# Rotations: Lesson 2 Angles & Sides

**Student Activity**

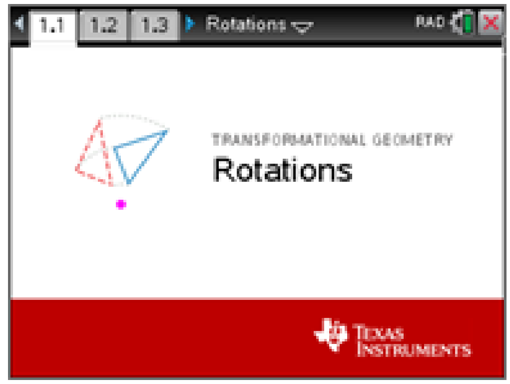
**Name** ______________

**Class** ______________

In this lesson, you will investigate the measures of angles and lengths of sides of triangles that have been rotated in different ways. Open the document: *Rotations.tns.*

**<u>It is important that the Rotations Tour be done before any Rotations lessons.</u>**

PLAY INVESTIGATE EXPLORE DISCOVER



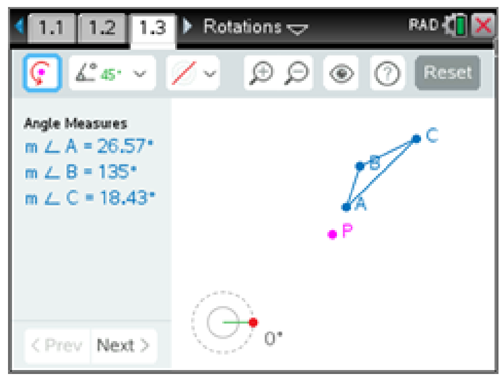

**Move to page 1.3.** ( ctrl ▶ two times)

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

1. Press menu to open the menu.

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

   Press 1 (1: Templates), 2 (2: Angles & Sides).




2. Rotate $\Delta$ABC 45° about point P (click on or press Q).

   Zoom in (+) or out (−) as needed.

   a. Record the Original angle measures (first measures displayed) in the first row of the following table.

   b. Investigate and mentally make note of Angle Measures by grabbing and moving each of the three vertices of $\Delta$ABC (A, B, C) to create different shaped triangles.

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

| **Rotate 45°** | $m\angle A$ | $m\angle B$ | $m\angle C$ | $m\angle A'$ | $m\angle B'$ | $m\angle C'$ |
|---|---|---|---|---|---|---|
| Original | | | | | | |
| Figure 1 | | | | | | |

   c. Discuss observations in your group. Write a conjecture about the angle measures.

d. Click on Next > or press ▢ to see the lengths of the sides of the triangles.
Record the Original side lengths (first measures displayed) in the first row of the following table.

e. Investigate and mentally make note of Side Lengths by grabbing and moving each of the three vertices of $\Delta$ABC (A, B, C) to create different shaped triangles.
Record a set of data observed in row "Figure 1" in the following table.

| **Rotate 45°** | $\overline{AB}$ | $\overline{BC}$ | $\overline{CA}$ | $\overline{A'B'}$ | $\overline{B'C'}$ | $\overline{C'A'}$ |
|---|---|---|---|---|---|---|
| Original | | | | | | |
| Figure 1 | | | | | | |

f. Discuss observations in your group. Write a conjecture about the lengths of the sides.

3. Reset the page. Press Reset ( ctrl del ).
Repeat what was done in exercise 2, but with each person in the group doing a different rotation.
Each person in the group should choose one from the following:

i) Rotate $\Delta$ABC 60° about point P.
ii) Rotate $\Delta$ABC 90° about point P.
iii) Rotate $\Delta$ABC – 60° about point P.
iv) Rotate $\Delta$ABC – 45° about point P.

(Note: to change the angle of rotation, click on ∠° 45° ⌄ or press E to open the menu, and press the space bar (␣) to select that measure and to close the menu.)

Rotate $\Delta$ABC about point P (click on or press Q).

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

b. Investigate and mentally make note of Angle Measures by grabbing and moving each of the three vertices of $\Delta$ABC (A, B, C) to create different shaped triangles.
Record a set of data observed in row "Figure 1" in the following table.

| **Circle: i ii iii iv** | $m\angle A$ | $m\angle B$ | $m\angle C$ | $m\angle A'$ | $m\angle B'$ | $m\angle C'$ |
|---|---|---|---|---|---|---|
| Original | | | | | | |
| Figure 1 | | | | | | |

c. Discuss observations in your group. Is your conjecture about the angle measures still true?

d. Click on Next or press ) to see the lengths of the sides of the triangles.
Record the Original side lengths (first measures displayed) in the first row of the table below.

e. Investigate and mentally make note of Side Lengths by grabbing and moving each of the three vertices of $\Delta$ ABC (A, B, C) to create different shaped triangles.
Record a set of data observed in row "Figure 1" in the following table.

| **Circle: i ii iii iv** | $\overline{AB}$ | $\overline{BC}$ | $\overline{CA}$ | $\overline{A'B'}$ | $\overline{B'C'}$ | $\overline{C'A'}$ |
|---|---|---|---|---|---|---|
| Original | | | | | | |
| Figure 1 | | | | | | |

f. Discuss observations in your group. Is your conjecture about the lengths of the sides still true?

4. Many different triangles have been rotated in several directions.
Generalize explorations and investigations by responding to the following:
   a. If a triangle is rotated about a point through an angle, what appears to be true about the measures of the angles of the pre-image and image triangles?

   b. If a triangle is rotated about a point through an angle, what appears to be true about the lengths of the sides of the pre-image and image triangles?

5. Because the corresponding angles and the corresponding sides of the pre-image and image triangles are congruent, the triangles are congruent.
Therefore, a rotation is a **rigid motion**, or an **isometry**.
We also say that a rotation is a **distance-preserving** and an **angle-preserving** transformation.

6. $\Delta DEF$ has been rotated 75$^{o}$ about a point. Answer the following.

   a. If $m\angle D = 55^o$, $m\angle D' =$ _____________.

   b. If EF = 9 cm, E'F' = _____________.

   c. If $m\angle E = 110^o$, which other angle has a measure of $110^o$? _____________

   d. If DF = 4 in, which other segment has a length of 4 in? ____________