



## Rotations: Lesson 5 Grid & Coordinates 2

Name \_\_\_\_\_

### Student Activity

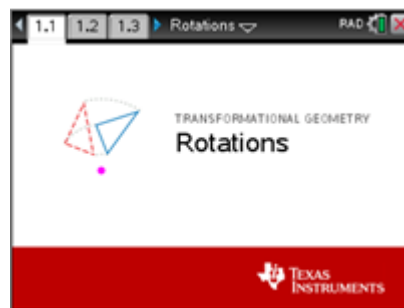


Class \_\_\_\_\_

In this lesson, you will continue to investigate the coordinates of vertices of rotated triangles and look for patterns.

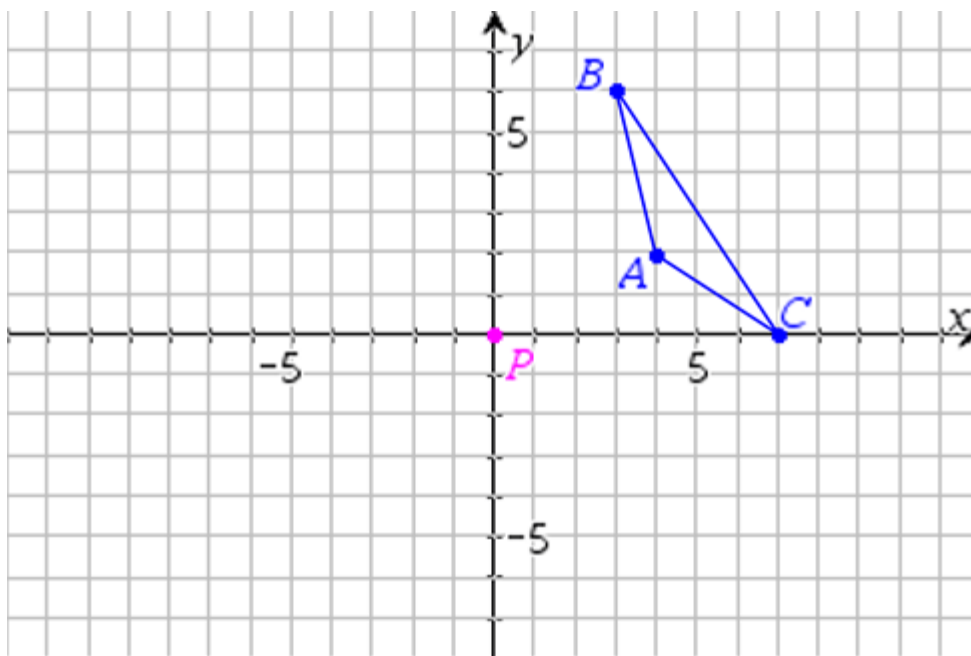
Open the document: *Rotations.tns*.

**It is important that Rotations Lesson 4 be completed before doing this Lesson.**



PLAY INVESTIGATE EXPLORE DISCOVER

1.



#### Recall from Lesson 4:

$\triangle ABC$  is rotated  $n^\circ$  about the origin. Use the grid above to help write the coordinates of the vertices of the image triangles in the table below.

$n^\circ$			
$0^\circ$	A: (4, 2)	B: (3, 6)	C: (7, 0)
$90^\circ$	A':	B':	C':
$180^\circ$	A'':	B'':	C'':
$270^\circ$	A''':	B''':	C''':
$360^\circ$	A <sup>(4)</sup> :	B <sup>(4)</sup> :	C <sup>(4)</sup> :



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Check your answers in the previous table by using the *Rotations.tns* file in exercise 2 below.

**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.)

2. Press to open the menu.

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

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

Grab and move each of the three vertices of  $\triangle ABC$

(, , ) so that: A: (4, 2) B: (3, 6) C: (7, 0)



3. To check your answers, 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 close the menu.

Make corrections as needed.

a. Click on or press to rotate  $\triangle ABC$   $90^\circ$  about the origin.  
Compare the ordered pairs listed on the screen to the ones in the table on the previous page.

b. Click on or press to rotate  $\triangle ABC$  an additional  $90^\circ$  about the origin, a total of  $180^\circ$ .  
Compare the ordered pairs listed on the screen to the ones in the table on the previous page.

c. Click on or press to rotate  $\triangle ABC$  an additional  $90^\circ$  about the origin, a total of  $270^\circ$ .  
Compare the ordered pairs listed on the screen to the ones in the table on the previous page.

d. Click on or press to rotate  $\triangle ABC$  an additional  $90^\circ$  about the origin, a total of  $360^\circ$ .  
Compare the ordered pairs listed on the screen to the ones in the table on the previous page.








4. Reset the page. Press ( ).

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. Look at the coordinates of corresponding vertices. Does each point (x, y) on  $\triangle ABC$  map to  $(-y, x)$  on  $\triangle A'B'C'$ ?



- b. Grab and move point P (click on point P or press  and use the directional arrows) and look at the coordinates of corresponding vertices. Move point P to several places on the grid. Does each point  $(x, y)$  on  $\triangle ABC$  always map to  $(-y, x)$  on  $\triangle A'B'C'$ ? Explain.
- c. Click on  or press  to rotate  $\triangle ABC$  an additional  $90^\circ$  about point P, a total of  $180^\circ$ . Move point P to several places on the grid. (click on point P or press  and use the directional arrows) Does each point  $(x, y)$  on  $\triangle ABC$  always map to  $(-x, -y)$  on  $\triangle A'B'C'$ ? Explain.
- d. Move point P back to the origin (click on point P or press  and use the directional arrows). Does each point  $(x, y)$  on  $\triangle ABC$  now map to  $(-x, -y)$  on  $\triangle A'B'C'$ ? Explain.
- e. Click on  or press  to rotate  $\triangle ABC$  an additional  $90^\circ$  about point P, a total of  $270^\circ$ . Move point P to several places on the grid. Does each point  $(x, y)$  on  $\triangle ABC$  always map to  $(y, -x)$  on  $\triangle A'B'C'$ ? Explain.
- f. Move point P back to the origin. Does each point  $(x, y)$  on  $\triangle ABC$  now map to  $(y, -x)$  on  $\triangle A'B'C'$ ? Explain.
- g. Discuss in your groups and make a generalization.

5. Reset the page. Press  (   ).

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.



- Record the Original coordinates (first coordinates displayed) in the first row of the following table. Look for patterns.
- 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.  
Look for patterns among the coordinates of corresponding vertices.  
Which coordinates remain the same? Which coordinates change? How? Discuss.

Rotate – $90^\circ$	A	B	C	A'	B'	C'
Original						
Figure 1						
Figure 2						

- 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)  $\rightarrow$  \_\_\_\_\_ '  $\rightarrow$  ' means "maps to"
- Similarly, the point (– 3, 7) would map to what point? That is (– 3, 7)  $\rightarrow$  \_\_\_\_\_.
- 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)  $\rightarrow$  \_\_\_\_\_ '  $\rightarrow$  ' means "maps to"
- Rotating a triangle –  $90^\circ$  about the origin is equivalent to a different rotation. Explain.
- What rotation is equivalent to rotating a triangle –  $180^\circ$  about the origin?
- What rotation is equivalent to rotating a triangle –  $270^\circ$  about the origin?