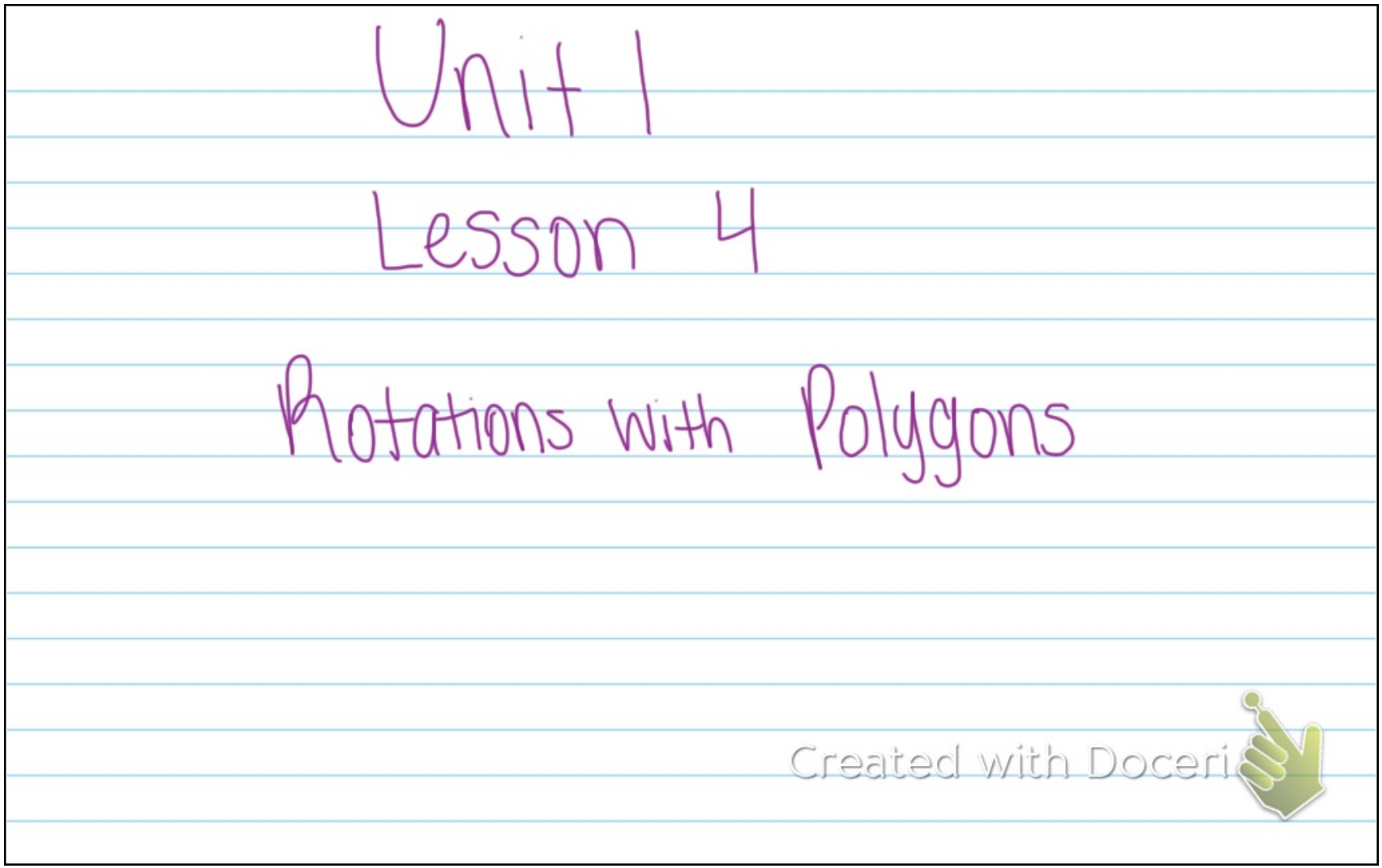
Unit 1

Lesson 4

Rotations with Polygons



Math 2
Unit 1 – Geometric Transformations
Lesson 3 – Rotations with Coordinates

Name_____
Date_____Pd_____

Rotations

Definition:

A **rotation** is a type of transformation which is a _____ in a given direction for a given number of _____ around a fixed _____. To rotate an object, you must specify the _____ of rotation, the _____ around which the rotation is to occur, and the direction.

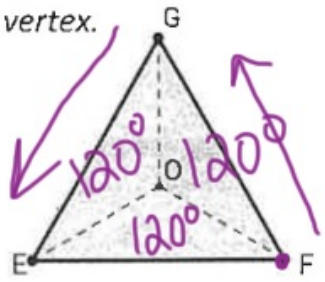
- Rotations can be completed in two directions: counter-clockwise & clockwise

Math 2
Unit 1 – Geometric Transformations
Lesson 4 – Rotations with Polygons

Name_____
Date_____ Pd_____

Part 1 – Regular Polygons and Rotational Symmetry

*A **regular polygon** is a **polygon** that is equiangular (all angles are equal in measure) and equilateral (all sides have the same length). In the case of **regular polygons** the **center** is the point that is equidistant from each vertex.*



1. Given *Regular Triangle EFG* with center O.
   a. F is rotated about O. If the image of F is G, what is the angle of rotation? 120°
   b. $\overline{FG}$ is rotated 120° about O. What is the image of $\overline{FG}$? $\overline{GE}$

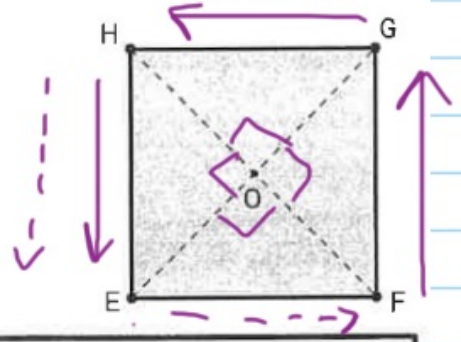
General Rule: The regular triangle has rotation symmetry with respect to the center of the polygon and angles of rotation that measure 120°, 240° and 360°.

Side note: A regular triangle is also called an equilateral *triangle or an* equiangular *triangle.*

Side note: A regular triangle is also called an ___ *triangle or an* ___ *triangle.*

All sides ≅

2. Given *Regular Quadrilateral* $EFGH$ with center O.



   a. F is rotated about O. If the image of F is G, what is the angle of rotation? 90°

   b. F is rotated about O. If the image of F is H, what is the angle of rotation? 180°

   c. $\overline{FG}$ is rotated 270° about O. What is the image of $\overline{FG}$? $\overline{EF}$ 3 CCW

General Rule: The regular quadrilateral has rotation symmetry with respect to the center of the polygon and angles of rotation that measure 90°, 180°, 270° and 360°.

Side note: A regular quadrilateral is often called a Square.

Parallelogram

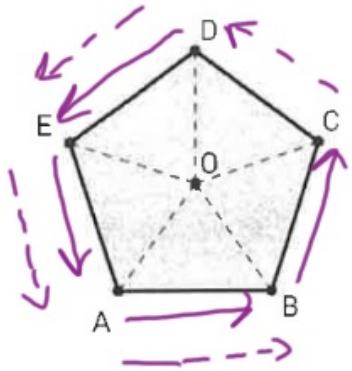
3. Given *Regular Pentagon ABCDE* with center O.

   a. C is rotated about O. If the image of C is D, what is the angle of rotation? 72°

   b. C is rotated about O. If the image of C is E, what is the angle of rotation? 144°

   c. C is rotated about O. If the image of C is A, what is the angle of rotation? 216°

   d. $\overline{DC}$ is rotated 288° about O, what is the image of $\overline{DC}$? $\overline{CB}$



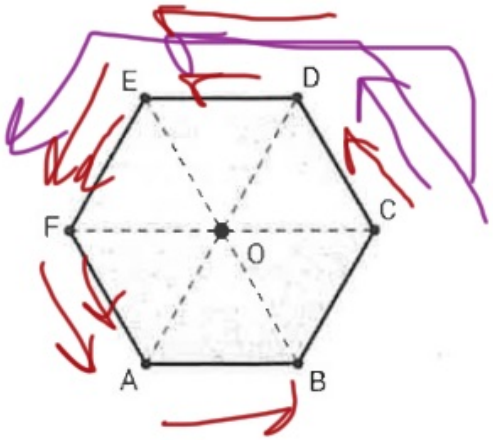
4 turns CCW

General Rule: The regular pentagon has rotation symmetry with respect to the center of the polygon and angles of rotation that measure 72°, 144°, 216°, 288° and 360°.

$\frac{360}{5} = 72°$

16

4. Given *Regular Hexagon ABCDEF* with center O.



a. C is rotated 60° about O, what is the image of C? D

b. C is rotated 120° about O, what is the image of C? E

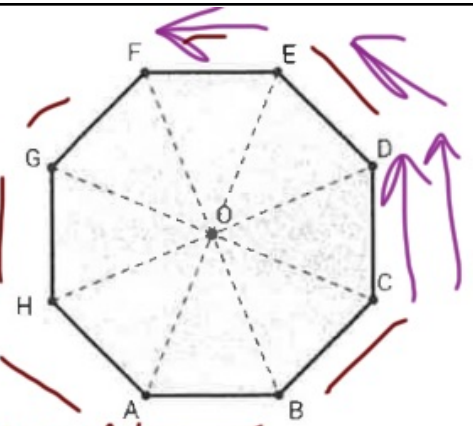
c. C is rotated 180° about O, what is the image of C? F

d. $\overline{DC}$ is rotated 240° about O, what is the image of $\overline{DC}$? $\overline{BA}$

1 2 3 4

General Rule: The regular hexagon has rotation symmetry with respect to the center of the polygon and angles of rotation that measure 60°, 120°, 180°, 240°, 300° and 360°.

5. Given *Regular Octagon ABCDEFGH* with center O.



a. When point C is rotated about O, the image of point C is point D.
Describe the rotation (be sure to include degree).

$R_{45°CCW}$ about point O / $R_{315°CW}$ AVO

b. When point C is rotated about O, the image of point C is point F.
Describe the rotation (be sure to include degree).

$R_{135°CCW}$ about point O / $R_{225°CW}$ AVO

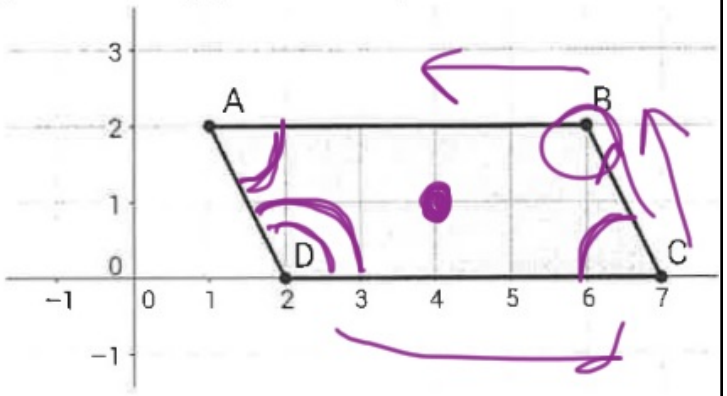
A regular polygon can be mapped onto itself if we rotate in multiples of the central angle measure.

The central angle of a regular polygon is found by $\frac{360}{x}$ x = # of sides

$\frac{360}{8} = 45°$

Part 2 – Parallelograms and Rotational Symmetry

6. Given *Parallelogram* $ABCD$, there is a center of rotation, O, that will map point A onto point C.



   a. What are the coordinates of O? (4,1)

   b. What degree of rotation mapped C onto A using the center O? 180°

   c. If we rotate the parallelogram around center O using the degree measure found in part b, $\angle D$ maps to $\angle B$.

   d. If $\angle A$ maps to $\angle C$, then $\angle A$ and $\angle C$ are $\cong$.

   e. If $\angle D$ maps to $\angle B$, then $\angle D$ and $\angle B$ are $\cong$.

Any other reflection line

Use paper & FOLD

Count over and down

$x = 0$

$y = 0$

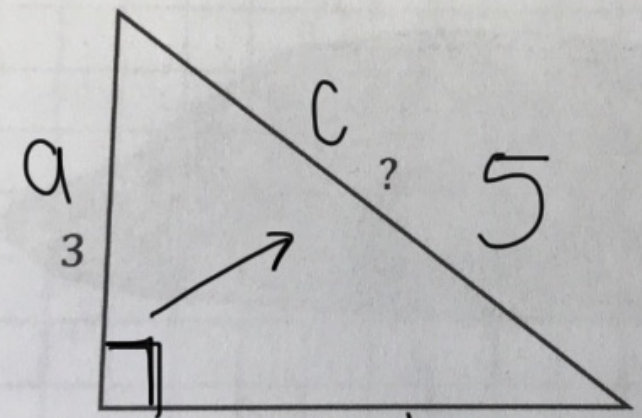
$y = -x$

$y = x$

MVP pg 4-6

measures in exact form if irrational.

1. $a^2+b^2=c^2$



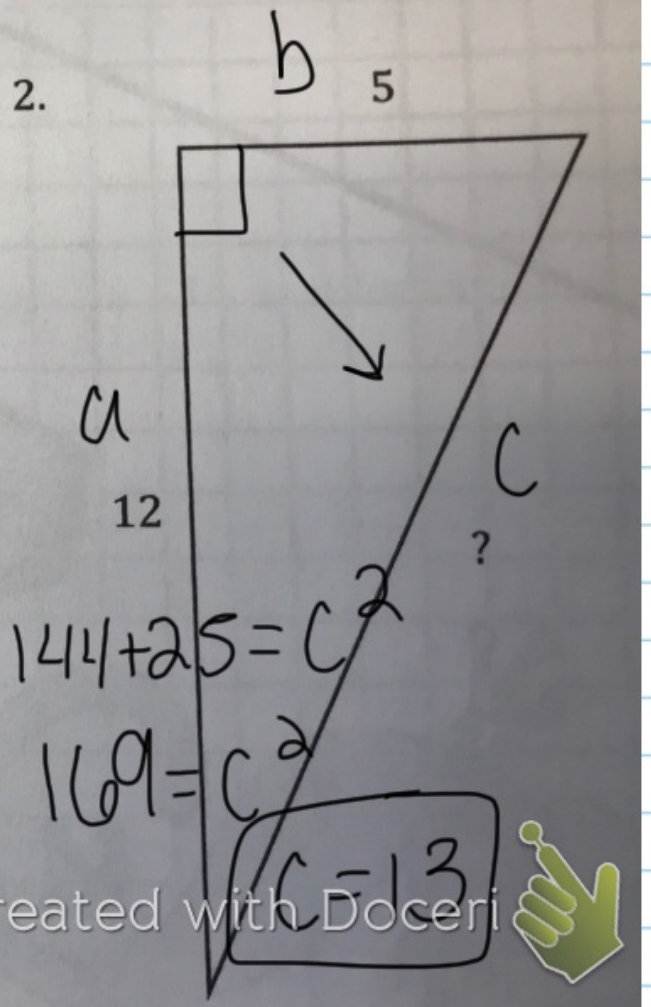
$a^2+b^2=c^2$

$9+16=c^2$

$\sqrt{25}=\sqrt{c^2}$

$c=5$

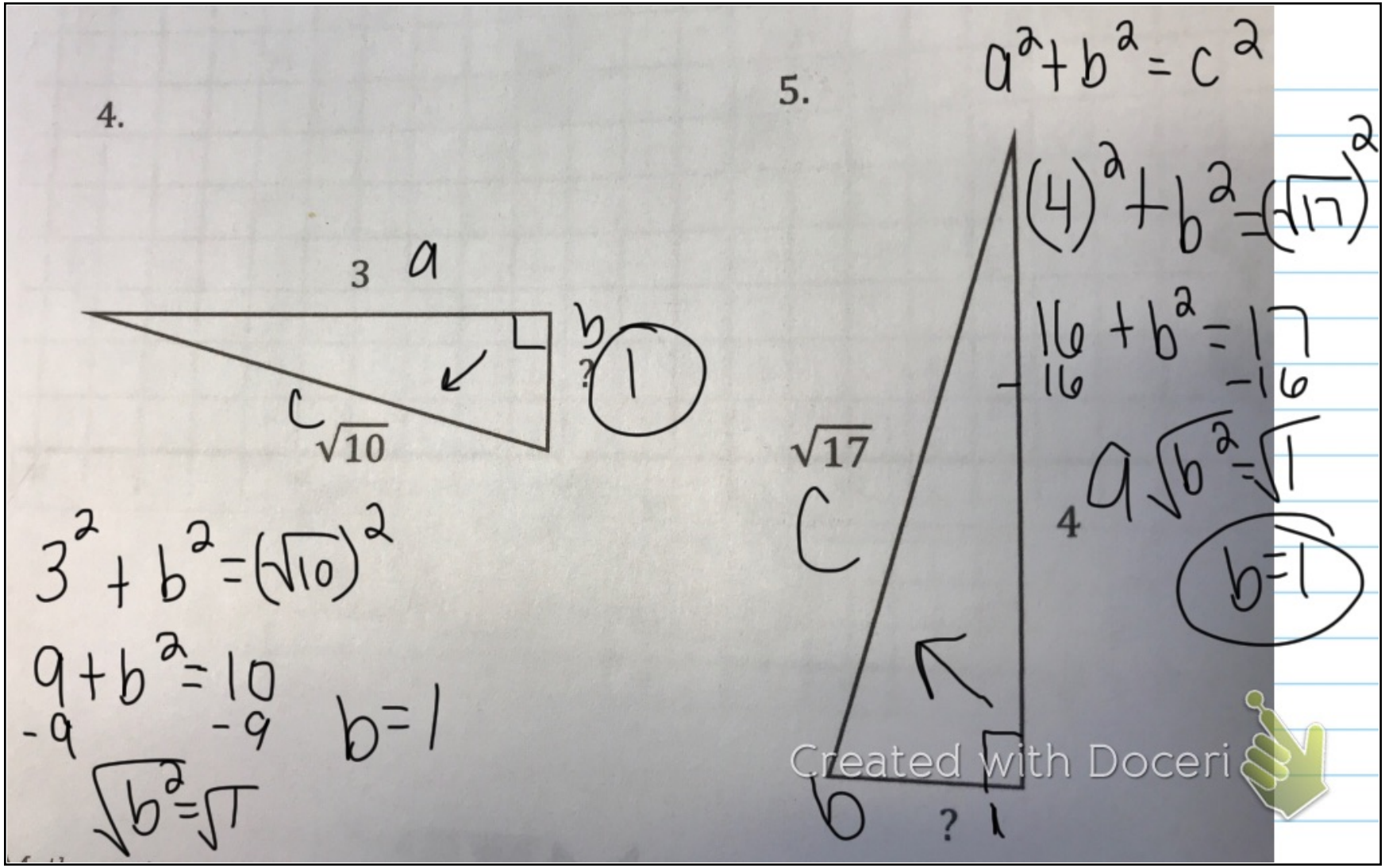
2.



$144+25=c^2$

$169=c^2$

$c=13$


4.
3
a
b
?
1
c
√10
3² + b² = (√10)²
9 + b² = 10
-9 -9
b = 1
√b² = √1
5.
a² + b² = c²
(4)² + b² = (√17)²
16 + b² = 17
-16 -16
b² = 1
√b² = √1
b = 1
√17
c
4
b
?
1
Created with Doceri