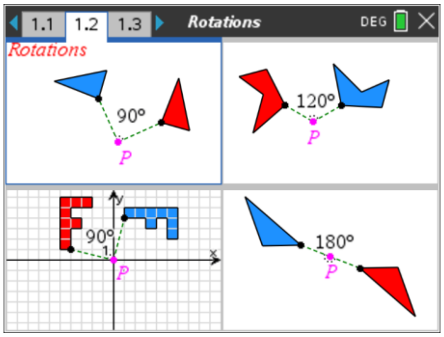
Name ________________

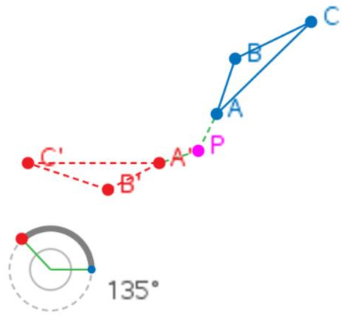
Class ________________

Transformational Geometry is a way to study geometry by focusing on geometric “movements” or “transformations” and observing/studying properties about these figures.



There are four geometric transformations:
< Reflections   < Translations   **< Rotations**   < Dilations

Play - Investigate - Explore - Discover
P I E D



In the figure to the right, ΔABC is rotated about point P.
ΔABC is called the pre-image while $\Delta A'B'C'$ is called the image (of rotation).
$\Delta A'B'C'$ is read “triangle A prime, B prime, C prime.”
Point P is called the point of rotation.

Download and install the red TI-Nspire student software and the Rotations TNS file from the website where you obtained this document.
Then you can interact with these figures, too. If you decide not to download the software, or if you cannot, you can still do this activity along with the videos.

A **conjecture** is an opinion or conclusion based on what is observed.

1. What conjecture(s) can you make based upon what you observed about a triangle and its image after being rotated?

2 a. When a figure is rotated about a point through an angle of positive measure, the figure rotates in a

____ direction.

b. When a figure is rotated about a point through an angle of negative measure, the figure rotates in a

____ direction.

3. a) After observing the angle measures being shown, what conjecture can you make?

b) After observing the side measures being shown, what conjecture can you make?

c) Note: do not say all the angles are equal, or do not say all the sides are equal. They aren’t.
The sides and angles that correspond to one another have equal lengths and measures, respectively.

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d) What is true about the triangles? State that using symbols.

4. a) After observing the perimeters being shown, what conjecture can you make?
Why should this be true?

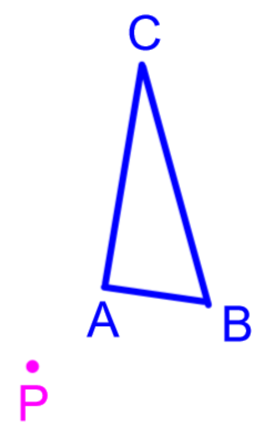
b) After observing the areas being shown, what conjecture can you make?
Why should this be true?

5. After observing how triangles have been rotated about a point, you should be able to rotate a triangle about a point through an angle of 90^o, or a multiple of 90^o. Ideally you will need a compass and straightedge.

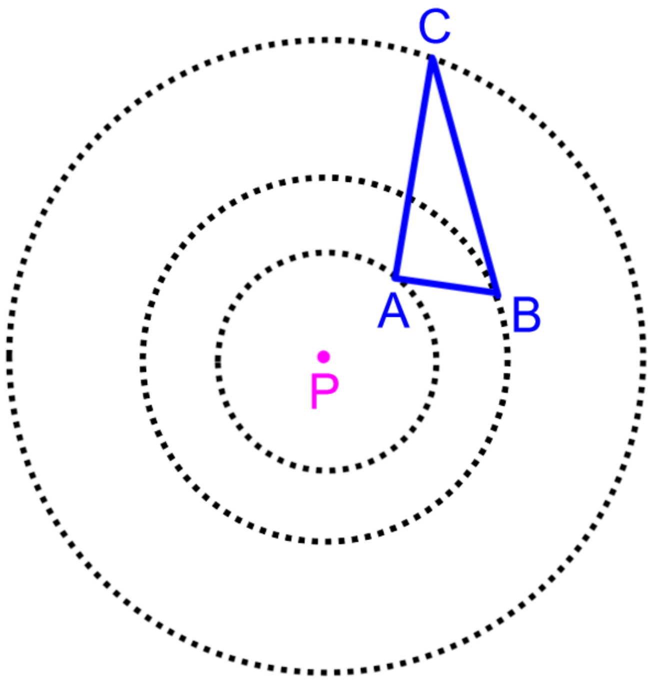
a. Rotate ΔABC about point P 90^o.
   Label this image ΔA'B'C'.

b. Rotate ΔABC about point P 180^o.
   Label this image ΔA"B"C".

c. Rotate ΔABC about point P 270^o.
   Label this image ΔA'"B'"C'".



6. If you do not have access to a compass, do problem 5 above using the figure below.
You will need a straightedge (or ruler).
Concentric circles are circles in the same plane, with the same center, but different length radii.



a. Rotate ΔABC about point P 90^o.
Label this image ΔA'B'C'.

b. Rotate ΔABC about point P 180^o.
Label this image ΔA"B"C".

c. Rotate ΔABC about point P 270^o.
Label this image ΔA'"B'"C'".

7. Based on your explorations and observations:
a. What appears to be true about segments

PA and PA'? ______________ PB and PB'? ____________ PC and PC' _____________

Why should these 3 statements be true?
(hint: look at the results to either #5 or #6 above)

8. Grids and Coordinates Rotate 90^o Complete the following.

a) If a triangle is rotated 90^o about the origin, the x-coordinate of the image is the

_________________________________ of the pre-image triangle.

b) If a triangle is rotated 90^o about the origin, the y-coordinate of the image is the

_________________________________ of the pre-image triangle.

c) Or in symbols, If (x, y) is a point on the pre-image, then ____________ is a point on the image triangle.

$(x, y) \rightarrow$ ___________ where '$\rightarrow$' means 'maps to'

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9. Grids and Coordinates Rotate 180^o Complete the following.

a) If a triangle is rotated 180^o about the origin, the x-coordinate of the image is the

________________________________ of the pre-image triangle.

b) If a triangle is rotated 180^o about the origin, the y-coordinate of the image is the

________________________________ of the pre-image triangle.

c) Or in symbols, If (x, y) is a point on the pre-image, then ____________ is a point on the image triangle.

$(x, y) \rightarrow$ ___________ where $'\rightarrow'$ means 'maps to'

10. Grids and Coordinates Rotate 270^o Complete the following.

a) If a triangle is rotated 270^o about the origin, the x-coordinate of the image is the

________________________________ of the pre-image triangle.

b) If a triangle is rotated 270^o about the origin, the y-coordinate of the image is the

________________________________ of the pre-image triangle.

c) Or in symbols, If (x, y) is a point on the pre-image, then ____________ is a point on the image triangle.

$(x, y) \rightarrow$ ___________ where $'\rightarrow'$ means 'maps to'

11. Grids and Coordinates Rotate 360^o Complete the following.
a) If a triangle is rotated 360^o about the origin, the x-coordinate of the image is the

________________________________ of the pre-image triangle.

b) If a triangle is rotated 360^o about the origin, the y-coordinate of the image is the

________________________________ of the pre-image triangle.

c) Or in symbols, If (x, y) is a point on the pre-image, then ____________ is a point on the image triangle.

$(x, y) \rightarrow$ ___________ where $'\rightarrow'$ means 'maps to'

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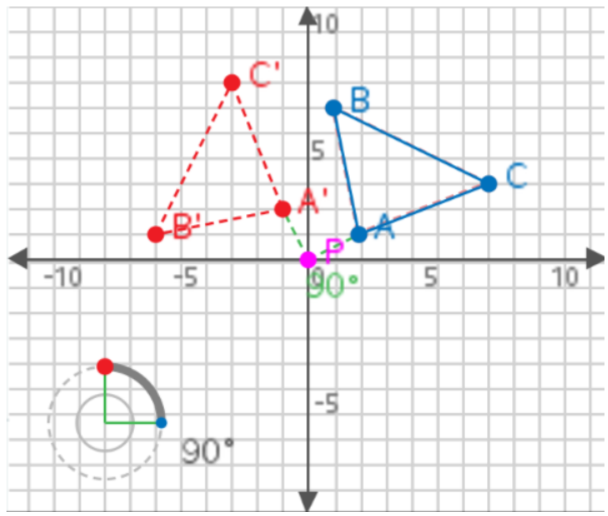
12. A rotation of -90^o is equivalent to a rotation of what positive angle measure? _______________

13. A rotation of -180^o is equivalent to a rotation of what positive angle measure? _______________

14. A rotation of -270^o is equivalent to a rotation of what positive angle measure? _______________

Corresponding Sides

We have already shown that corresponding sides of triangle rotated about the origin are equal in length. What else seems to be true about pairs of corresponding sides? Let's explore.



15. Calculate the slopes of corresponding sides either graphically or by slope formula.

Show your work in the space provided below.

Write all answers as fractions in simplest form.

Record your answers in the #15 row of the table on the bottom of this page.
Look for patterns!

ΔABC is rotated 90^o about the origin.

15. Find the slopes as fractions of:

$a.\ \overline{AB}\ and\ \overline{A'B'}$ $b.\ \overline{BC}\ and\ \overline{B'C'}$ $c.\ \overline{AC}\ and\ \overline{A'C'}$

Rotate 90^o	$m(\overline{AB})$	$m(\overline{A'B'})$	$m(\overline{BC})$	$m(\overline{B'C'})$	$m(\overline{AC})$	$m(\overline{A'C'})$
# 15						
# 16						
# 17 video						

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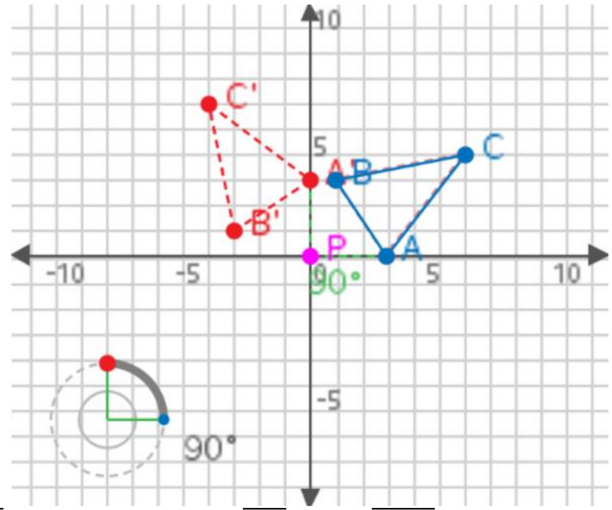
16. Calculate the slopes of corresponding sides either graphically or by slope formula.

Show your work in the space provided below.

Write all answers as fractions in simplest form.

Record your answers in the #16 row of the table on the bottom of the previous page.
Look for patterns!



ΔABC is rotated 90^o about the origin.

16. Find the slopes as fractions of:

$a.\ \overline{AB}\ and\ \overline{A'B'}$ $b.\ \overline{BC}\ and\ \overline{B'C'}$ $c.\ \overline{AC}\ and\ \overline{A'C'}$

17. There is an example on the video that we want you to record the slopes of sides into the table on the bottom of the previous page. Pause the video and record the slopes as fractions in simplest form.

18. After completing exercises 15 – 17 and recording the slopes in the table, then do this exercise.
a. Look at the slopes of corresponding sides in the table on the previous page.
What pattern do you notice?

b. What does that mean is true about lines: $\overleftrightarrow{AB}\ and\ \overleftrightarrow{A'B'}$? $\overleftrightarrow{BC}\ and\ \overleftrightarrow{B'C'}$? $\overleftrightarrow{AC}\ and\ \overleftrightarrow{A'C'}$?

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