$
    Coordinates for Point A'(**−4** , **−2**)

19. Point $B(-5, -3)$ rotate $-90°$
    Coordinates for Point B'(**−3** , **5**)

20. Point $C(-7, 3)$ rotate $180°$
    Coordinates for Point C'(**7** , **−3**)

21. Point $D(1, -6)$ rotate $-90°$
    Coordinates for Point D'(**−6** , **−1**)



Name: **Transformations and Congruence | 6.3H**

Ready, Set, Go!

Ready

Topic: Polygons, definition and names

1. What is a polygon? Describe in your own words what a polygon is.

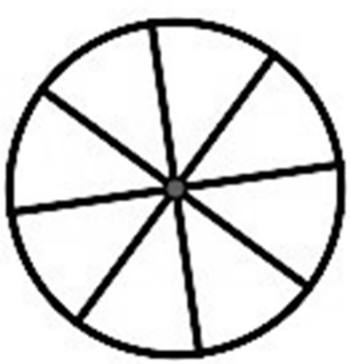
   Answers will vary but should include: closed figure with straight sides and no curves.

2. Fill in the names of each polygon based on the number of sides the polygon has.

Number of Sides	Name of Polygon
3	**Triangle**
4	**Quadrilateral**
5	**Pentagon**
6	**Hexagon**
7	**Heptagon**
8	**Octagon**
9	**Nonagon**
10	**Decagon**

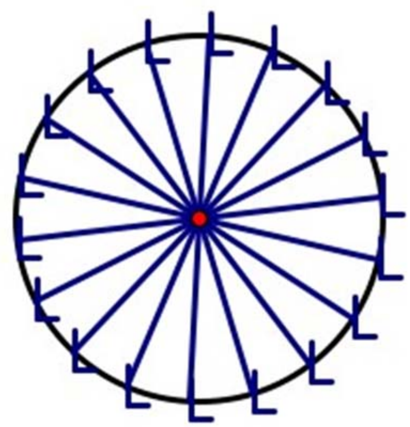
Topic: Rotation as a transformation

3. What fraction of a turn does the wagon wheel below need to turn in order to appear the very same as it does right now? How many degrees of rotation would that be?



$\frac{1}{8}$ **of a turn; 45°**

4. What fraction of a turn does the model of a Ferris wheel below need to turn in order to appear the very same as it does right now? How many degrees of rotation would that be?

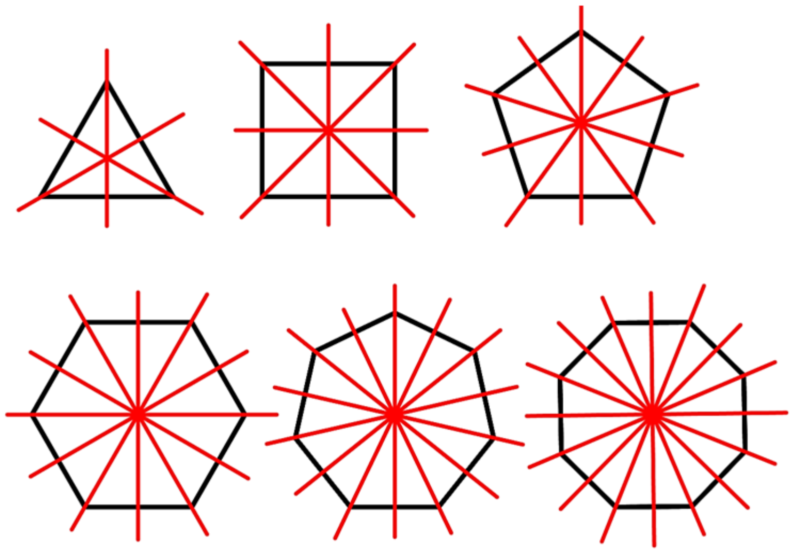


$\frac{1}{18}$ **of a turn; 20°**

Set

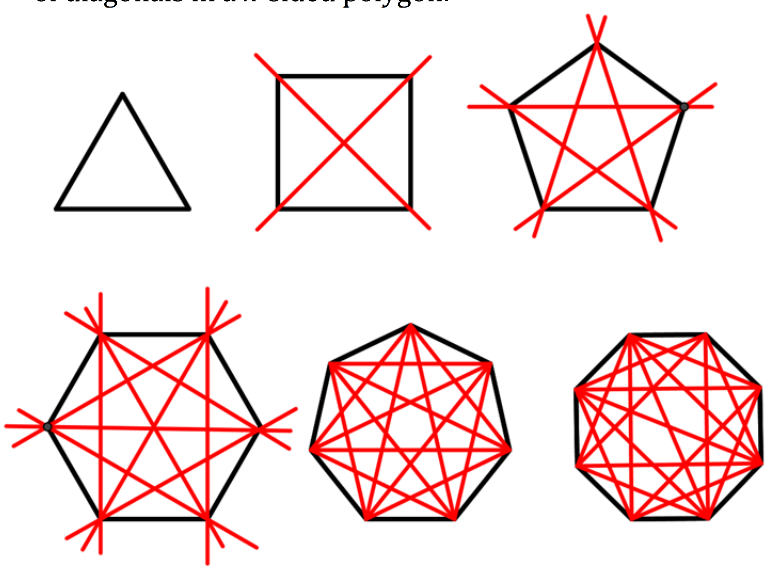
Topic: Lines of symmetry and diagonals

5. Draw the lines of symmetry for each regular polygon, fill in the table including an expression for the number of lines of symmetry in a n-sided polygon.



Number of Sides	Number of lines of symmetry
3	**3**
4	**4**
5	**5**
6	**6**
7	**7**
8	**8**
n	$\boldsymbol{n}$

6. Find all of the diagonals in each regular polygon. Fill in the table including an expression for the number of diagonals in a n-sided polygon.



Number of Sides	Number of diagonals
3	**0**
4	**2**
5	**5**
6	**9**
7	**14**
8	**20**
n	$\frac{n(n-3)}{2}$

7. Are all lines of symmetry also diagonals? Explain.

No, some lines of symmetry go through the midpoints of opposite sides of the regular polygons which means that these lines of symmetry are not diagonals of the polygon.

8. Are all diagonals also lines of symmetry? Explain.

   No, only diagonals that go through the center of regular polygons are lines of symmetry.

9. What shapes will have diagonals that are not lines of symmetry? Name some and draw them.

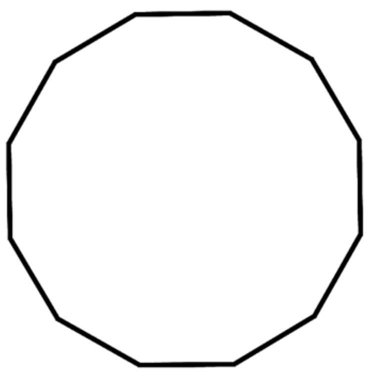
   Non-regular polygons

10. Will all parallelograms have diagonals that are lines of symmetry? If so, draw and explain. If not draw and explain.

    Only squares and rhombuses have diagonals that are lines of symmetry.

Topic: Finding angles of rotation for regular polygons.

11. Find the angle(s) of rotation that will carry the 12 sided polygon below onto itself.



30°

12. What are the angles of rotation (less than 360°) for a 20-gon? How many lines of symmetry (lines of reflection) will it have?

    18°, 36°, 54°, 72°, 90°, 108°, 126°, 144°, 162°, 180°, 198°, 216°, 234°, 252°, 270°, 288°, 306°, 324°, 342°
    20 lines of symmetry

13. What are the angles of rotation (less than 360°) for a 15-gon? How many line of symmetry (lines of reflection) will it have?

    24°, 48°, 72°, 96°, 120°, 144°, 168°, 192°, 216°, 240°, 264°, 288°, 312°, 336°
    15 lines of symmetry

14. How many sides does a regular polygon have that has an angle of rotation equal to 18°? Explain.

    20 sides
    20 lines of symmetry

15. How many sides does a regular polygon have that has an angle of rotation equal to 20°? How many lines of symmetry will it have?

    18 sides
    18 lines of symmetry

Go

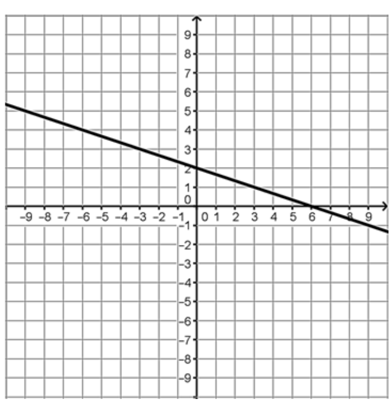
Topic: Equations for parallel and perpendicular lines.

<table>
<tr><th></th><th>Find the equation of a line PARALLEL to the given info and through the indicated point.</th><th>Find the equation of a line PERPENDICULAR to the given line and through the indicated point.</th></tr>
<tr><td>16. Equation of a line:
$y = 4x + 1$</td><td>a. Parallel line through point $(-1, -7)$:

$\boldsymbol{y = 4(x + 1) - 7}$</td><td>b. Perpendicular line though point $(-1, -7)$:

$\boldsymbol{y = -\frac{1}{4}(x + 1) - 7}$</td></tr>
<tr><td>17. Table of a line:
<table>
<tr><th>x</th><th>y</th></tr>
<tr><td>3</td><td>-8</td></tr>
<tr><td>4</td><td>-10</td></tr>
<tr><td>5</td><td>-12</td></tr>
<tr><td>6</td><td>-14</td></tr>
</table></td><td>a. Parallel line through point $(3, 8)$:

$\boldsymbol{y = -2(x - 3) + 8}$</td><td>b. Perpendicular to the line through point $(3, 8)$:

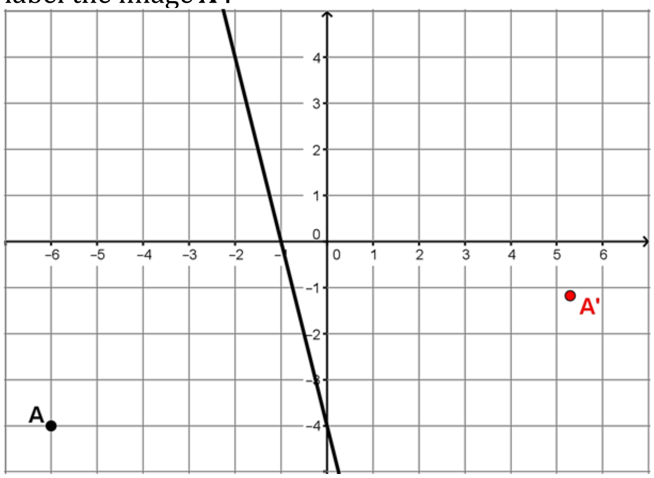
$\boldsymbol{y = \frac{1}{2}(x - 3) + 8}$</td></tr>
<tr><td>18. Graph of a line:
</td><td>a. Parallel line through point $(2, -9)$:

$\boldsymbol{y = -\frac{1}{3}(x - 2) - 9}$</td><td>b. Perpendicular line through point $(2, -9)$:

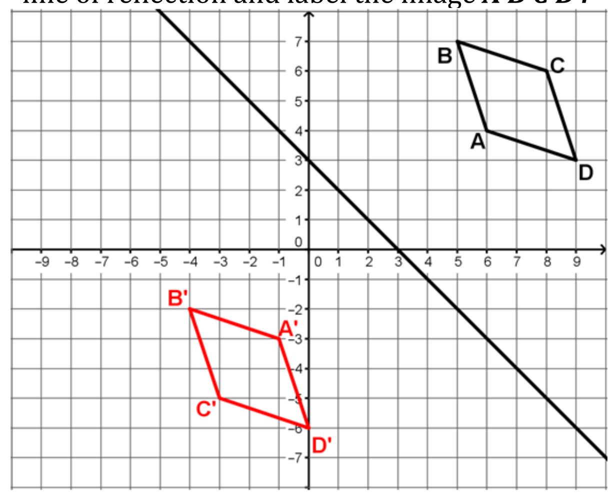
$\boldsymbol{y = 3(x - 2) - 9}$</td></tr>
</table>

Topic: Reflecting and rotating points on the coordinate plane.

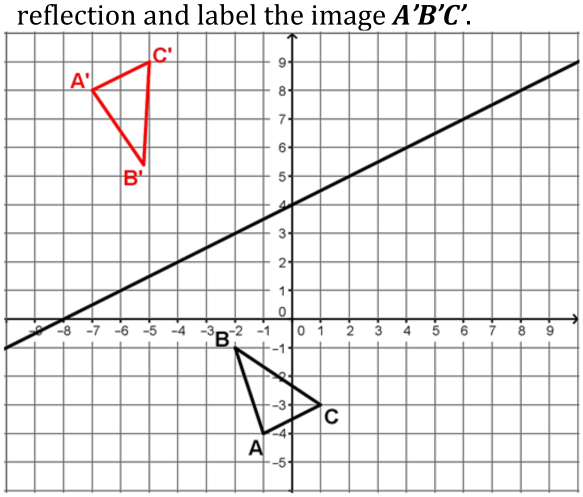
19. Reflect point ***A*** over the given line of reflection and label the image ***A***'.



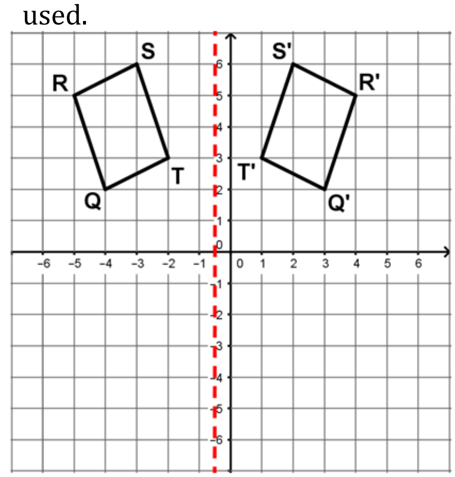
20. Reflect parallelogram ***ABCD*** over the given line of reflection and label the image ***A'B'C'D'.***



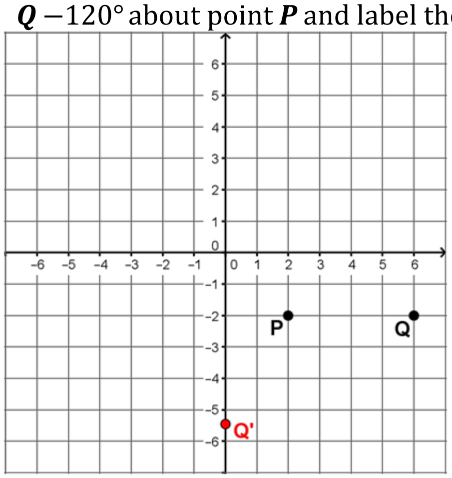
21. Reflect triangle ***ABC*** over the given line of reflection and label the image ***A'B'C'***.



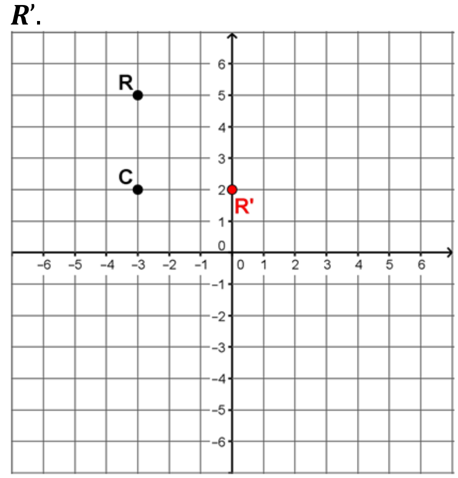
22. Given parallelogram ***QRST*** and its image ***Q'R'S'T'*** draw the line of reflection that was used.



23. Using point ***P*** as a center of rotation. Rotate point ***Q*** $-120°$ about point ***P*** and label the image ***Q***'.



24. Using point ***C*** as the center or rotation. Rotate point ***R*** 270° about point ***C*** and label the image ***R***'.



Ready, Set, Go!

Ready

Topic: Defining congruence and similarity.

1. What do you know about two figures if they are congruent?
   Same side lengths and same angle measurements

2. What do you need to know about two figures to be convinced that the two figures are congruent?

   There is a sequence of rigid motions that map one onto the other.

3. What do you know about two figures if they are similar?

   Same shape (angle measures are the same) but different side lengths.

4. What do you need to know about two figures to be convinced that the two figures are similar?

   There is a dilation that maps one onto the other.

Set

Topic: Classifying quadrilaterals based on their properties.

Using the information given determine the most specific classification of the quadrilateral.

5. Has 180° rotational symmetry.
   Parallelogram

6. Has 90° rotational symmetry.
   Square

7. Has two lines of symmetry that are diagonals.
   Rhombus

8. Has two lines of symmetry that are not diagonals.
   Rectangle

9. Has congruent diagonals.
   Rectangle

10. Has diagonals that bisect each other.
    Parallelogram

11. Has diagonals that are perpendicular.
    Rhombus

12. Has congruent angles.
    Rectangle

Go

Topic: Slope and distance

Find the *slope* between each pair of points. Then, using the Pythagorean Theorem, find the *distance* between each pair of points.

13. $(-3,-2)\ (0,0)$

a. Slope $\frac{2}{3}$

b. Distance: $\sqrt{13}$

14. $(7,-1)\ (11,7)$

a. Slope 2

b. Distance: $4\sqrt{5}$

15. $(-10,13)\ (-5,1)$

a. Slope $-\frac{12}{5}$

b. Distance: 13

16. $(-6,-3)\ (3,1)$

a. Slope $\frac{4}{9}$

b. Distance: $\sqrt{97}$

17. $(5,22)\ (17,28)$

a. Slope $\frac{1}{2}$

b. Distance: $6\sqrt{5}$

18. $(1,-7)\ (6,5)$

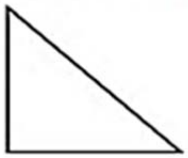
a. Slope $\frac{12}{5}$

b. Distance: 13

Topic: Similar and congruent figures

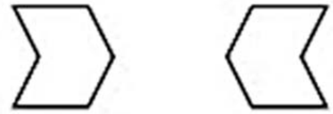
Determine which letter best describes the shapes shown.

19.



a. The shapes are only congruent
b. The shapes are only similar
c. The shapes are both similar and congruent
d. The shapes are neither similar nor congruent

20.



a. The shapes are only congruent
b. The shapes are only similar
c. The shapes are both similar and congruent
d. The shapes are neither similar nor congruent

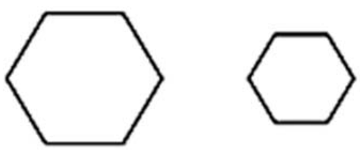
21.

a. The shapes are only congruent
b. The shapes are only similar
c. The shapes are both similar and congruent
d. The shapes are neither similar nor congruent

22.

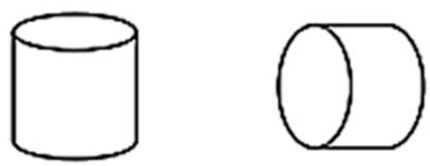
a. The shapes are only congruent
b. The shapes are only similar
c. The shapes are both similar and congruent
d. The shapes are neither similar nor congruent

23.



a. The shapes are only congruent
b. The shapes are only similar
c. The shapes are both similar and congruent
d. The shapes are neither similar nor congruent

24.

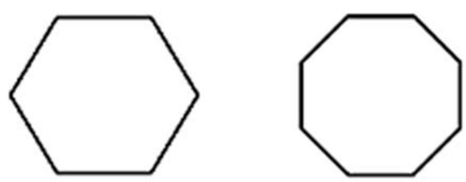


a. The shapes are only congruent
b. The shapes are only similar
c. The shapes are both similar and congruent
d. The shapes are neither similar nor congruent

25.

a. The shapes are only congruent
b. The shapes are only similar
c. The shapes are both similar and congruent
d. The shapes are neither similar nor congruent

26.



a. The shapes are only congruent
b. The shapes are only similar
c. The shapes are both similar and congruent
d. The shapes are neither similar nor congruent

Name: **Transformations and Congruence | 6.5H**

Ready, Set, Go!

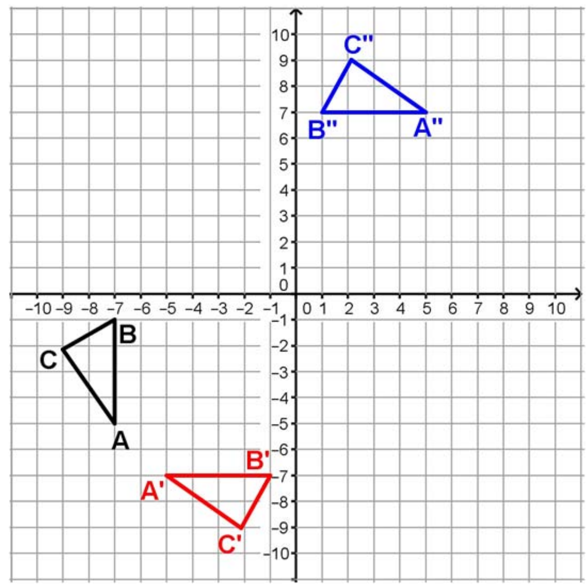
Ready

Topic: Performing a sequence of transformations

The given figures are to be used as pre-images. Perform the stated transformations to obtain an image. Label the corresponding parts of the image in accordance with the pre-image.

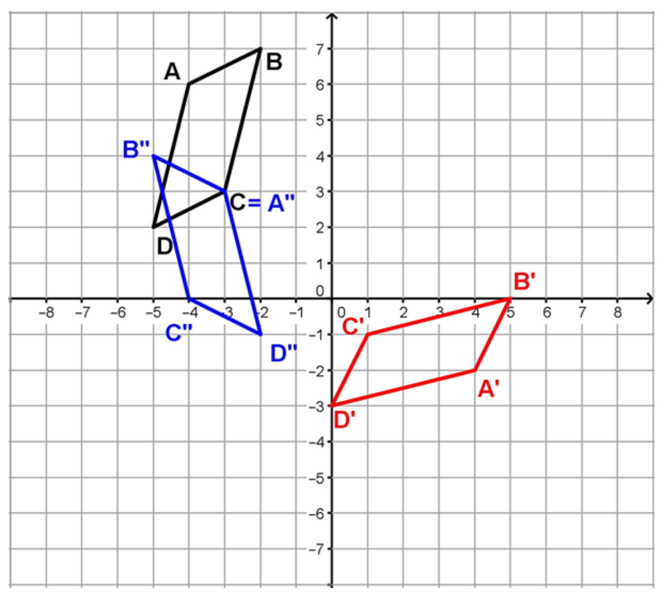
1.
   a. Reflect triangle ***ABC*** over the line $y = x$ and label the image ***A'B'C'***.

   b. Rotate triangle ***A'B'C'*** 180° around the origin and label the image ***A''B''C''.***



2.
   a. Reflect quadrilateral ABCD over the line $y = x + 2$ and label the image A'B'C'D'.

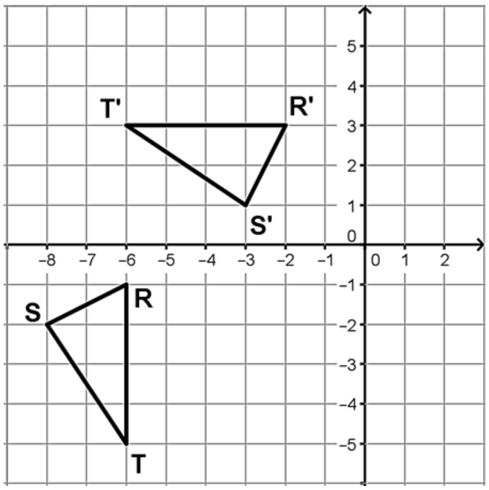
   b. Rotate the quadrilateral A'B'C'D' 90° around $(-2, -3)$. Label the image A''B''C''D''.



Topic: Find the sequence of transformations.

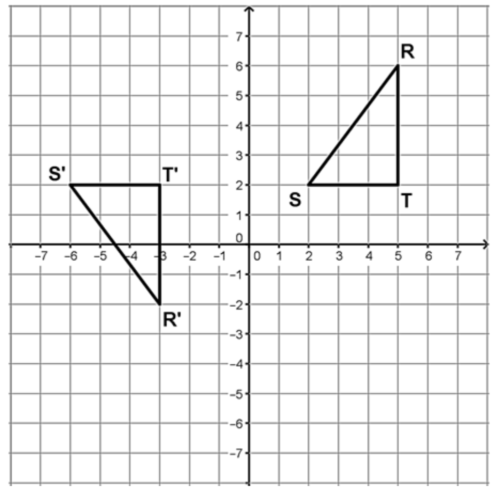
Find the sequence of transformations that will carry $\Delta \boldsymbol{RST}$ onto $\Delta \boldsymbol{R'S'T'}$. Clearly describe the sequence of transformations below each grid.

3.



Translate 8 units up, rotate $-90°$ about point T, and reflect about $y = 3$.

4.

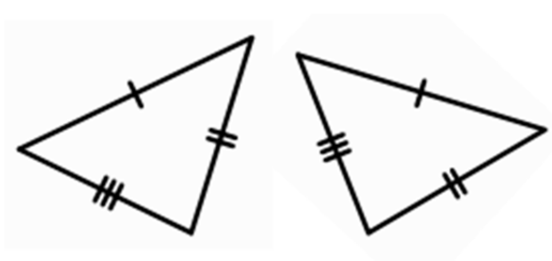
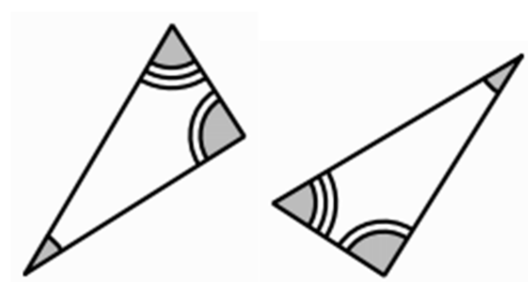
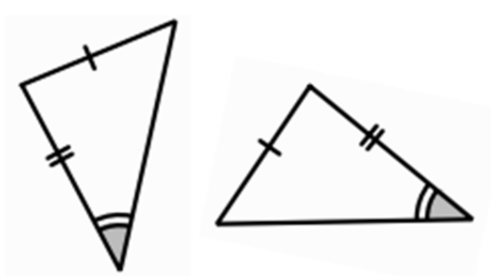
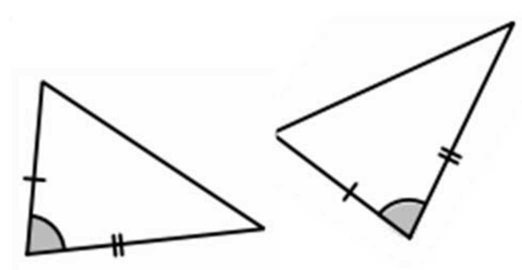


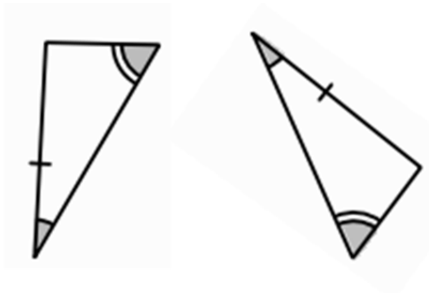
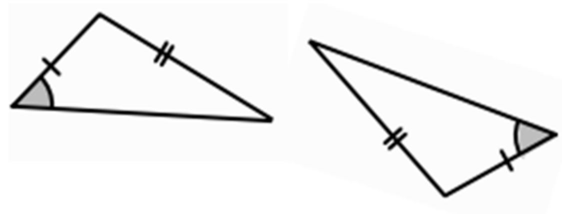
Translate 8 units left, reflect over $y = 2$.

Set

Topic: Triangle congruencies

Explain whether or not the triangles are congruent, similar, or neither based on the markings that indicate congruence.

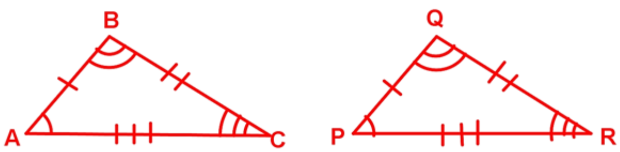
5.  **Congruent**	6.  **Similar**
7.  **Neither**	8.  **Congruent**

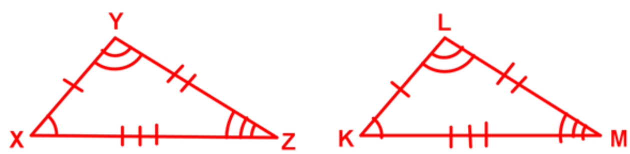
<table>
<tr>
<td>9.

Congruent</td>
<td>10.

Neither</td>
</tr>
</table>

Use the given congruence statement to draw and label two triangles that have the proper corresponding parts congruent to one another.

11. $\Delta ABC \cong \Delta PQR$

12. $\Delta XYZ \cong \Delta KLM$



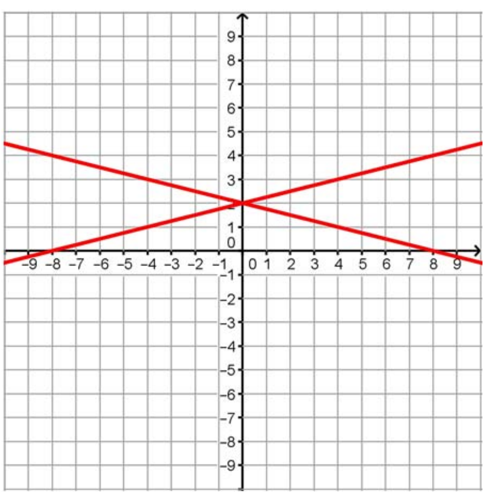


Go

Topic: Graphing functions and making comparisons.

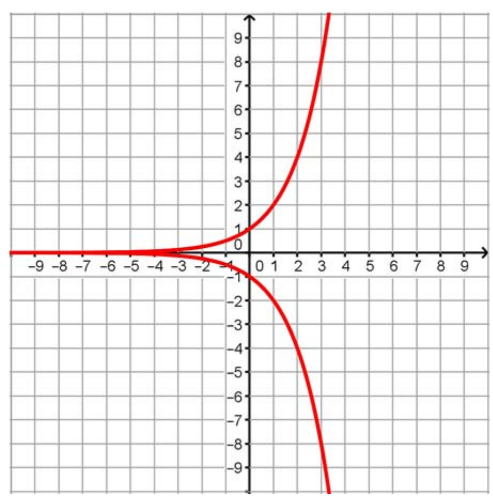
Graph each pair of functions and make an observation about how the functions compare to one another.

13. $y = \frac{1}{4}x + 2$
$y = -\frac{1}{4}x + 2$



The lines have the same y-intercept

14. $y = 2^x$
$y = -2^x$



The curves are reflections over the x-axis.

Topic: Review of finding recursive rules for sequences

Use the given sequence of numbers to write a recursive rule for the *n*th value of the sequence.

15. $3, -6, 12, -24, \ldots$

$\boldsymbol{f(1) = 3,\ f(n) = f(n-1) \cdot (-2)}$

16. $\frac{1}{2}, 0, -\frac{1}{2}, -1, \ldots$

$\boldsymbol{f(1) = \frac{1}{2},\ f(n) = f(n-1) - \frac{1}{2}}$

Topic: Triangle congruence properties

Questions #17-20 can be completed by going to: http://illuminations.nctm.org/Activity.aspx?id=3504
Investigate congruence by manipulating the parts (sides and angles) of a triangle. If you can create two different triangles with the same parts, then those parts do not prove congruence. Can you prove all the theorems (SAS, , SSA, SSS, AAS, ASA, AAA)?

17. Each triangle congruence theorem uses three elements (sides and angles) to prove congruence. Select three triangle elements from the top, right menu to start. (Note: The tool does not allow you to select more than three elements. If you select the wrong element, simply unselect it before choosing another element.) This creates those elements in the work area.

    On the top of the toolbar, the three elements are listed in order. For example, if you choose side AB, angle A, and angle B, you will be working on Angle – Side – Angle. If instead you choose side AB, angle A, and angle C, you will be working on Angle – Angle – Side. The two theorems are different, even though both involve two angles and one side.

18. Construct your triangle:
    - Move the elements of the triangle so that points labeled with the same letter touch.
    - Click and drag a dot to move the element to a new location.
    - Click and drag a side's endpoint or angle's arrow to rotate the element. The center of rotation is the side's midpoint or the angle's vertex, respectively.
    - To help place elements, points marked with the same letter snap together. When angles snap, the rays are extended to the edge of the work area.
    - When you create a closed triangle, the points merge and center is filled in.
    - Once a triangle is formed with the original three elements, the triangle moves to the bottom, right corner of the work area, and congruent elements appear.

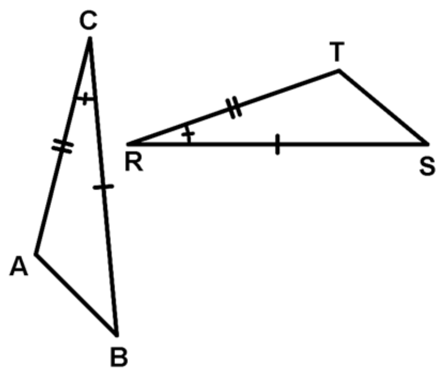
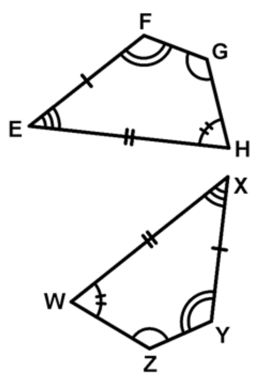
Name: **Transformations and Congruence | 6.6H**

Ready, Set, Go!

Ready

Topic: Corresponding parts of figures and transformations

Given the figures in each sketch with congruent angles and sides marked, first list the parts of the figures that correspond (For example, in #3, $\angle C \cong \angle R$). Then determine if a reflection occurred as part of the sequence of transformations that was used to create the image.

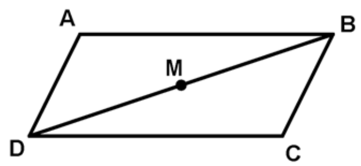
1. 	<u>Congruencies</u> $\angle C \cong \angle R$ $\overline{AC} \cong \overline{SR}$ $\overline{BC} \cong \overline{TR}$ Reflected? Yes or No
2. 	<u>Congruencies</u> $\overline{EF} \cong \overline{XY}$ $\overline{EH} \cong \overline{XW}$ $\angle E \cong \angle X$ $\angle F \cong \angle Y$ $\angle G \cong \angle Z$ $\angle H \cong \angle W$ Reflected? Yes or No

Set

Topic: Use congruent triangle criteria and transformations to justify conjectures.

In each problem below there are some true statements listed. From these statements a conjecture (a guess) about what might be true has been made. Using the given statements and conjecture statement create an argument that justifies the conjecture.

3. True statements:
Point M is the midpoint of $\overline{DB}$
$\angle ABD \cong \angle BDC$
$\overline{AB} \cong \overline{DC}$

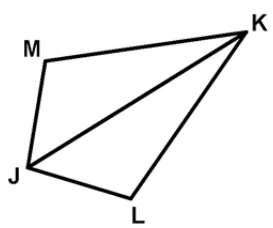


Conjecture: $\angle A \cong \angle C$

a. Is the conjecture correct? **Yes**

b. Argument to prove you are right:
The two triangles are congruent by SAS. Therefore, the corresponding parts are congruent.

4. True statements:
$\angle KJL \cong \angle KJM$
$\overline{JL} \cong \overline{JM}$

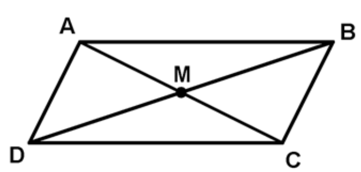


Conjecture: $\overline{JK}$ bisects $\angle MKL$

a. Is the conjecture correct? **Yes**

b. Argument to prove you are right:
The two triangles are congruent by SAS. Therefore, corresponding parts are congruent since $\angle MKJ \cong \angle LKJ$ and $\overline{JK}$ bisects $\angle MKL$

5. True statements:
ΔADM is a 180° rotation of ΔCMB



Conjecture: $\Delta ABM \cong \Delta CDM$

a. Is the conjecture correct? **Yes**

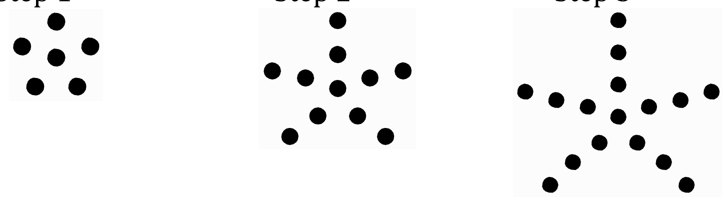
b. Argument to prove you are right:
A rotation maps ΔADM only CMB. Therefore, $\Delta ADM \cong \Delta CMB$, $\overline{AM} \cong \overline{CM}$, and $\overline{DM} \cong \overline{MB}$. $\angle AMB \cong \angle DMC$ because $\angle AMD \cong \angle BMC$ and they are 2 linear pairs $\angle AMB$ & $\angle AMD$ and $\angle DMC$ & $\angle MBC$. Therefore, the triangles are congruent by SAS.

Go

Topic: Create both explicit and recursive rules for the visual patterns.

6. Find an explicit function rule and a recursive rule for dots in step n.

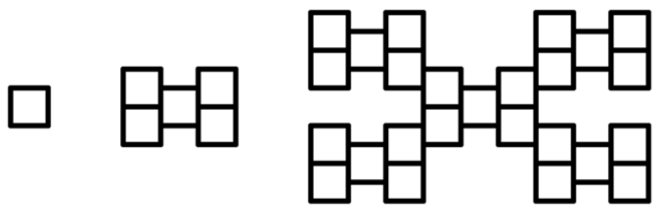
Step 1 Step 2 Step 3



Explicit: $f(n) = 5(n-1)+6$
Recursive: $f(1) = 6,\ f(n) = f(n-1)+5$

7. Find an explicit function rule and a recursive rule for squares in step n.

Step 1 **Step 2** **Step 3**



Explicit: $f(n) = 5^{n-1}$
Recursive: $f(1) = 1,\ f(n) = f(n-1)+5$

Find an explicit function rule and a recursive rule for the values in each table.

8.

Step	Value
1	1
2	11
3	21
4	31

Explicit: $f(n) = 10n - 9$
Recursive: $f(1) = 1,$
$f(n) = f(n-1)+10$

9.

n	$f(n)$
2	16
3	8
4	4
5	2

Explicit: $f(n) = 16\left(\frac{1}{2}\right)^{n-2}$

Recursive: $f(2) = 16$
$f(n) = f(n-1)\cdot\frac{1}{2}$

10.

n	$f(n)$
1	-5
2	25
3	-125
4	625

Explicit: $f(n) = (-5)^{n-1}$
Recursive: $f(1) = -5$
$f(n) = f(n-1)\cdot(-5)$

Topic: Review of solving equations.

Solve each equation for t.

11. $xy - t = 13t + w$

$t = \frac{xy-w}{14}$

12. $10 - t = 4t + 12 - 3t$

$t = -1$

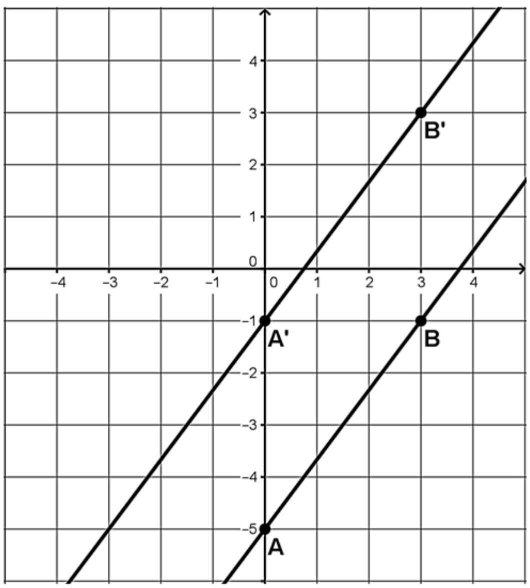
Ready, Set, Go!

Ready

Topic: Transformations of lines

For each set of lines use the points on the line to determine which line is the image and which is the pre-image, label them, write image by the image line and pre image by the original line. Then define the transformation that was used to create the image. Finally find the equation for each line.

1.



a. Description of Transformation:

translated 4 units up

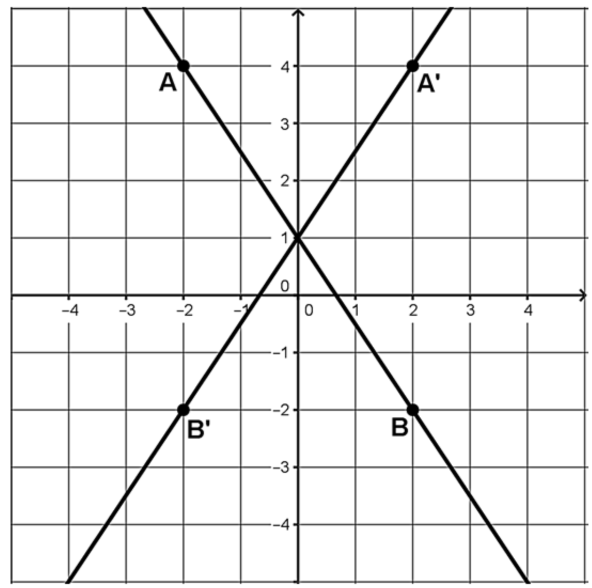
b. Equation for pre-image:

$y = \frac{4}{3}x - 5$

c. Equation for image:

$y = \frac{4}{3}x - 1$

2.



a. Description of Transformation:

Reflect about $x = 0$

b. Equation for pre-image:

$y = -\frac{3}{2}x + 1$

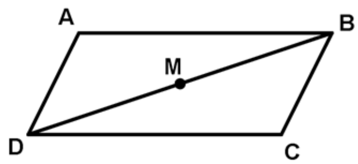
c. Equation for image:

$y = \frac{3}{2}x + 1$

Set

Topic: Triangle congruence properties

3. True statements:
$\angle ABD \cong \angle BDC$
$\angle A \cong \angle C$
$\overline{AB} \cong \overline{DC}$

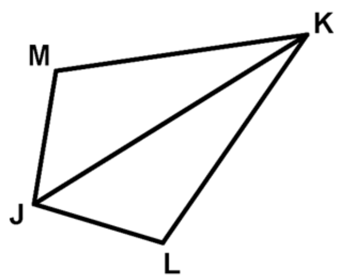


Conjecture: $\overline{AD} \cong \overline{CB}$

a. Is the conjecture correct? **Yes**

b. Argument to prove you are right:
The triangles are congruent ASA. Therefore, $\overline{AD} \cong \overline{CB}$ because they are corresponding parts of congruent triangles.

4. True statements:
$\angle LKJ \cong \angle MKJ$
$\overline{MK} \cong \overline{LK}$

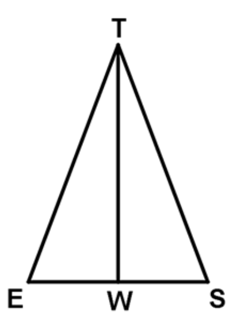


Conjecture: $\overline{JK}$ bisects $\angle MJL$

a. Is the conjecture correct? **Yes**

b. Argument to prove you are right:
The triangles are congruent by SAS. Therefore, $\angle MJK \cong \angle KJL$ because they are corresponding parts of congruent triangles.

5. True statements:
W is the midpoint of $\overline{ES}$
$\overline{ET} \cong \overline{TS}$



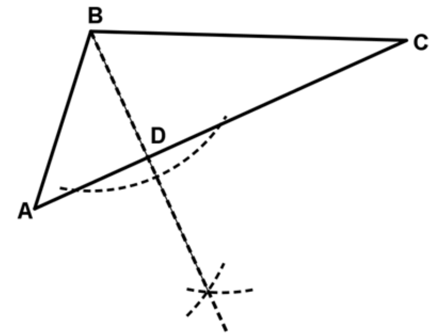
Conjecture: $\overline{TW}$ is perpendicular to $\overline{ES}$

a. Is the conjecture correct? **Yes**

b. Argument to prove you are right:
The triangles are congruent by SSS. Therefore, $\angle EWT \cong \angle SWT$ because they are corresponding parts of congruent triangles. They are 180° together and 90° each.

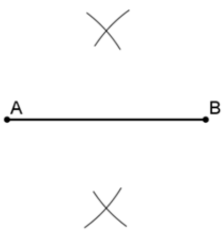
Topic: Geometric constructions

6. According to the construction shown in the diagram to the right, what do we call segment $\overline{BD}$?



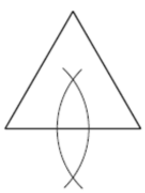
Altitude of ΔABC from B to $\overline{AC}$

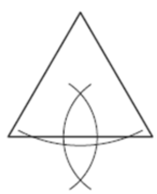
7. What do the construction marks in the figure below create?

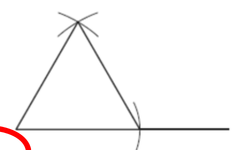


Perpendicular bisector of $\overline{AB}$

8. Which diagram shows the construction of an equilateral triangle?

a. 

b. 

c. 

d. 

Go

Topic: Solving systems of equations

Solve each system of equations. Utilize substitution or elimination.

9. $\begin{cases} x = 11 + y \\ 2x + y = 19 \end{cases}$

$\mathbf{(10, -1)}$

10. $\begin{cases} -4x + 9y = 9 \\ x - 3y = -6 \end{cases}$

$\mathbf{(9, 5)}$

11. $\begin{cases} x + 2y = 11 \\ x - 4y = 2 \end{cases}$

$\mathbf{\left(8, \frac{3}{2}\right)}$

12. $\begin{cases} y = -x + 1 \\ y = 2x + 1 \end{cases}$

$\mathbf{(0, 1)}$

13. $\begin{cases} y = -2x + 7 \\ -3x + y = -8 \end{cases}$

$\mathbf{(3, 1)}$

14. $\begin{cases} 4x - y = 7 \\ -6x + 2y = 8 \end{cases}$

$\mathbf{(11, 37)}$

Name: **Constructions | 6.8H**

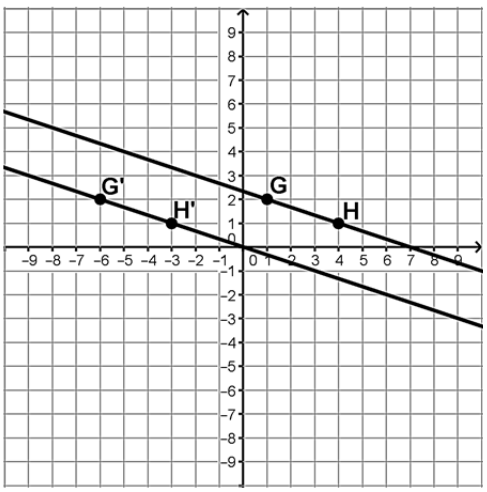
Ready, Set, Go!

Ready

Topic: Transformations of lines, algebraic and geometric thoughts.

For each set of lines use the points on the line to determine which line is the image and which is the pre-image, label them, write image by the image line and pre image by the original line. Then define the transformation that was used to create the image. Finally find the equation for each line.

1.



a. Description of Transformation:

Translate left 7

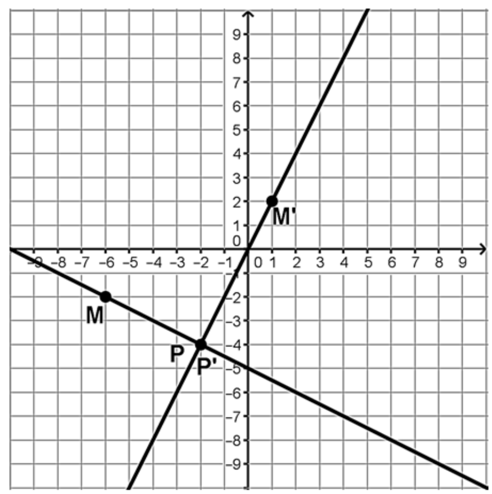
b. Equation for pre-image:

$y = -\frac{1}{3}x + 2\frac{1}{3}$

c. Equation for image:

$y = -\frac{1}{3}x$

2.



a. Description of Transformation:

Rotate $-90°$ about P

b. Equation for pre-image:

$y = -\frac{1}{2}x - 5$

c. Equation for image:

$y = 2x$

Set

Topic: Transformations and triangle congruence.

Determine whether or not the statement is true or false. If true, explain why. If false, explain why not or provide a counterexample.

3. If one triangle can be transformed so that one of its angles and one of its sides coincide with another triangle's angle and side then the two triangles are congruent.

   False. There is a possibility of having a SSA situation.

4. If one triangle can be transformed so that two of its sides and any one of its angles will coincide with two sides and an angle from another triangle then the two triangles will be congruent.

   False. There is a possibility of having a SSA situation.

5. If three angles of one triangle are congruent to three angles of another triangle, then there is a sequence of transformations that will transform one triangle onto the other.

   False. The triangles may be similar or congruent.

6. If three sides of one triangle are congruent to three sides of another triangle, then there is a sequence of transformations that will transform one triangle onto the other.

   True. SSS is one of the triangle congruencies.

7. For any two congruent polygons there is a sequence of transformations that will transform one of the polygons onto the other.

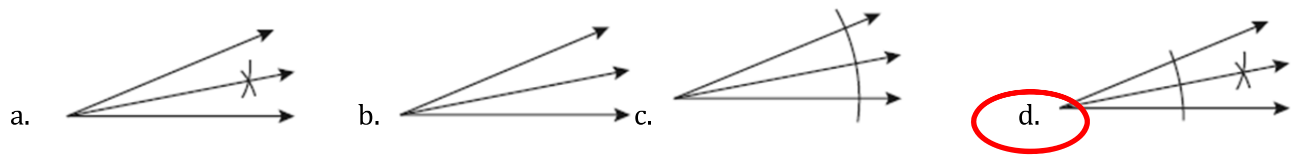
   True. If the polygons are congruent, they can be rotated, reflected, and/or translated to transform one onto the other.

Topic: Geometric constructions

8. When finished with the construction for "Copy an Angle", segments are drawn connecting where the arcs cross the sides of the angles. What method proves these two triangles to be congruent?

   a. ASA b. SAS c. SSS d. AAS

9. Which illustration shows the correct construction of an angle bisector?



Go

Topic: Triangle congruence and properties of polygons.

10. What is the minimum amount of information needed to determine that two triangles are congruent? List all possible combinations of needed criteria.

    3 pieces of information (angles and/or sides) are needed to determine that two triangles are congruent.
    Possible combinations of needed criteria: SSS, ASA, SAS, AAS

11. What is a line of symmetry and what is a diagonal? Are they the same thing? Could they be the same in a polygon? If so give an example, if not explain why not.

    A line of symmetry cuts the diagonal into two congruent shapes that are mirror images of each other.
    A diagonal connects two non-adjacent vertices

12. How is the number of lines of symmetry for a *regular* polygon connected to the number of sides of the polygon? How is the number of diagonals for a polygon connected to the number of sides?

    The number of lines of symmetry for a regular polygon is the same as the number of sides of the polygon.

    The number of diagonals is equation to $\frac{n(n-3)}{2}$ where n is the number of sides.

13. What do right triangles have to do with finding distance between points on a coordinate grid?

    The Pythagorean Theorem can be used to find the distance between points on the coordinate grid.

Topic: Finding distance and slope.

For each pair of given coordinate points find distance between them and find the slope of the line that passes through them. Show all your work.

14. $(-10, 31)\ (20, 11)$

a. Slope: $-\frac{2}{3}$

b. Distance: $10\sqrt{13}$

15. $(16, -45)\ (-34, 75)$

a. Slope: $-\frac{12}{5}$

b. Distance: 130

16. $(8, 21)\ (20, -11)$

a. Slope: $-\frac{8}{3}$

b. Distance: $4\sqrt{73}$

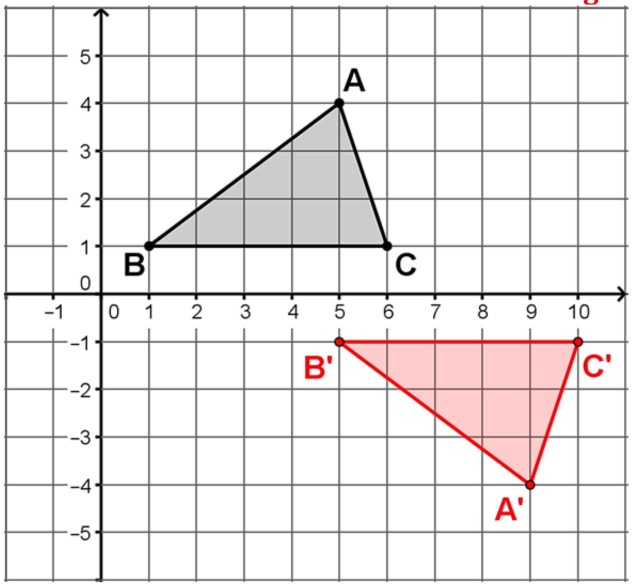
17. $(-10, 0)\ (14, -18)$

a. Slope: $-\frac{3}{4}$

b. Distance: 30

Module 6 Review Homework

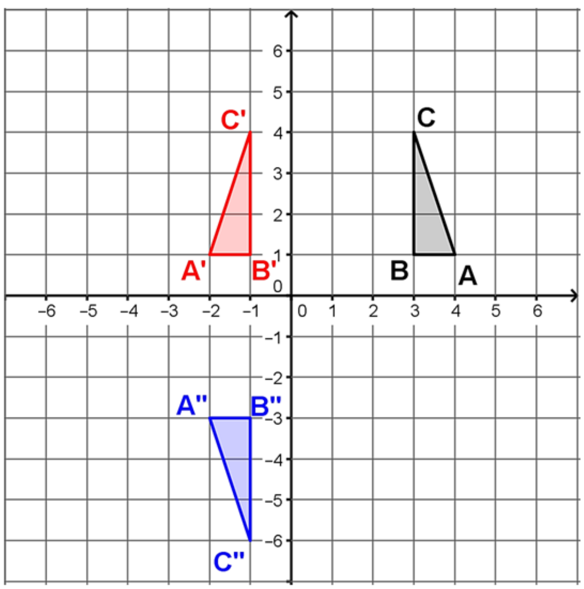
1. Describe the sequence of rigid motions that shows $\Delta ABC \cong \Delta A'B'C'$.
   Reflect over the *x*-axis and then translate right 4 units.



2. Use the coordinate grid, below, to complete parts (a)–(c).
   a. Reflect ΔABC across the vertical line, parallel to the y-axis, going through point $(1, 0)$. Label the transformed points ABC as A', B', C', respectively.
   See image in RED below.

   b. Reflect $\Delta A'B'C'$ across the horizontal line, parallel to the x-axis going through point $(0, -1)$. Label the transformed points of $A'B'C'$ as $A''B''C''$, respectively.
   See image in BLUE below.

   c. Describe a single rigid motion that would map ΔABC to $\Delta A''B''C''$.
   Rotation 180° about the origin.

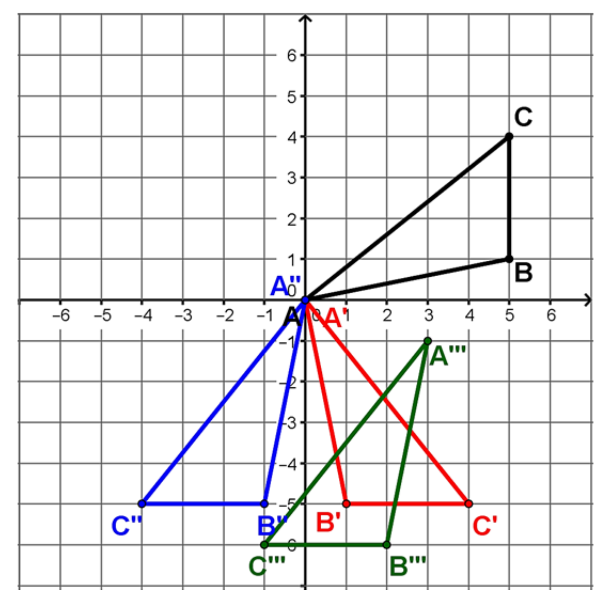


3. Pre-image: $A(0,0), B(5,1), C(5,4)$

a. Rotate the figure $-90°$ about the origin. Label the image as $A'B'C'$.
See image in RED.

b. Reflect $A'B'C'$ over the y-axis. Label the image as $A''B''C''$.
See image in BLUE.

c. Translate $A''B''C''$ right 3 units and down 1 unit. Label the image as $A'''B'''C'''$.
See image in GREEN.

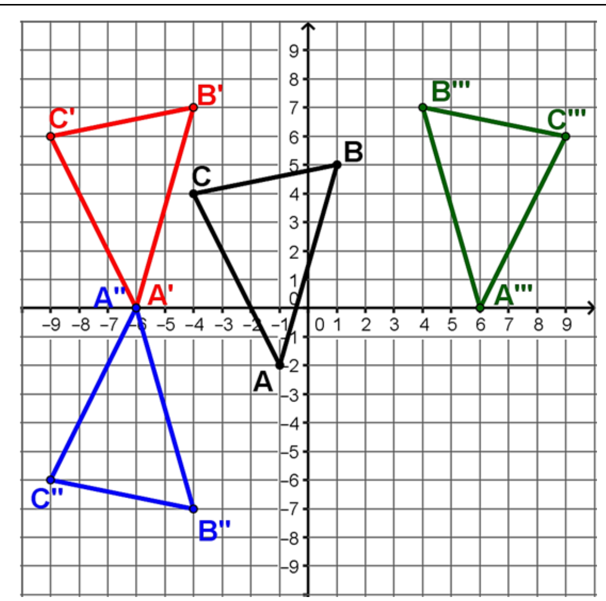


4. Pre-image: $A(-1,-2), B(1,5), C(-4,4)$

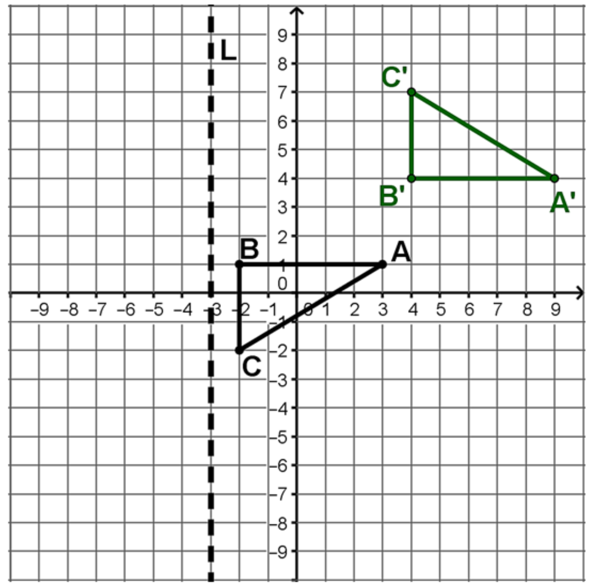
a. Translate the figure up 2 units and left 5 units. Label the image as $A'B'C'$.
See image in RED.

b. Reflect $A'B'C'$ over the x-axis. Label the image as $A''B''C''$.
See image in BLUE.

c. Rotate $A''B''C''$ 180° about the origin. Label the image as $A'''B'''C'''$.
See image in GREEN.



5. Pre-image: $A(3,1), B(-2,1), C(-2,-2)$

Perform the following sequence of transformations: Reflect the image over the given line (line L), then rotate 180° around the origin, then translate up 5 units.	

Topic: Rotation symmetry for regular polygons and transformations

6. What angles of rotational symmetry are there for a regular pentagon?

   72°, 144°, 216°, 288°, 360°

7. What angles of rotational symmetry are there for a regular hexagon?

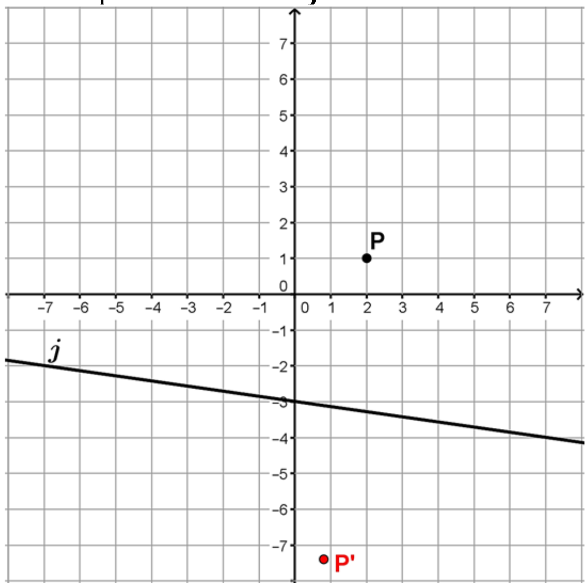
   60°, 120°, 180°, 240°, 300°, 360°

8. If a regular polygon has an angle of rotational symmetry that is 40°, how many sides does the polygon have?

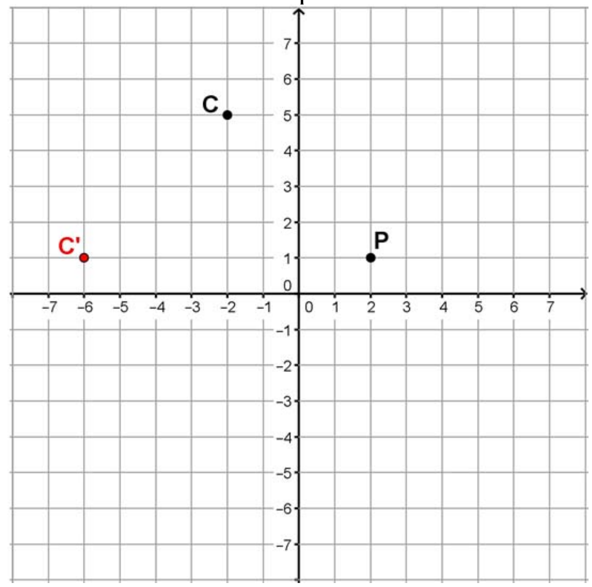
   9 sides

On each given coordinate grid below perform the indicated transformation.

9. Reflect point ***P*** over line ***j***.



10. Rotate ***P*** $-90°$ around point ***C***.



Topic: Connecting tables with transformations.

For each function find the outputs that fill in the table. Then describe the relationship between the outputs in each table.

11. $f(x) = 2x$

x	$f(x)$
1	**2**
2	**4**
3	**6**
4	**8**

$g(x) = 2(x - 3)$

x	$g(x)$
1	**-4**
2	**-2**
3	**0**
4	**2**

12. $t(x) = 4^x$

x	$t(x)$
1	**4**
2	**16**
3	**64**
4	**256**

$h(x) = 4^{(x-3)}$

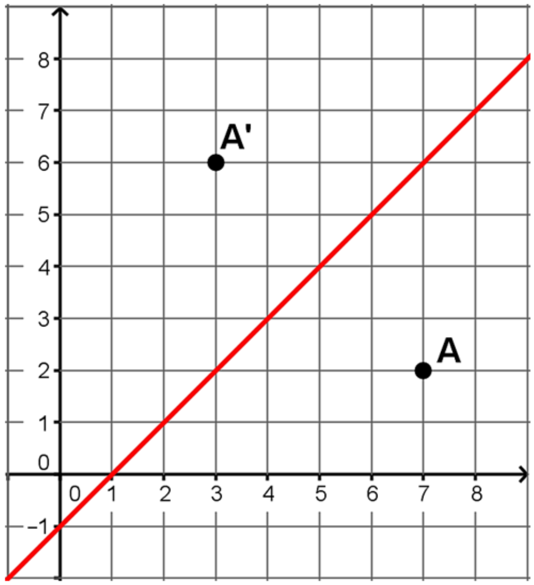
x	$h(x)$
1	$\frac{1}{16}$
2	$\frac{1}{4}$
3	**1**
4	**4**

Relationship between $f(x)$ and $g(x)$:
$g(x)$ is always 6 less than $f(x)$

Relationship between $t(x)$ and $h(x)$:
$h(x)$ is always 3 steps behind $t(x)$

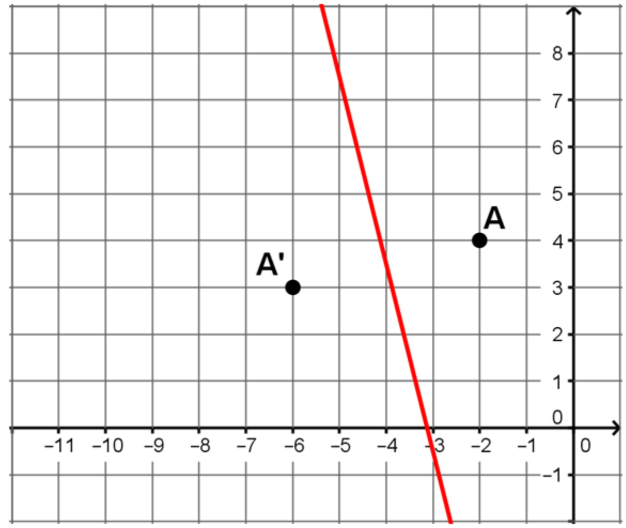
In each figure find and mark at least four possible centers of rotation that would work for rotating the pre-image point to the image point.

13.



Centers of rotation: **Answers may vary.**
Any point on the lines $y = x - 1$.

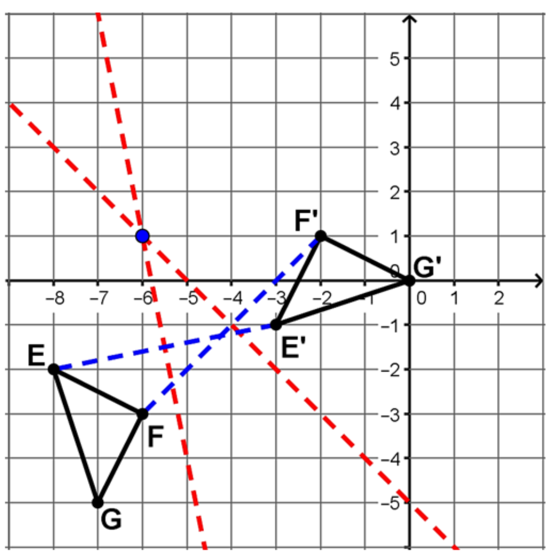
14.



Centers of rotation: **Answers may vary.**
Any point on the line $y = -4x - \frac{25}{2}$.

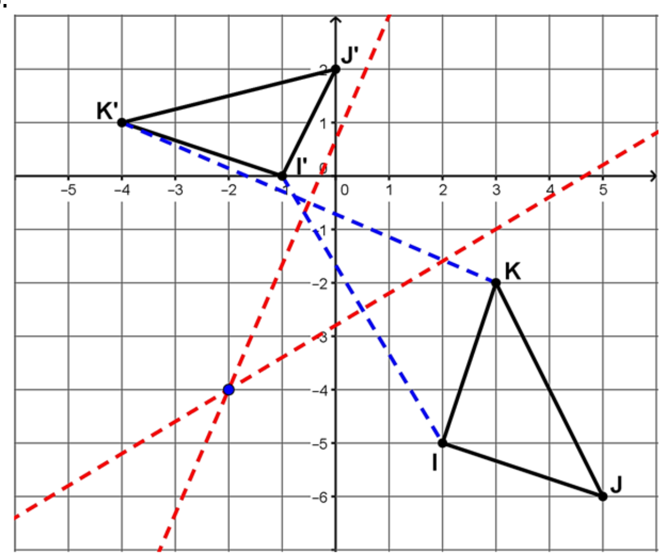
Find the point of rotation that maps each pre-image to the image.

15.



$(-6, 1)$

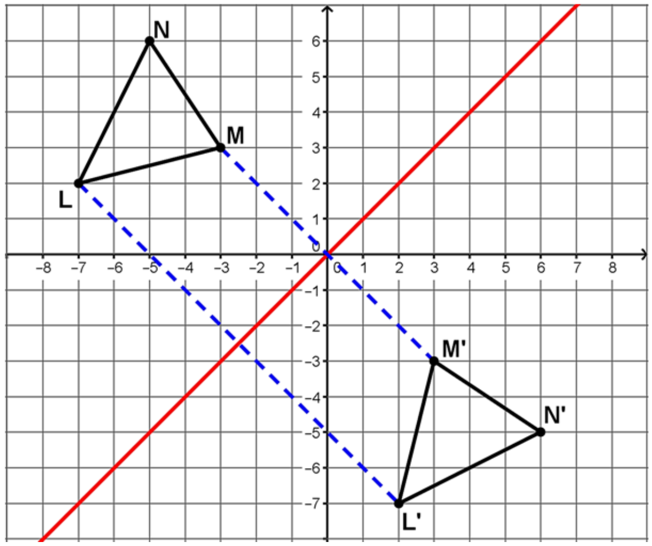
16.



$(-2, -4)$

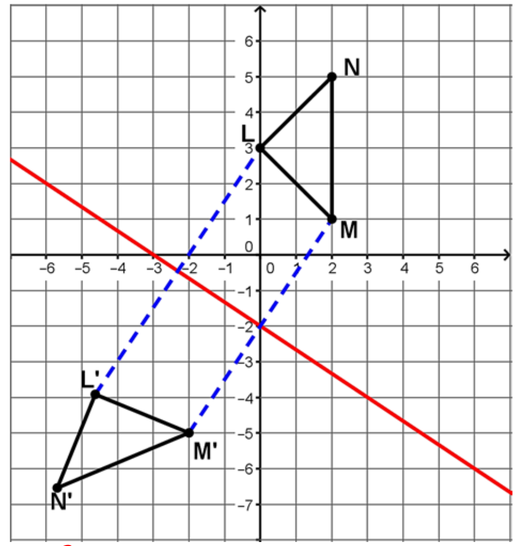
Find the line of reflection that maps each pre-image to the image.

17.



$y = x$

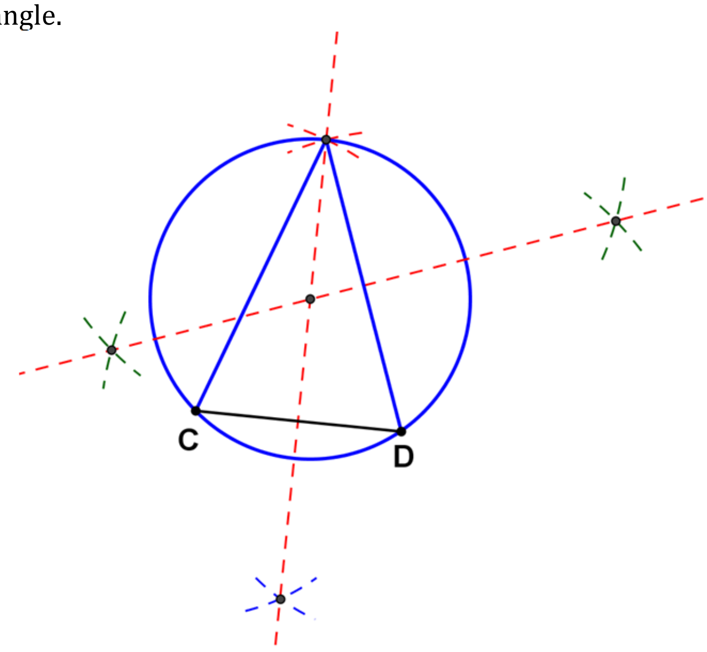
18.



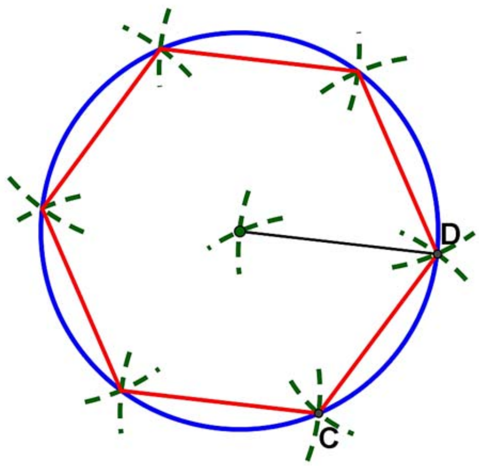
$y = -\frac{2}{3}x - 2$

Topic: Constructing regular polygons inscribed in a circle

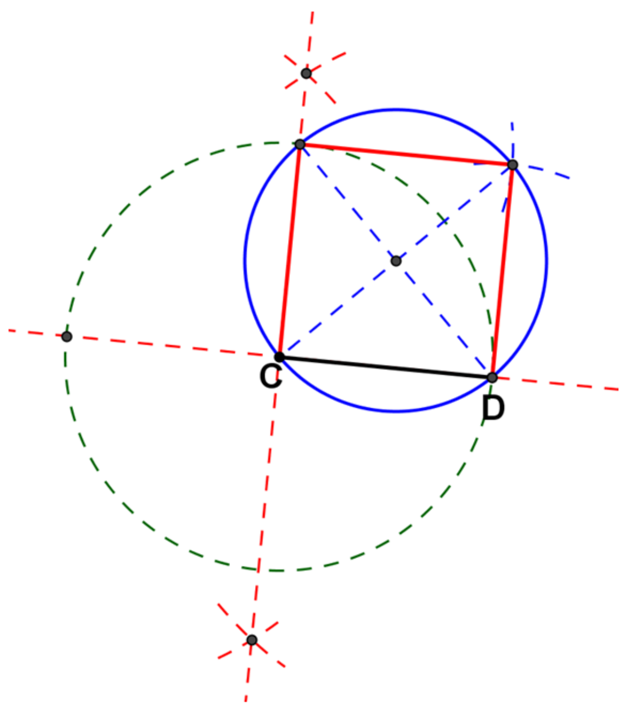
19. Construct an isosceles triangle that incorporates $\overline{CD}$ as one of the sides. Construct the circle that circumscribes the triangle.



20. Construct a hexagon that incorporates $\overline{CD}$ as one of the sides. Construct the circle that circumscribes the hexagon.

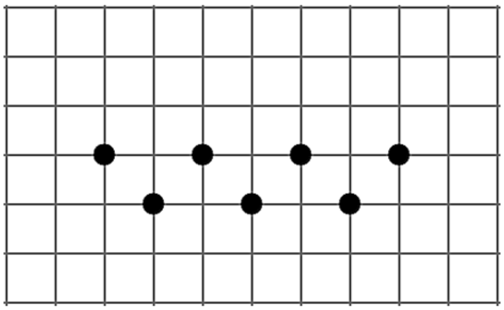


21. Construct a square that incorporates $\overline{CD}$ as one of the sides. Construct the circle that circumscribes that square.

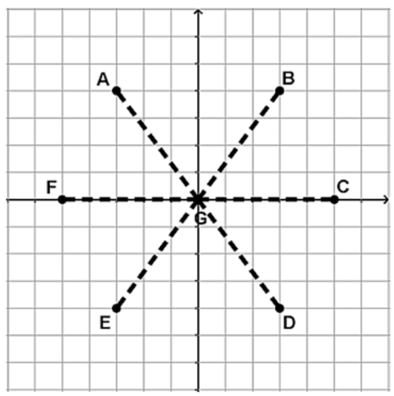


Intro to Module 7 Honors - Go the Distance
A Develop Understanding Task

The performances of the Podunk High School drill team are very popular during half-time at the school's football and basketball games. When the Podunk High School drill team choreographs the dance moves that they will do on the football field, they lay out their positions on a grid like the one below:



In one of their dances, they plan to make patterns holding long, wide ribbons that will span from one dancer in the middle to six other dancers. On the grid, their pattern looks like this:



The question the dancers have is how long to make the ribbons. Some dancers think that the ribbon from Gene (G) to Casey (C) will be shorter than the one from Gene (G) to Bailey (B).

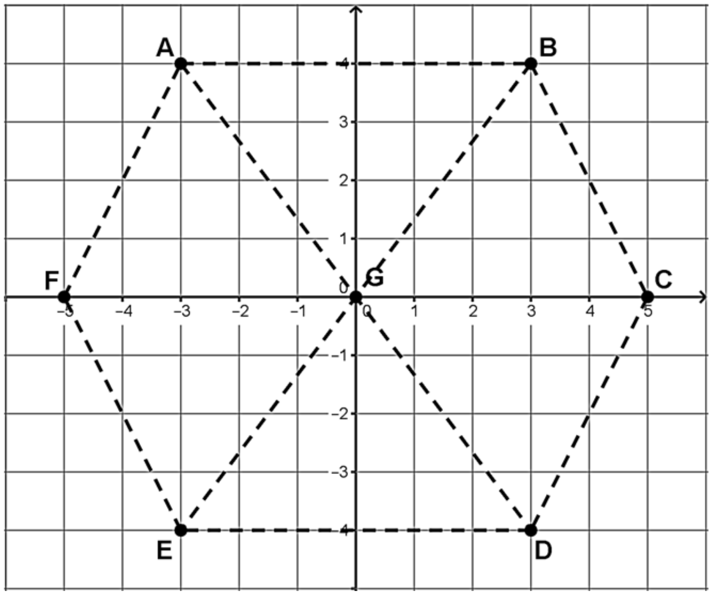
1. How long does each ribbon need to be?

   Each Ribbon needs to be 5 units long

2. Explain how you found the length of each ribbon.

   Use Pythagorean Theorem for each ribbon, except for *GF* and *GC.*

When they have finished with the ribbons in this position, they are considering using them to form a new pattern like this:

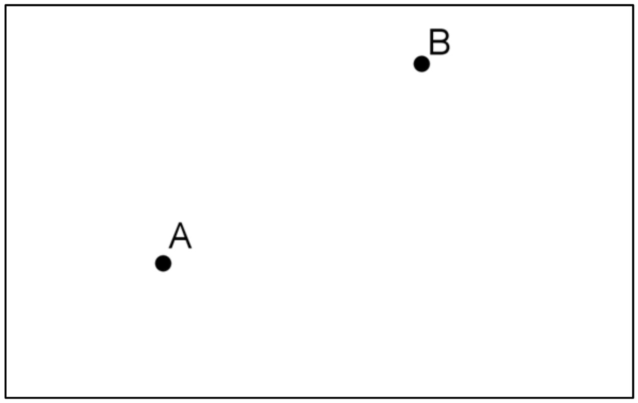


3. Will the ribbons they used in the previous pattern be long enough to go between Bailey (B) and Casey (C) in the new pattern? Explain your answer.

Yes, because they will only need $\sqrt{20}$ *or* $2\sqrt{5}$ units, which is less than 5.

Gene notices that the calculations she is making for the length of the ribbons reminds her of math class. She says to the group, "Hey, I wonder if there is a process that we could use like what we have been doing to find the distance between any two points on the grid." She decides to think about it like this:

"I'm going to start with two points and draw the line between them that represents the distance that I'm looking for. Since these two points could be anywhere, I named them A (x_1, y_1) and B (x_2, y_2). Hmmmm. . . . when I figured the length of the ribbons, what did I do next?"



4. Think back on the process you used to find the length of the ribbon and write down your steps here, using points A and B.

$$\mathbf{C^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$\mathbf{C = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}}$$

5. Use the process you came up with in question 4 to find the distance between two points located at $(-1, 5)$ and $(2, -6)$

$$\mathbf{\sqrt{130}}$$

6. Use your process to find the perimeter of the hexagon pattern shown above question 3.

$$\boldsymbol{P = 12 + 8\sqrt{5}}$$

Intro to Module 7 Honors - Ready, Set, Go!

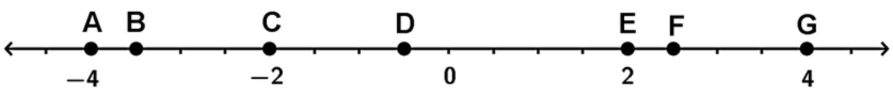
http://www.flickr.com/photos/briemckinneyxo/

Ready

Topic: Finding the distance between two points

Use the number line to find the distance between the given points. (Note: The notation AB means the distance between points A and B.)

1. AE
   6
2. GB
   7.5
3. BF
   6

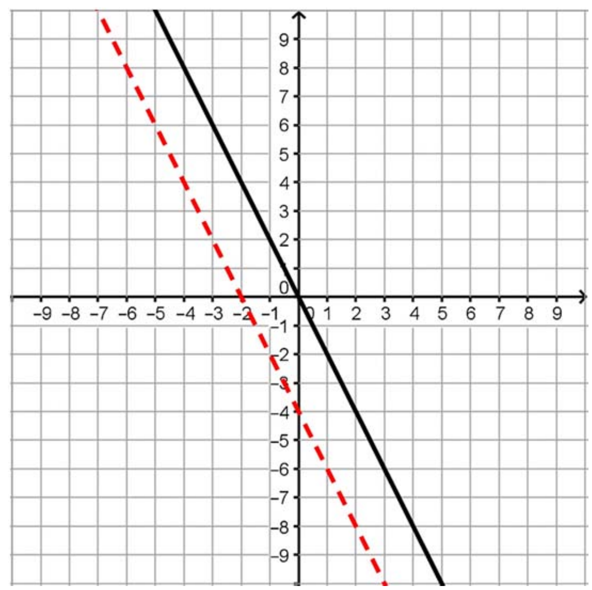


4. Describe a way to find the distance between two points on a number line without counting the spaces.

   Find the absolute value of the difference between the points

Topic: Graphing lines.

The graph at the right is of the line $f(x) = -2x$.



5. On the same grid, graph a parallel line that is 4 units below it.
   Dashed line at right
6. Write the equation of the new line.
   $\boldsymbol{y = -2x - 4}$
7. Write the y-intercept of the new line as an ordered pair.
   $\boldsymbol{(0, -4)}$
8. Write the x-intercept as an ordered pair.
   $\boldsymbol{(-2, 0)}$
9. a. Write the equation of the new line in point-slope form using the y-intercept

   $\boldsymbol{(y - (-4)) = -2(x - 0)}$

   b. Write the equation of the new line in point-slope form using the x-intercept.

   $\boldsymbol{(y - 0) = -2(x - (-2))}$

   c. Explain in what way the equations in 5a and 5b are the same and in what way they are different.

   Simplified equations are equivalent. Difference is in the starting point.

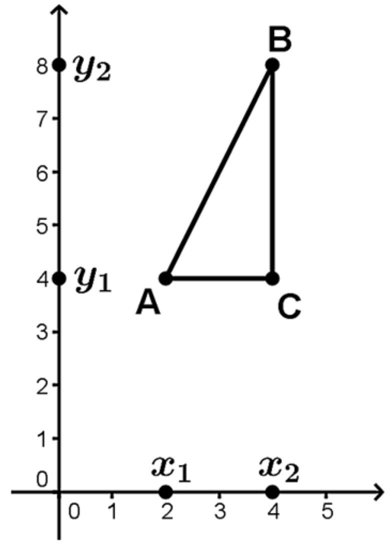
Set

Topic: Slope triangles and the distance formula.

ΔABC is a slope triangle for $\overline{AB}$ where BC is the rise and AC is the run. Notice that the length of $\overline{BC}$ has a corresponding length on the y-axis and the length of $\overline{AC}$ has a corresponding length on the x-axis. The slope formula is written as $m = \frac{y_2 - y_1}{x_2 - x_1}$ where m is the slope.

10. a. What does the value $(y_2 - y_1)$ tell you?

the vertical distance

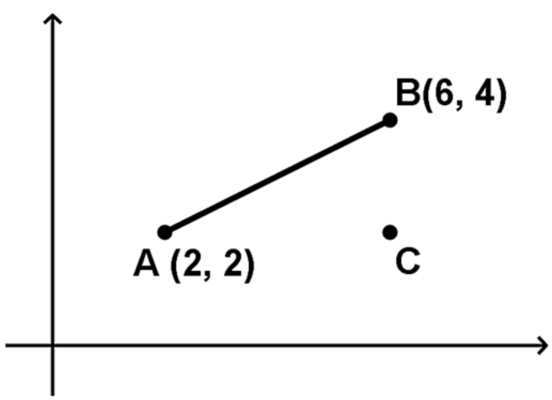


b. What does the value $(x_2 - x_1)$ tell you?

the horizontal distance

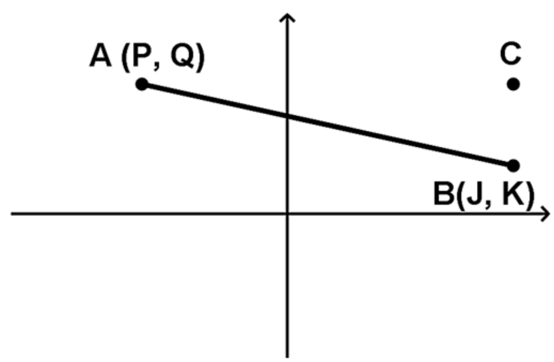
In the previous module you found the length of a slanted line segment by drawing the slope triangle and performing the Pythagorean Theorem. In this exercise try to develop a more efficient method of finding the length of a line segment by using the meaning of $(y_2 - y_1)$ and $(x_2 - x_1)$ combined with the Pythagorean Theorem.

11. Find AB



$\sqrt{20} \approx 4.47$

12. Find AB



$\sqrt{(P-J)^2 + (Q-K)^2}$

Go

Topic: Rectangular coordinates

Use the given information to fill in the missing coordinates. Then find the length of the indicated line segment.

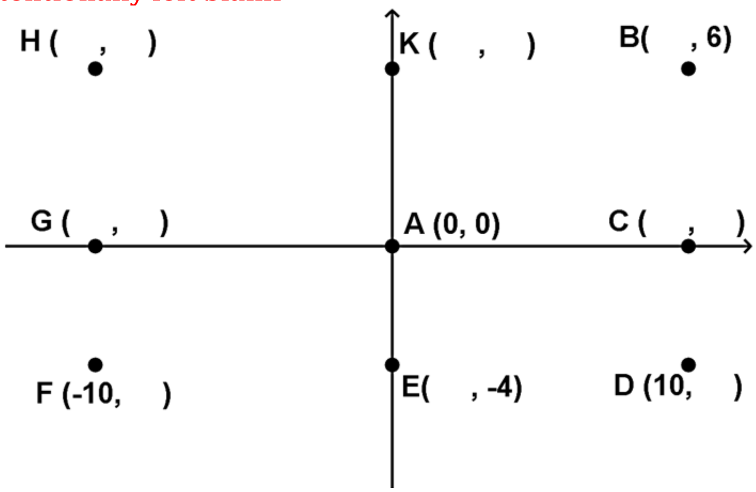
Coordinates on graphs are intentionally left blank

13. a. Find HB

20

b. Find BD

10



Topic: Writing equations of lines.

Write the equation of the line in point-slope form using the given information.

14. Slope = $-\frac{1}{4}$ point (12, 5)

$\mathbf{y - 5 = -\frac{1}{4}(x - 12)}$

15. $A(11, -3)$, $B(6, 2)$

$\mathbf{y + 3 = -1(x - 11)}$

16. x-intercept: -2, y-intercept: -3

$\mathbf{y + 3 = -\frac{3}{2}x}$

17. All x values are -7, y can be anything

$\mathbf{x = -7}$

18. Slope: $-\frac{1}{2}$, x-intercept: 5

$\mathbf{y = -\frac{1}{2}(x - 5)}$

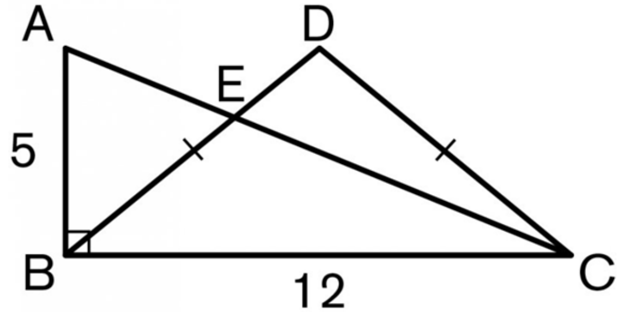
19. $E(-10, 17)$, $G(13, 17)$

$\mathbf{y = 17}$

End of Module 6 Honors Challenge Problems

The following problems are intended for students to work on after Module 6H Test. The problems focus on using similar triangles to find area. The next module builds on the idea of connecting Algebra and Geometry. The following page is blank for the teacher to copy and give to each student after the test. Below are the solutions.

Both right triangle ABC and isosceles triangle BCD, shown here, have height 5 cm from base $BC = 12$ cm. Use the figure and information provided to answer the following questions.



1. What is the absolute difference between the areas of ΔABC and ΔBCD?
   The areas of ΔABC and ΔBCD can be denoted by [ΔABC] and [ΔBCD], respectively. This notation will be used to denote the areas of the triangles throughout this solution set. Since ΔABC and ΔBCD both have base $BC = 12$ cm and height 5 cm, it follows that $[\Delta ABC] = [\Delta BCD]$. Therefore, because the two triangles have the same area, the absolute difference in the areas is $[\Delta ABC] - [\Delta BCD] = 0$.

2. What is the ratio of the area of ΔABE to ΔCDE?
   From the figure, we see that $[\Delta ABE] + [\Delta BCE] = [\Delta ABC]$. Similarly, $[\Delta BCE] + [\Delta CDE] = [\Delta BCD]$. Again, since $[\Delta ABC] = [\Delta BCD]$, we can write the following equation: $[\Delta ABE] + [\Delta BCE] = [\Delta BCE] + [\Delta CDE]$. When simplified, we have $[\Delta ABE] = [\Delta CDE]$, so the ratio $\frac{[\Delta ABE]}{[\Delta CDE]} = 1$.

3. What is the area of ΔBCE?
   The figure shows altitude EY of ΔBCE and altitude DX of ΔBCD, both drawn perpendicular to base BC. Notice that $\Delta BEY \sim \Delta BDX$, which means the lengths of corresponding sides are proportionate. Also, notice that $\Delta EYC \sim \Delta ABC$. It follows, then, that $[\Delta BCE] = \left(\frac{1}{2}\right)(12)\left(\frac{10}{3}\right) = 20$ cm².

4. What is the area of pentagon ABCDE?
   Therefore, the area of pentagon ABCDE is $[\Delta ABC] + [\Delta BCD] - [\Delta BCE] = 30(2) - 20 = 60 - 20 = 40$ cm².