



# Rotations: Lesson 4 Grid & Coordinates

Name \_\_\_\_\_

## Student Activity



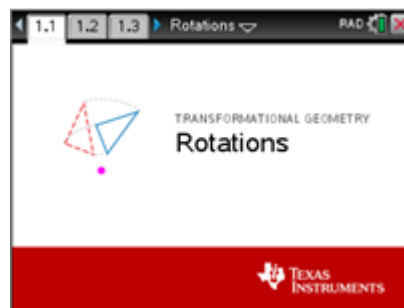
Class \_\_\_\_\_

In this lesson, you will investigate the coordinates of 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)

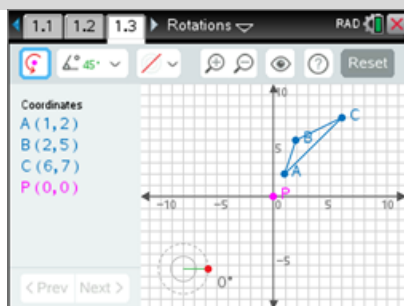
On the handheld, press ► and ◀ to navigate through the pages of the lesson.

(On the iPad®, select the page thumbnail in the page sorter panel.)

1. Press to open the menu.

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

Press (1: Templates), (5: Grid & Coordinates).



2. Rotate a triangle about the origin through angles of  $90^\circ$ ,  $180^\circ$ ,  $270^\circ$ , and  $360^\circ$  and look for patterns among the coordinates.

Change the angle of rotation to  $90^\circ$ . Click on or press to open the menu, and press the space bar () to select  $90^\circ$  and to close the menu.

Click on or press to rotate  $\triangle ABC$   $90^\circ$  about the origin.

- a. Record the Original coordinates (first coordinates displayed) in the first row of the table on the next page. Look for patterns.

- b. Investigate and mentally make note of the coordinates by grabbing and moving each of the three vertices of  $\triangle ABC$  (, , ) 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" in the following table.

**Suggestion:** Move point A to Quadrant II and move point C to Quadrant IV.

Look for patterns among the coordinates of corresponding vertices.

Which coordinates remain the same? Which coordinates change? How? Discuss.



# Rotations: Lesson 4 Grid & Coordinates

Name \_\_\_\_\_

## Student Activity



Class \_\_\_\_\_

Rotate 90°	A	B	C	A'	B'	C'
Original						
Figure 1						
Figure 2						


- c. Using the pattern observed in the previous table, if a point on the pre-image triangle has coordinates (5, 8), what are the coordinates of the corresponding point on the image triangle? That is (5, 8) → \_\_\_\_\_ '→' means "maps to"  
Similarly, the point (− 3, 7) would map to what point? That is (− 3, 7) → \_\_\_\_\_.

- d. In general, if a point on the pre-image triangle has coordinates (x, y), what are the coordinates of the corresponding point on the image triangle?

That is (x, y) → \_\_\_\_\_ '→' means "maps to"

3. Reset the page. Press  (  ).

Change the angle of rotation to 180°. Click on  or press **[E]** to open the menu, and press the space bar (**[ ]**) to select 180° and to close the menu.

Click on  or press **[Q]** to rotate  $\triangle ABC$  180° about the origin.

- a. Record the Original coordinates (first coordinates displayed) in the first row of the following table. Look for patterns.

- b. Investigate and mentally make note of the coordinates 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.

**Suggestion:** Move point A to Quadrant IV and move point C to Quadrant II.

Look for patterns among the coordinates of corresponding vertices.

Which coordinates remain the same? Which coordinates change? How? Discuss.

Rotate 180°	A	B	C	A'	B'	C'
Original						
Figure 1						
Figure 2						



- c. Using the pattern observed in the previous table, if a point on the pre-image triangle has coordinates (5, 8), what are the coordinates of its corresponding point on the image triangle?  
That is (5, 8) → \_\_\_\_\_ '→' means "maps to"


Similarly, the point (− 3, 7) would map to what point? That is (− 3, 7) → \_\_\_\_\_.

- d. In general, if a point on the pre-image triangle has coordinates (x, y), what are the coordinates of its corresponding point on the image triangle?

That is (x, y) → \_\_\_\_\_ '→' means "maps to"

4. Reset the page. Press  (ctrl ).

Change the angle of rotation to 270°. Click on  or press **E** to open the menu, and press the space bar () to select 270° and to close the menu.

Click on  or press **Q** to rotate  $\triangle ABC$  270° about the origin.

- a. Record the Original coordinates (first coordinates displayed) in the first row of the following table. Look for patterns.
- b. Investigate and mentally make note of the coordinates 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.  
**Suggestion:** Move point A to Quadrant II and move point C to Quadrant IV.  
Look for patterns among the coordinates of corresponding vertices.

Rotate 270°	A	B	C	A'	B'	C'
Original						
Figure 1						
Figure 2						

- c. Using the pattern observed in the previous table, if a point on the pre-image triangle has coordinates (5, 8), what are the coordinates of its corresponding point on the image triangle?  
That is (5, 8) → \_\_\_\_\_ '→' means "maps to"





Similarly, the point  $(-3, 7)$  would map to what point? That is  $(-3, 7) \rightarrow$  \_\_\_\_\_.

- d. In general, if a point on the pre-image triangle has coordinates  $(x, y)$ , what are the coordinates of the corresponding point on the image triangle?




That is  $(x, y) \rightarrow$  \_\_\_\_\_ '  $\rightarrow$  ' means "maps to"

5. Reset the page. Press  (  ).

Change the angle of rotation to  $360^\circ$ . Click on  or press  to open the menu, and press the space bar () to select  $360^\circ$  and to close the menu.

Click on  or press  to rotate  $\triangle ABC$   $360^\circ$  about the origin.

- a. Discuss in your groups what you see on the screen.

Investigate and mentally make note of the coordinates by grabbing and moving each of the three vertices of  $\triangle ABC$  (, , ) to create different shaped triangles.

- b. Based upon your observations, to what point would  $(5, 8)$  map? That is  $(5, 8) \rightarrow$  \_\_\_\_\_

- c. In general, the point  $(x, y)$  would map to what point? That is  $(x, y) \rightarrow$  \_\_\_\_\_.

6. Summarize the results of these investigations below:

$\triangle ABC$  is rotated about the origin. The number of degrees of rotation is given below along with the coordinates of a point,  $(p, q)$ , on the pre-image  $\triangle ABC$ .

Write the coordinates of the corresponding point on its image.

- a.  $\triangle ABC$  is rotated  $90^\circ$  about the origin.  $(p, q) \rightarrow$  \_\_\_\_\_

- b.  $\triangle ABC$  is rotated  $180^\circ$  about the origin.  $(p, q) \rightarrow$  \_\_\_\_\_

- c.  $\triangle ABC$  is rotated  $270^\circ$  about the origin.  $(p, q) \rightarrow$  \_\_\_\_\_

- d.  $\triangle ABC$  is rotated  $360^\circ$  about the origin.  $(p, q) \rightarrow$  \_\_\_\_\_



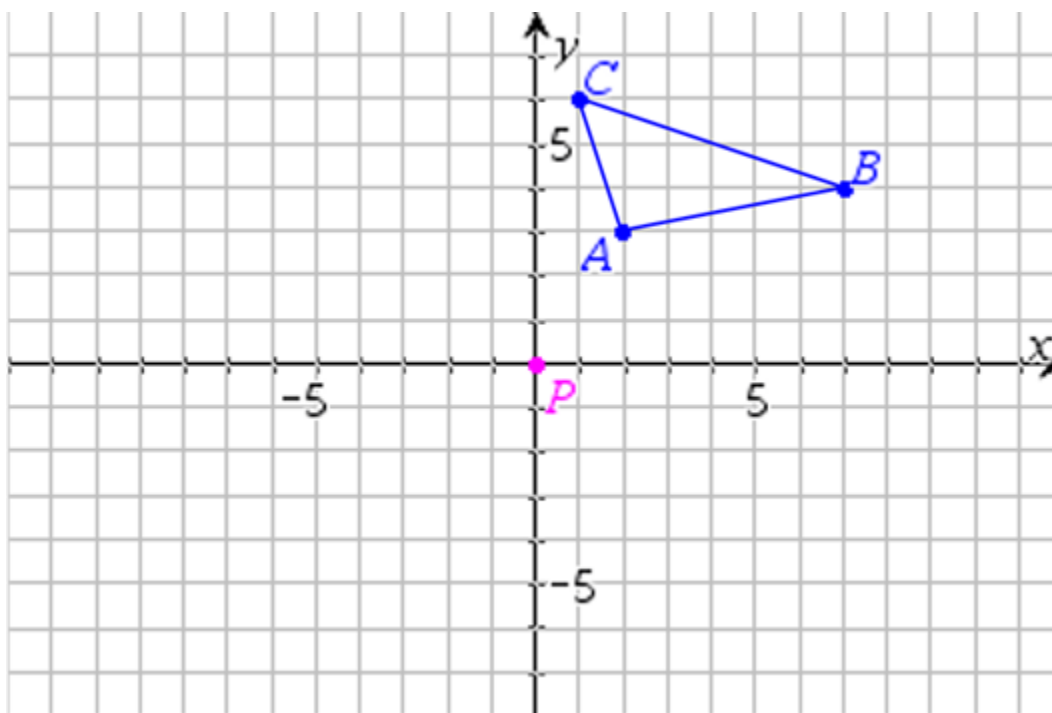
7. Using the results from exercise 6 a – d, perform the following rotations on the grid supplied.

- Rotate  $\triangle ABC$   $90^\circ$  about the origin, P. Label the vertices  $A'$ ,  $B'$ , and  $C'$ .
- Rotate  $\triangle ABC$   $180^\circ$  about the origin, P. Label the vertices  $A''$ ,  $B''$ , and  $C''$ .
- Rotate  $\triangle ABC$   $270^\circ$  about the origin, P. Label the vertices  $A'''$ ,  $B'''$ , and  $C'''$ .

List the coordinates of the points below:

A: \_\_\_\_\_ B: \_\_\_\_\_ C: \_\_\_\_\_  $A'$ : \_\_\_\_\_  $B'$ : \_\_\_\_\_  $C'$ : \_\_\_\_\_

$A''$ : \_\_\_\_\_  $B''$ : \_\_\_\_\_  $C''$ : \_\_\_\_\_  $A'''$ : \_\_\_\_\_  $B'''$ : \_\_\_\_\_  $C'''$ : \_\_\_\_\_



d. What is true about these four triangles? \_\_\_\_\_

e. Draw  $\angle APA'$ . What is the measure of  $\angle APA'$ ? \_\_\_\_\_

f. Draw  $\angle CPC''$ . What is the measure of  $\angle CPC''$ ? \_\_\_\_\_

g. Draw  $\angle BPB'''$ . What is the measure of  $\angle BPB'''$ ? \_\_\_\_\_

h. What is the image of  $\triangle ABC$  when it is rotated  $360^\circ$  about the origin?

\_\_\_\_\_

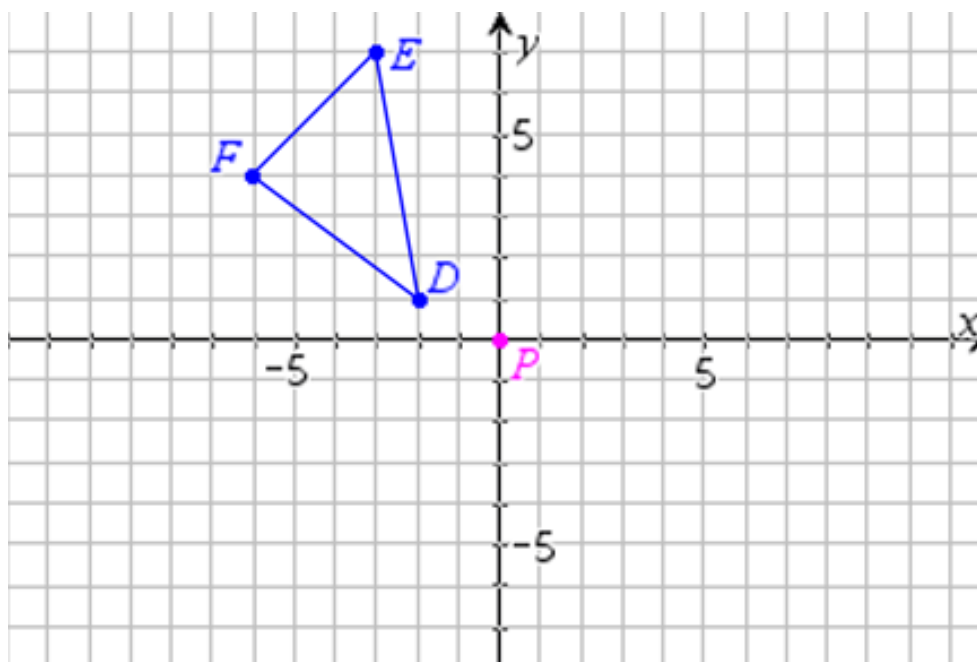


8. Perform the following rotations on the grid supplied.
- Rotate  $\triangle DEF$   $90^\circ$  about the origin, P. Label the vertices  $D'$ ,  $E'$ , and  $F'$ .
  - Rotate  $\triangle DEF$   $180^\circ$  about the origin, P. Label the vertices  $D''$ ,  $E''$ , and  $F''$ .
  - Rotate  $\triangle DEF$   $270^\circ$  about the origin, P. Label the vertices  $D'''$ ,  $E'''$ , and  $F'''$ .

List the coordinates of the points below:

D: \_\_\_\_\_ E: \_\_\_\_\_ F: \_\_\_\_\_  $D'$ : \_\_\_\_\_  $E'$ : \_\_\_\_\_  $F'$ : \_\_\_\_\_

$D''$ : \_\_\_\_\_  $E''$ : \_\_\_\_\_  $F''$ : \_\_\_\_\_  $D'''$ : \_\_\_\_\_  $E'''$ : \_\_\_\_\_  $F'''$ : \_\_\_\_\_



- What is true about these four triangles? \_\_\_\_\_
- Draw  $\angle DPD'$ . What is the measure of  $\angle DPD'$ ? \_\_\_\_\_
- Draw  $\angle D''PD'''$ . What is the measure of  $\angle D''PD'''$ ? \_\_\_\_\_
- Draw  $\angle E'PE'''$ . What is the measure of  $\angle E'PE'''$ ? \_\_\_\_\_
- What is the image of  $\triangle DEF$  when it is rotated  $360^\circ$  about the origin?  
\_\_\_\_\_