SECONDARY MATH I // MODULE 6

TRANSFORMATIONS AND SYMMETRY - 6.1

6.1
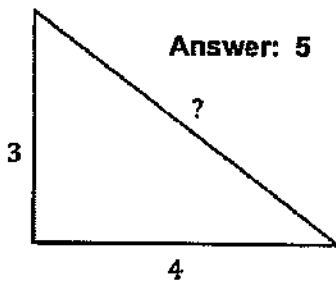
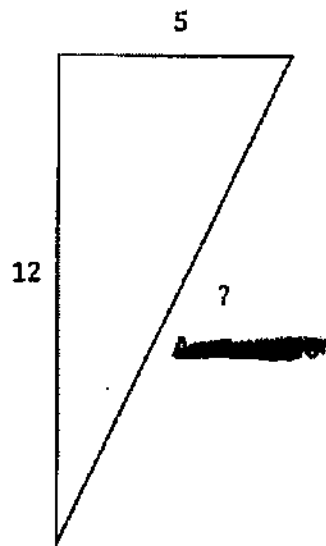**READY, SET, GO!** Name   Period   Date

READY

Topic: Pythagorean Theorem

For each of the following right triangles determine the measure of the missing side. Leave the measures in exact form if irrational.
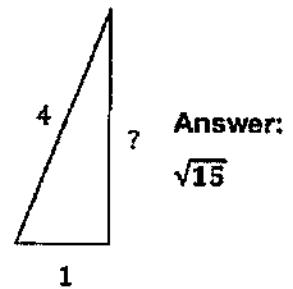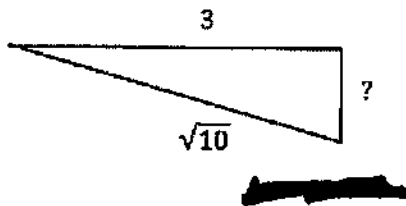
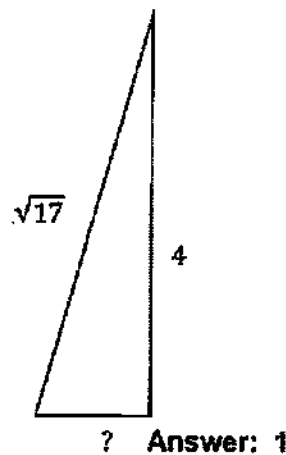**1.**

Answer: 5

3

?

4

2.

5

12

?

3.

4

?

Answer:

$\sqrt{15}$

1

4.

3

$\sqrt{10}$

?

5.

$\sqrt{17}$

4

?   **Answer: 1**
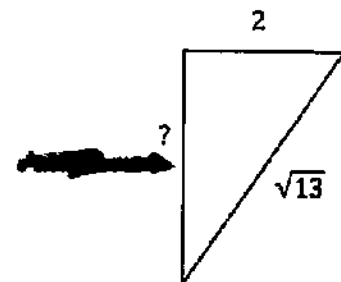
6.

2

?

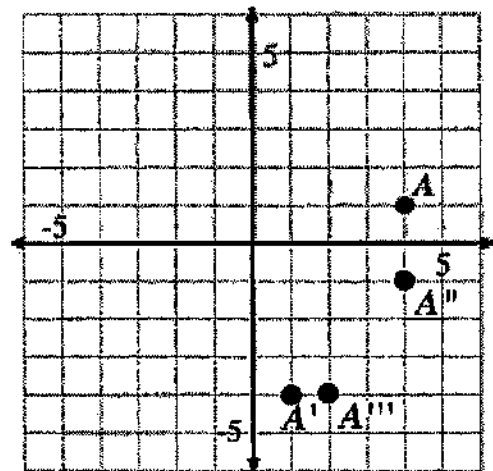$\sqrt{13}$

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SET

Topic: Transformations.

Transform points as indicated in each exercise below.

7a. Rotate point A around the origin 90° clockwise, label as A'
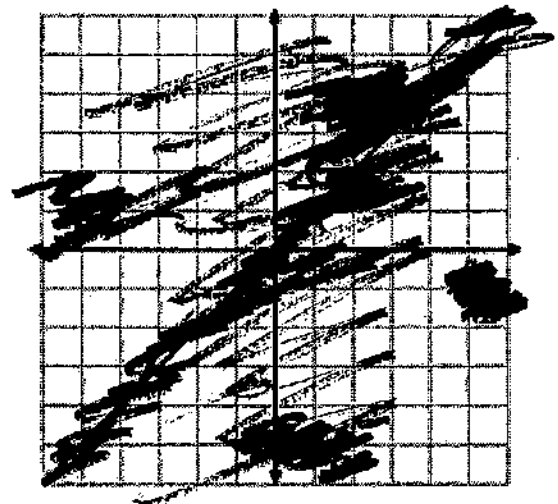
  b. Reflect point A over x-axis, label as A"

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

8a. 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""
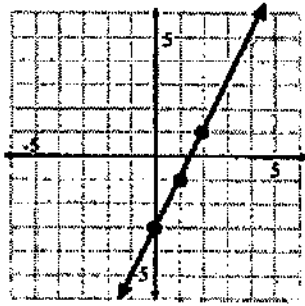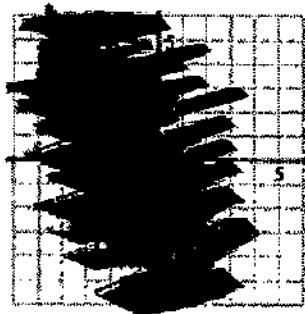
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GO

Topic: Graphing linear equations.

Graph each function on the coordinate grid provided. Extend the line as far as the grid will allow.
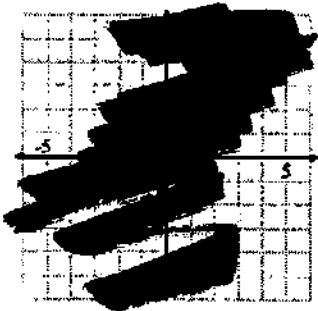
9. $f(x) = 2x - 3$

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

11. What similarities and differences are there between the functions $f(x)$ and $g(x)$?

Possible Answers:
- **Same y-intercept**
- **Same steepness**
- **Opposite slope**
- **Reflection across y-axis.**

12. $h(x) = \frac{2}{3}x + 1$

13. $k(x) = -\frac{3}{2}x + 1$
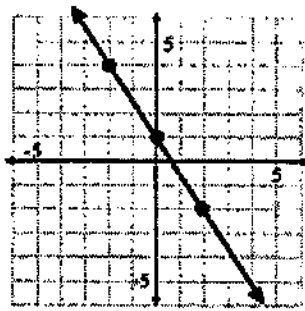
14. What similarities and differences are there between the equations $h(x)$ and $k(x)$?

15. $a(x) = x + 1$

16. $b(x) = x - 3$

17. What similarities and differences are there between the equations $a(x)$ and $b(x)$?

Possible Answers:
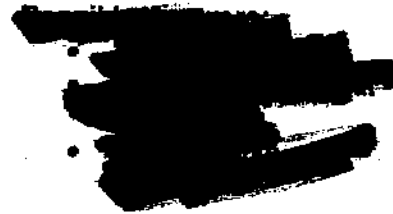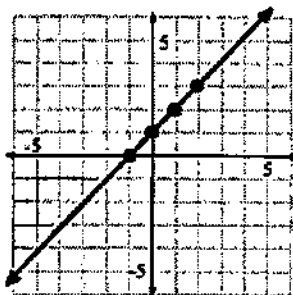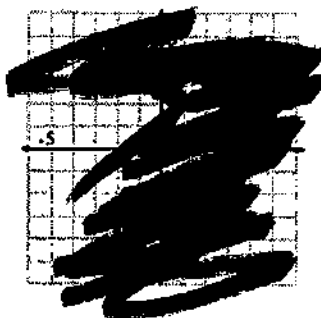- **Different y-intercept**
- **Same slope**
- **Parallel**

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SECONDARY MATH I // MODULE 6

TRANSFORMATIONS AND SYMMETRY - 6.2

6.2

READY, SET, GO! Name   Period   Date

READY

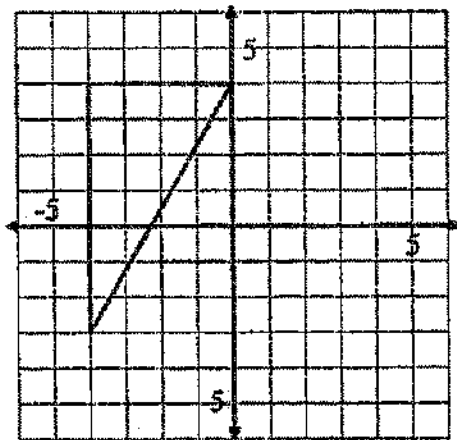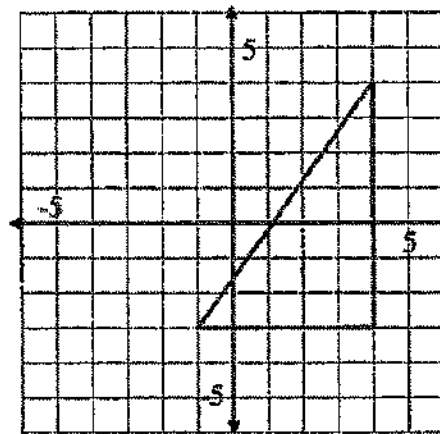Topic: Finding Distance using Pythagorean Theorem

Use the coordinate grid to find the length of each side of the triangles provided. Give answers in exact form and where necessary rounded to the nearest hundredth.
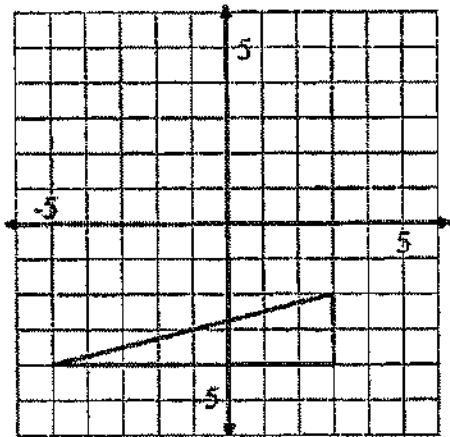
1.

Answer:
Side lengths
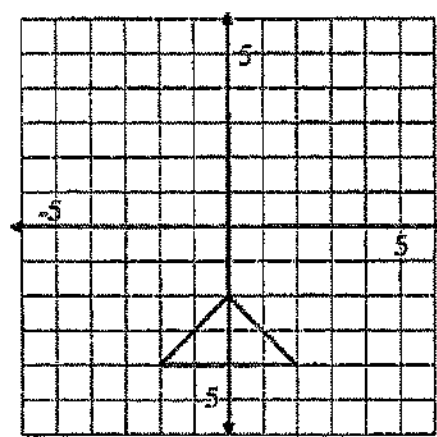4
7
$\sqrt{65} \approx 8.06$

2.

Answer:

3.

Answer:
Side lengths
2
8
$\sqrt{68} \approx 8.25$

4.

Answer:
Side lengths

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SECONDARY MATH I // MODULE 6

TRANSFORMATIONS AND SYMMETRY – 6.2

6.2

SET
Topic: Slopes of parallel and perpendicular lines.

Answers will vary. Possible answers below:

5. Graph a line *parallel* to the given line.
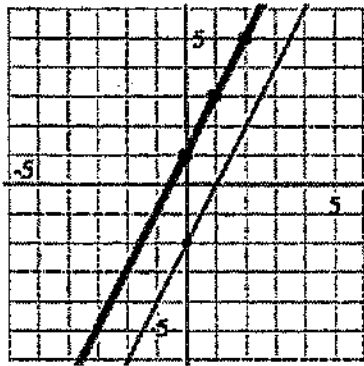
Equation for given line:
Answer: $y = 2x - 2$

Equation for new line:
Answers will vary depending on graph. Equation must have same slope. $y = 2x + 1$

6. Graph a line *parallel* to the given line.
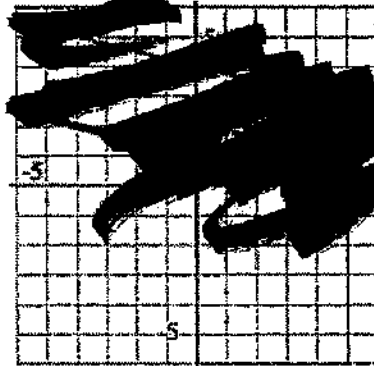
Equation for given line:

Equation for new line:
Answer for above example:

7. Graph a line *parallel* to the given line.
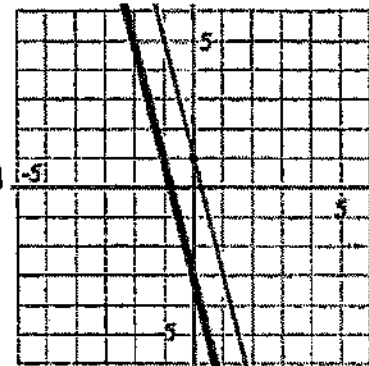
Equation for given line:
Answer: $y = -4x + 1$

Equation for new line:
Answer for above example:
$y = -4x - 3$

8. Graph a line *perpendicular* to the given line.
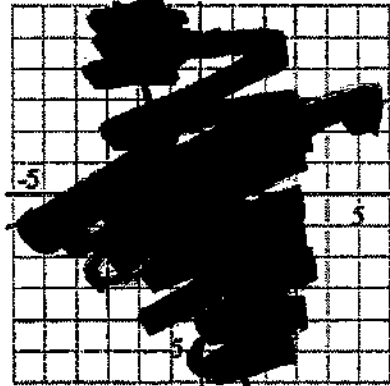
Equation for given line:

Answer:

Equation for new line:

9. Graph a line *perpendicular* to the given line.
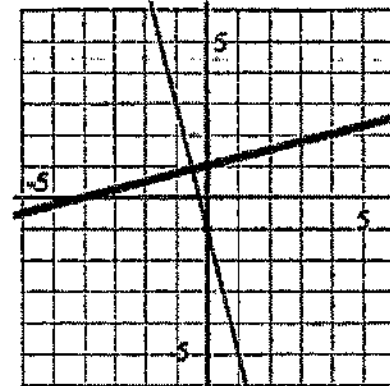
Equation for given line:

Answer: $y = -4x - 1$

Equation for new line:
Answer for above example:
$y = \frac{1}{4}x + 1$

10. Graph a line *perpendicular* to the given line.
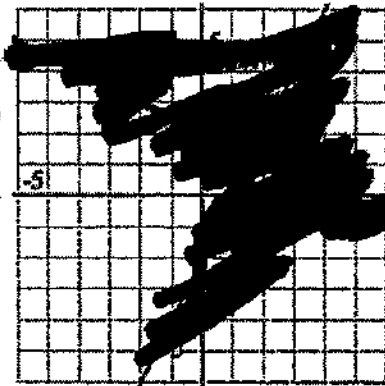
Equation for given line:

Answer:

Equation for new line:
Answer for above example:

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GO

Topic: Solve the following equations.

Solve each equation for the indicated variable.

11. $3(x - 2) = 5x + 8$; Solve for x.

   Answer: $x = -7$

12. $-3 + n = 6n + 22$; Solve for n.

   ▬▬▬▬▬▬

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

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

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

   ▬▬▬▬▬

SECONDARY MATH I // MODULE 6

TRANSFORMATIONS AND SYMMETRY – 6.3

6.3

READY, SET, GO! Name   Period   Date

READY

Topic: Rotations and Reflections of figures.

In each problem there will be a pre-image and several images based on the give 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. (Compare all images to the pre-image.)

1.

Pre-Image

Image A
Answer:
Rotation
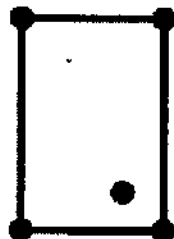
Image B
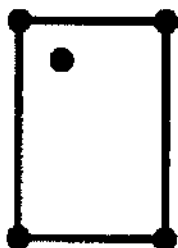**Answer:**
Rotation
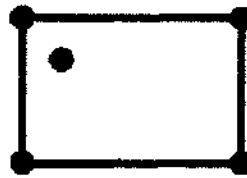
Image C
Answer:
Reflection
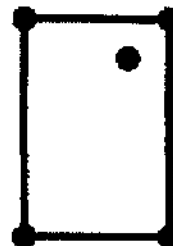
Image D
Answer:
Rotation &
Reflection

2.

Image B

Image D

Pre-Image

Image A

Image C

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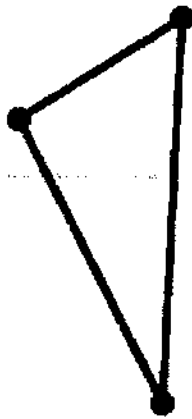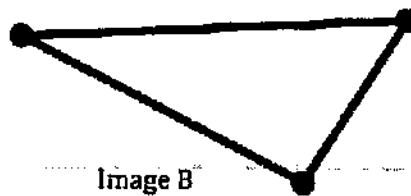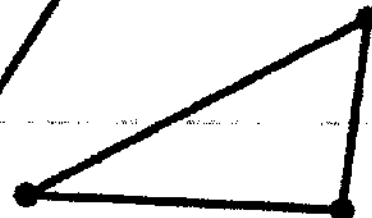
SET

Topic: Reflecting and rotating points.

On each of the coordinate grids there is a labeled point and line. Use the line as a line of reflection to reflect the given point and create its reflected image over the line of reflection. (Hint: points reflect along paths perpendicular to the line of reflection. Use perpendicular slope!)

3.
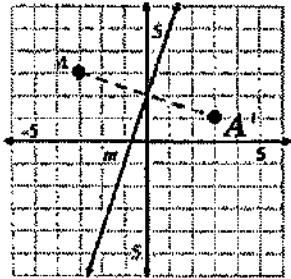
Reflect point *A* over line *m* and label the image *A′*

4.

5.
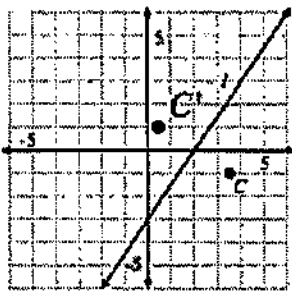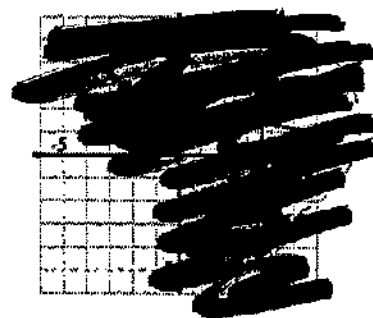
Reflect point *C* over line *l* and label the image *C′*

6.

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.

7.

Answer:

$$y = -2x + 7$$

or

$$y = -2(x - 3) + 1$$

8.

Answer:

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SECONDARY MATH I // MODULE 6

TRANSFORMATIONS AND SYMMETRY – 6.3

6.3
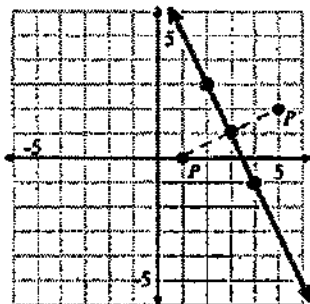
For each pair of point, A and A' draw in the line of reflection that would need to be used to reflect A onto A'. Then find the equation of the line of reflection.

9.
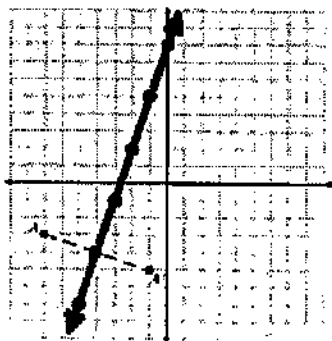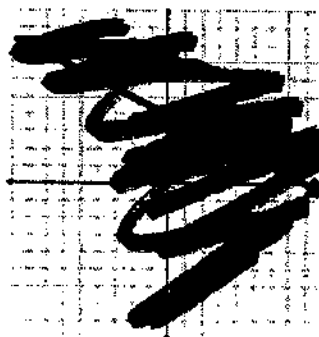
Answer:

$y = 3x + 8$

or

$y = 3(x + 4) - 4$

10.

Answer:

GO

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

For each linear equation <u>write the slope</u> of a line parallel to the given line.

11. $y = -3x + 5$

Answer: $m = -3$

12. $y = 7x - 3$

13. $3x - 2y = 8$

Answer: $m = \frac{3}{2}$

For each linear equation <u>write the slope</u> of a line perpendicular to the given line.

14. $y = -\frac{2}{7}x + 5$

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

Answer: $m = -5$

16. $3x + 5y = -15$

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

17. (-2, -3) (1, 1)

a. Slope:

Answer:

$m = \frac{4}{3}$

b. Distance:

Answer:

5

18. (-7, 5) (-2, -7)

a. Slope:

Answer:

b. Distance:

Answer:

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SECONDARY MATH I // MODULE 6
TRANSFORMATIONS AND SYMMETRY – 6.4

6.4
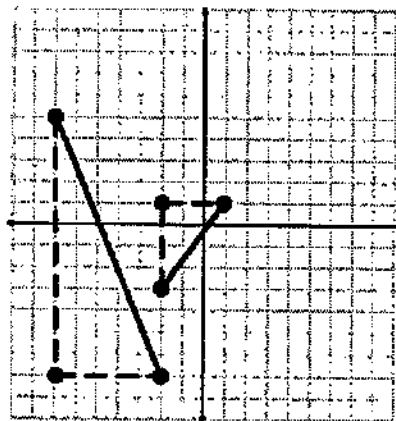
> READY, SET, GO!   Name   Period   , Date

READY

Topic: Defining polygons and their attributes
For each of the geometric words below write a definition of the object that addresses the essential elements.

1.   Quadrilateral: **Answer: Four sided polygon**

2.   Parallelogram: ████████████████████████████

3.   Rectangle: **Answer: Quadrilateral with 4 right angles**

4.   Square: ████████████████████████████

5.   Rhombus: **Answer: Quadrilateral with 4 equal sides**

6.   Trapezoid: ████████████████████████████

SET

Topic: Reflections and rotations, composing reflections to create a rotation.

7.
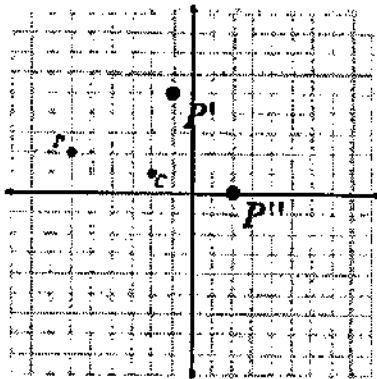
Use the center of rotation point C and rotate point P clockwise around it 90°. Label the image P'.
With point C as a center of rotation also rotate point P 180°. Label this image P''.

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8.

Use the center of rotation point C and rotate point P clockwise around it $90°$. Label the image P'.
With point C as a center of rotation also rotate point P $180°$. Label this image P''.

9.

a. What is the equation for the line for reflection that reflects point P onto P'?   **Answer: $x = 0$ (y-axis)**
b. What is the equation for the line of reflections that reflects point P' onto P''?   **Answer: $y = 0$ (x-axis)**
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?   **Answer: $180°$ rotation around the origin**

10.

a. What is the equation for the line for reflection that reflects point P onto P'?   **Answer: $y = 2x - 2$**
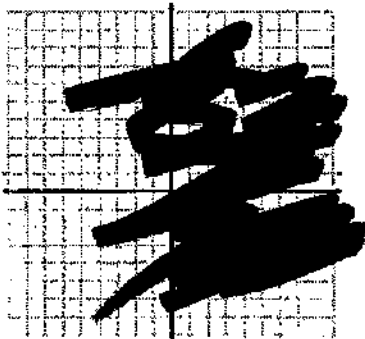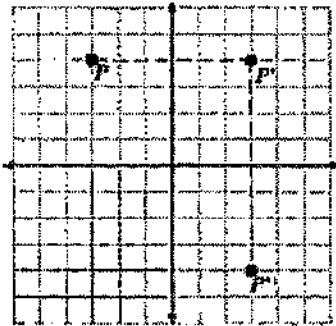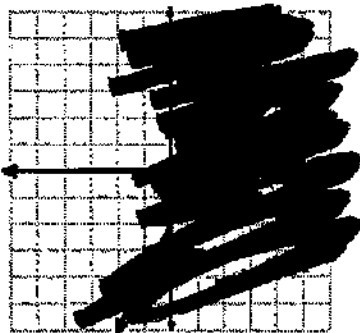b. What is the equation for the line of reflections that reflects point P' onto P''?   **Answer: $y = 0$ (x-axis)**
c. Could P'' also be considered a rotation of point P? If so what is the center of rotation and how many degrees was point P rotated?

11.

a. What is the equation for the line for reflection that reflects point P onto P'?   **Answer: $y = \frac{3}{2}x + 3$**
b. What is the equation for the line of reflections that reflects point P' onto P''?   **Answer: $y = -3x - 8$**
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?   **Answer: $180°$ rotation about (-2.5,-4) or approx. $88°$ counter-clockwise rotation about (-2.5,-0.5)**
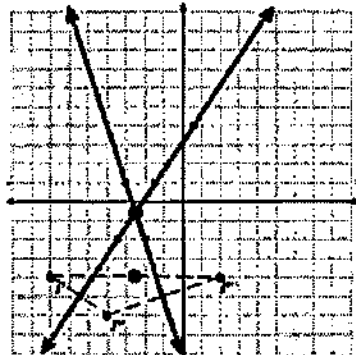
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SECONDARY MATH I // MODULE 6
TRANSFORMATIONS AND SYMMETRY – 6.4

GO
Topic: Rotations about the origin.

Plot the given coordinate and then perform the indicated rotation in a clockwise direction around the origin, the point (0 , 0), and plot the image created. State the coordinates of the image.

12. Point A (4, 2) rotate 180°
    Coordinates for Point A' ▮▮▮▮

13. Point B (-5, -3) rotate 90° clockwise
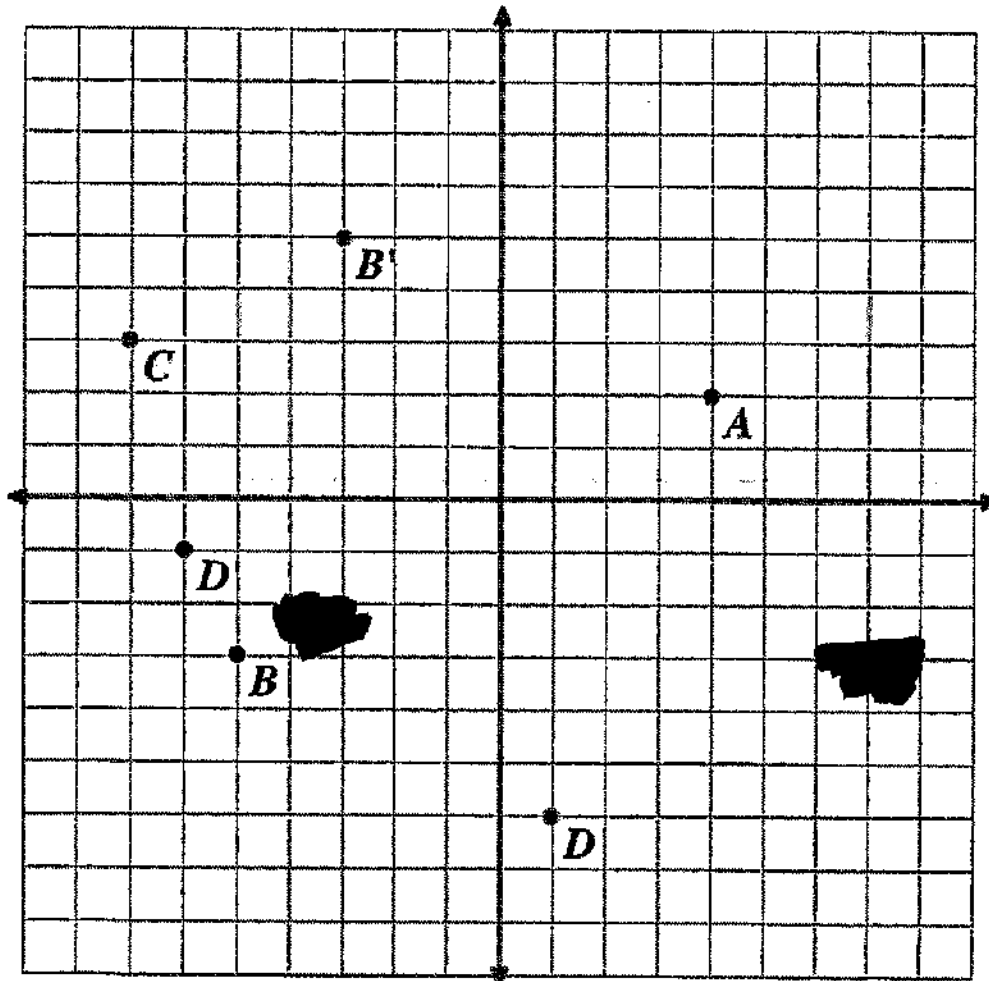   Coordinates for Point B' (-3 , 5)
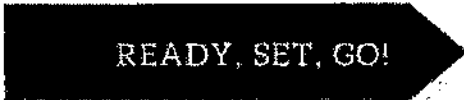
14. Point C (-7, 3) rotate 180°
    Coordinates for Point C' ▮▮▮▮

15. Point D (1, -6) rotate 90° clockwise
    Coordinates for Point D' (-6 , -1)

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READY, SET, GO!   Name   Period   Date

READY

Topic: Polygons, definition and names

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

Answers will vary. Possible answer: A polygon is a closed shape with straight line segments as sides.

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

Number of Sides	Name of Polygon
3	■■■■
4	■■■■
5	■■■
6	■■■
7	■■■
8	■■■■
9	■■■■
10	■■■

SET

Topic: Kites, Lines of symmetry and diagonals.

3. One quadrilateral with special attributes is a kite. Find the geometric definition of a kite and write it below along with a sketch. (You can do this fairly quickly by doing a search online.)

Possible answer: A kite is a quadrilateral with 2 sets of adjacent

equal sides in which the diagonals form perpendicular lines.

4. Draw a kite and draw all of the lines of reflective symmetry and all of the diagonals.

Lines of Reflective Symmetry   **Diagonals**

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5. List all of the rotational symmetry for a kite.

Answer: 360°

6. Are lines of symmetry also diagonals in any given polygon? Explain.
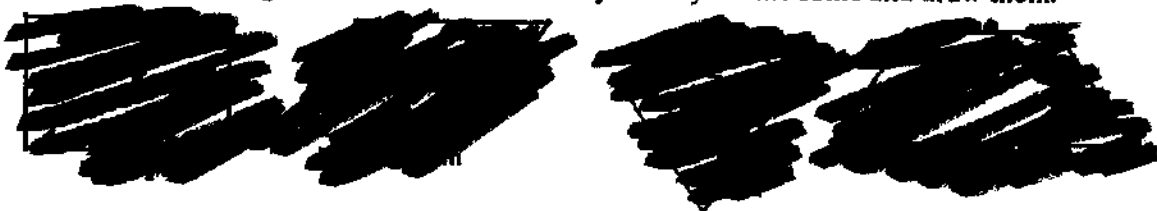
Answer: ██

7. Are all diagonals also lines of symmetry in any given polygon? Explain.

Answer: No, for example, in a pentagon none of the diagonals are lines of symmetry. The lines of symmetry are between a vertex and the midpoint of the side opposite the vertex.

8. Which quadrilaterals have diagonals that are not lines of symmetry? Name some and draw them.

Possible answers: ██

9. Do parallelograms have diagonals that are lines of symmetry? If so, draw and explain. If not draw and explain.
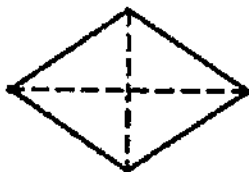
**Possible answers: Rectangles, squares, rhombi are also parallelograms.
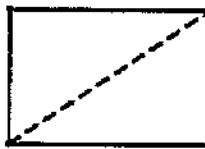A square and rhombus do have diagonals that are lines of symmetry.
A rectangle and parallelogram don't have diagonals that are lines of symmetry.**
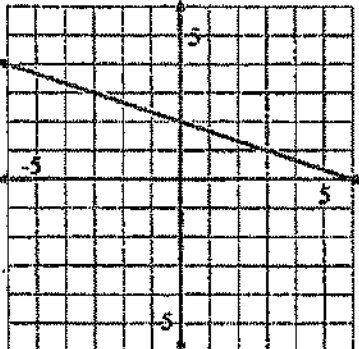
Square   Rhombus   Rectangle   Parallelogram

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GO

Topic: Equations for parallel and perpendicular lines.

	Find the equation of a line PARALLEL to the given info and through the indicated y-intercept.	Find the equation of a line PERPENDICULAR to the given line and through the indicated y-intercept.
10. Equation of a line: $y = 4x + 1$.	a. Parallel line through point (0, -7): Answer:	b. Perpendicular to the line line through point (0, -7): Answer:
11. Table of a line: 	x	y
---	---
3	-8
4	-10
5	-12
6	-14		a. Parallel line through point (0, 8): Answer: $y = -2x + 8$	b. Perpendicular to the line through point (0, 8): Answer: $y = \frac{1}{2}x + 8$
12. Graph of a line:	a. Parallel line through point (0, -9): Answer:	b. Perpendicular to the line through point (0, -9): Answer:

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SECONDARY MATH I // MODULE 6

TRANSFORMATIONS AND SYMMETRY - 6.6

6.6

READY, SET, GO!   Name   Period   Date

READY

Topic: Rotational symmetry, connected to fractions of a turn and degrees.

1. 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?
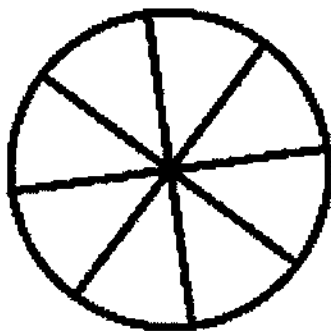
Answer:

$\frac{1}{8}, 45°$

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

Answer:

3. 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?

Answer:

$\frac{1}{18}, 20°$

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SECONDARY MATH I // MODULE 6

TRANSFORMATIONS AND SYMMETRY – 6.6
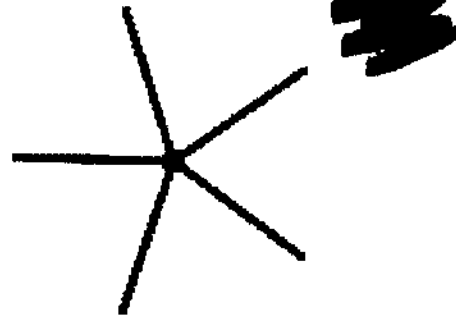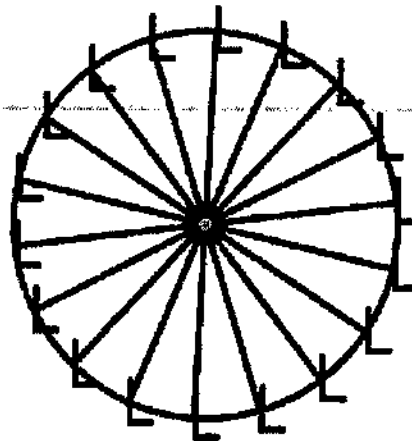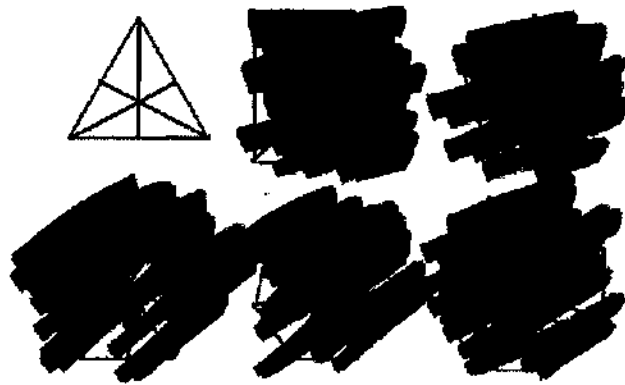
6.6

SET

Topic: Finding angles of rotational symmetry for regular polygons, lines of symmetry and diagonals

4. 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	
4	
5	
6	
7	
8	
n	

5. Draw all of the diagonals in each regular polygon. Fill in

the table and find a pattern, is it linear, exponential or neither? How do you know? Attempt to find an

expression for the number of diagonals in a n-sided polygon.
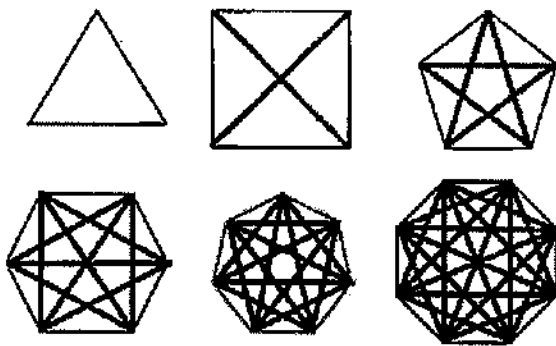
Number of Sides	Number of diagonals
3	0
4	2
5	5
6	9
7	14
8	20
n	

Answer: $\frac{n(n-3)}{2}$

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

Answer: M█████████████████

7. What are the angles of rotation for a 20-gon? How many lines of symmetry (lines of reflection) will it have?

Answer: 18, 36, 54, 72, 90, 108, 126 144, 162, 180, 198, 216, 234, 252, 270, 288, 306, 324, 342, 360 degrees (multiples of 18 degrees)

20 lines of symmetry

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

have?   **Answer:** ████████████████████

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

Answer: The polygon has 20 sides since 18 degrees rotated 20 times would be a total of 360.

10. 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?
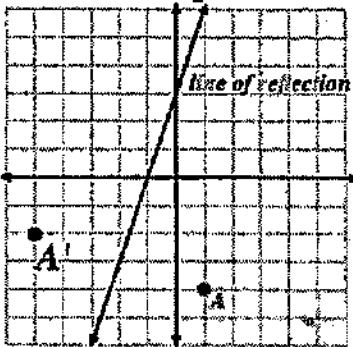
Answer: T████████████████████
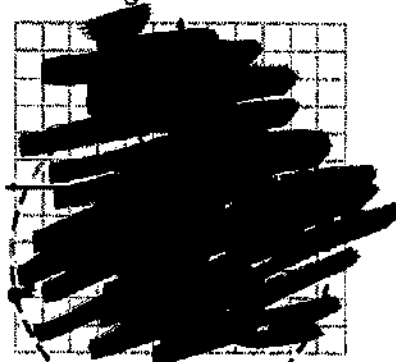
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GO

Topic: Reflecting and rotating points on the coordinate plane.

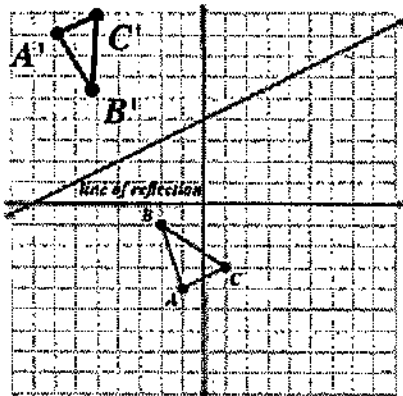(The coordinate grid, compass, ruler and other tools may be helpful in doing this work.)

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

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

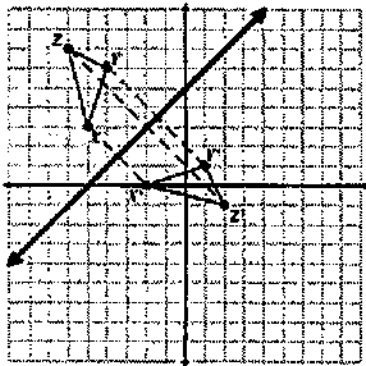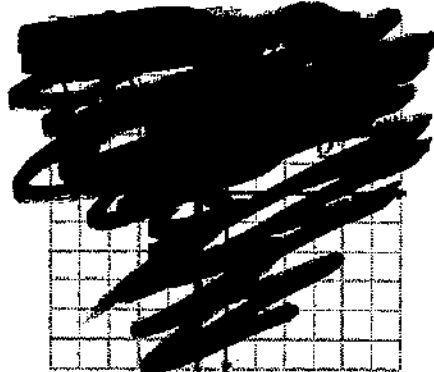11. Reflect triangle *ABC* over the line of reflection and label the image *A'B'C'*.

12. Reflect parallelogram *ABCD* over the line of reflection and label the image *A'B'C'D'*.
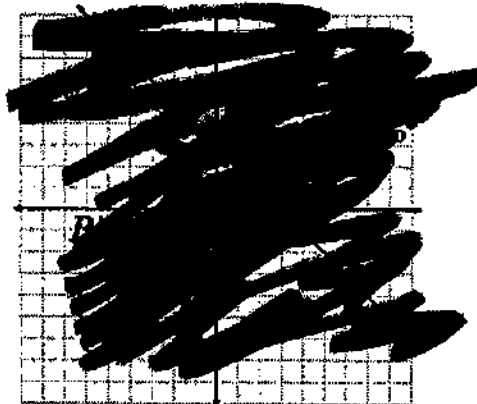
13. Given triangle *XYZ* and its image *X'Y'Z'* draw the line of reflection that was used.

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

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> READY, SET, GO!

Name   Period   Date

READY

Topic: Defining congruence and similarity.

1. What do you know about two figures if they are congruent?
   Answer: A series of transformations will make one land exactly on the other

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

3. What do you know about two figures if they are similar?
   Answer: They are the same shape but different sizes. One is a dilation of the other.

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

SET

Topic: Classifying quadrilaterals based on their properties.

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

5. Has 180° rotational symmetry.
   Answer: Parallelogram

6. Has 90° rotational symmetry.
   ▓▓▓▓▓▓▓▓▓

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

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

9. Has congruent diagonals.
   Answer: Rectangle

10. Has diagonals that bisect each other.
    ▓▓▓▓▓▓▓▓▓

11. Has diagonals that are perpendicular.
    Answer: Rhombus

12. Has congruent angles.
    ▓▓▓▓▓▓▓▓▓

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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. Distances should be provided in the most exact form.

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

a. Slope:

Answer:

$$m = \frac{2}{3}$$

b. Distance:

Answer:

$$\sqrt{13}$$

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

a. Slope:

Answer:

b. Distance:

Answer:

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

a. Slope:

Answer:

$$m = \frac{12}{-5}$$

b. Distance:

Answer:

13

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

a. Slope:

Answer:

b. Distance:

Answer:

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

a. Slope:

Answer:

$$m = \frac{1}{2}$$

b. Distance:

Answer:

$$\sqrt{180}$$

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

a. Slope:

Answer:

b. Distance:

Answer:

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