



Rotations: Lesson 6 Distance to Vertices

Name _____

Student Activity

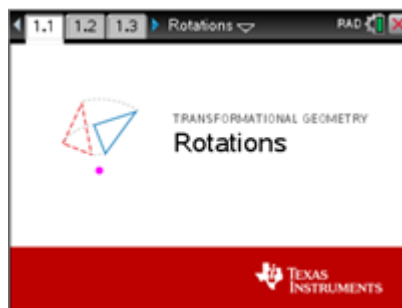


Class _____

In this lesson, you will investigate the distances from the point of rotation to each of the vertices of rotated triangles and look for patterns. Open the document: *Rotations.tns*.

It is important that the Rotations Tour be done before any Rotations lessons.

PLAY INVESTIGATE EXPLORE DISCOVER



Move to page 1.3. (► two times)

On the handheld, press ► and ◀ to navigate through the pages of the lesson.
(On the iPad®, select the page thumbnail in the page sorter panel.)

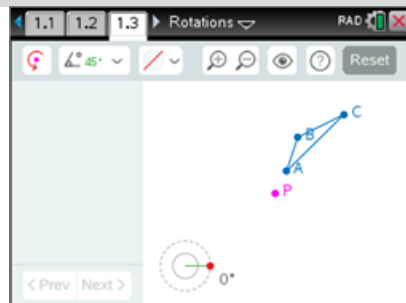
1. Click on or press to rotate $\triangle ABC$ 45° about point P.

Look at segments: \overline{PA} and $\overline{PA'}$.

What seems to be true about the lengths of \overline{PA} and $\overline{PA'}$?

Discuss in your groups.

Grab point A () and move it about the screen.



Click on or press to rotate $\triangle ABC$ an additional 45° .

Grab point A () and move it about the screen.

Make a conjecture about the lengths of \overline{PA} and $\overline{PA'}$.

2. Reset the page. Press ().
 - a. Each person in the group select one of the pairs of segments to observe:
 - i) the lengths of \overline{PB} and $\overline{PB'}$
 - ii) the lengths of \overline{PC} and $\overline{PC'}$

Click on or press to rotate $\triangle ABC$ 45° about point P.

Look at the lengths of segments: i) \overline{PB} and $\overline{PB'}$ or ii) \overline{PC} and $\overline{PC'}$.

What seems to be true about the lengths of: i) \overline{PB} and $\overline{PB'}$ or ii) \overline{PC} and $\overline{PC'}$?

Discuss in your groups.

Grab either point B () or point C () and move it about the screen.




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- b. Click on  or press **Q** to rotate $\triangle ABC$ an additional 45° .
Grab either point B (**B**) or point C (**C**) and move it about the screen.
- c. Make a conjecture about the lengths of: i) \overline{PB} and $\overline{PB'}$ or ii) \overline{PC} and $\overline{PC'}$.

3. Reset the page. Press  (**ctrl** **del**).

- a. Click on  or press **Q** to rotate $\triangle ABC$ 45° about point P.


To assist in validating your conjectures, do the following:


Click on the Multiple Icon  or press **M**. Press the down arrow (**▼**) once and press the space bar (**␣**) to select the second choice in the dropdown menu.

Discuss in your groups what is displayed on the screen.

- b. Three dashed circles appeared on the screen. The circles all have the same center, P, but have different radii. They are called **concentric circles**.

- c. Continue to rotate $\triangle ABC$ about point P until it shows 360° on the screen.
Look at \overline{PA} and $\overline{PA'}$, \overline{PB} and $\overline{PB'}$, and \overline{PC} and $\overline{PC'}$ as you rotate $\triangle ABC$.

- d. To see all previous images, open the Options menu (press  or **O**).
Use the directional arrows (**▲ ▼ ◀ ▶**) to move to the box next to "Historical Images".
Press the space bar key (**␣**) to put a check mark in the box. Press **enter** or **esc**.
Observe the screen.

- e. Click on  or press **Q** to rotate $\triangle ABC$ 45° about point P.
Continue to rotate $\triangle ABC$ about point P until it shows 360° on the screen.
Look at \overline{PA} and $\overline{PA'}$, \overline{PB} and $\overline{PB'}$, and \overline{PC} and $\overline{PC'}$ as you rotate $\triangle ABC$.


- f. Discuss in your groups how the concentric circles can help convince you why your conjecture is true.



4. Press **[menu]** to open the menu.

(On the iPad, tap the wrench icon  to open the menu.)

Press **[1]** (1: Templates), **[4]** (4: Dist P to Vertices).

Click on  or press **[Q]** to rotate $\triangle ABC$ 45° about point P.

a. Record the Original lengths (first lengths displayed) in the first row of the table below.

Look for patterns.

b. Investigate and mentally make note of the lengths by grabbing and moving each of the three vertices of $\triangle ABC$ (**[A]**, **[B]**, **[C]**) to create different shaped triangles.

Record a set of data observed in row "Figure 1" in the following table.


Repeat and move each of the three vertices and record a set of data in row "Figure 2" below.

Look for patterns among the lengths of corresponding sides.

Rotate 45°	PA	PB	PC	PA'	PB'	PC'
Original						
Figure 1						
Figure 2						

c. Based upon the data in the table above, make a conjecture.

5. Reset the page. Press **Reset** (**[ctrl]** **[del]**).


a. Each person in the group will select a different angle for the step size ( or press **[E]**).
i) 30° ii) 60° iii) -60° iv) -45°

Press the space bar (**[]**) to select that measure and to close the menu.

b. Click on  or press **[Q]** to rotate $\triangle ABC$ about point P through the angle you chose.

Record the Original lengths (first lengths displayed) in the first row of the following table.


Look for patterns.

c. To see all previous images, open the Options menu (press  or **[O]**).

Use the directional arrows (**[↑]** **[↓]** **[←]** **[→]**) to move to the box next to "Historical Images".

Press the space bar key (**[]**) to put a check mark in the box. Press **[enter]** or **[esc]** .



Click on the Multiple Icon  or press **[M]**. Press the down arrow (**▼**) once and press the space bar (**[]**) to select the second choice in the dropdown menu.

- d. Investigate and mentally make note of the lengths by grabbing and moving each of the three vertices of $\triangle ABC$ (**[A]**, **[B]**, **[C]**) to create different shaped triangles. Record a set of data observed in row "Figure 1" in the following table. Repeat and move each of the three vertices and record a set of data in row "Figure 2" below. Look for patterns among the lengths of corresponding sides.

Circle:				PA	PB	PC	PA'	PB'	PC'
i	ii	iii	iv						
Original									
Figure 1									
Figure 2									

- e. Continue to rotate $\triangle ABC$ about point P until it shows 360° on the screen. Look at \overline{PA} and $\overline{PA'}$, \overline{PB} and $\overline{PB'}$, and \overline{PC} and $\overline{PC'}$ as you rotate $\triangle ABC$.
- f. Based upon the data in the table above, is your conjecture still true?

6. $\triangle DEF$ has been rotated 65° about point Z. Answer the following questions.

- a. List 3 pairs of segments that have point Z as one of the endpoints that are congruent.
- b. If $ZD = 5$ cm, then _____ = 5 cm.
- c. If $ZE' = 4$ in, then _____ = 4 in.

7. Define concentric circles.