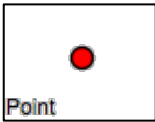



## ROTATE A POINT

1. Open [geometricfunctions.org/links/rotate-family/](http://geometricfunctions.org/links/rotate-family/) and tap “Investigate 1.”



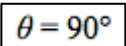
2. To create independent variable  $x$ , tap the  tool. Click or drag to locate independent variable  $x$  in the sketch. Then drag  $x$  around in the sketch.

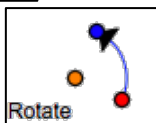


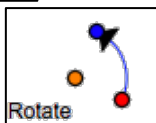
3. To create a center and angle for rotation, tap the  tool. Click or drag to place center  $C$ , and click again to place angle measurement  $\theta$ .

**Q1** Drag point  $\theta$  (not the measurement) and notice how its measurement changes. What is the smallest value you can make? What is the largest value you can make?

Smallest value:	Largest value:
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4. Set  $\theta$  to  $90^\circ$ : .



5. To rotate  $x$ , tap the  tool. Attach glowing point  $x$  to your existing point  $x$ . The dependent variable,  $R_{C,\theta}(x)$ , is the “rotation about  $C$  by  $\theta$  of  $x$ .”

**Q2** Turn on tracing, vary  $x$  to make a shape, and draw the traces on the left. (Also show your center and angle value.) Do the same on the right, but use a different angle.

$\theta =$ 	$\theta =$ 
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**Q3** Compare the speed of  $x$  and  $R_{C,\theta}(x)$ . Which one is faster, or do they move with the same speed?

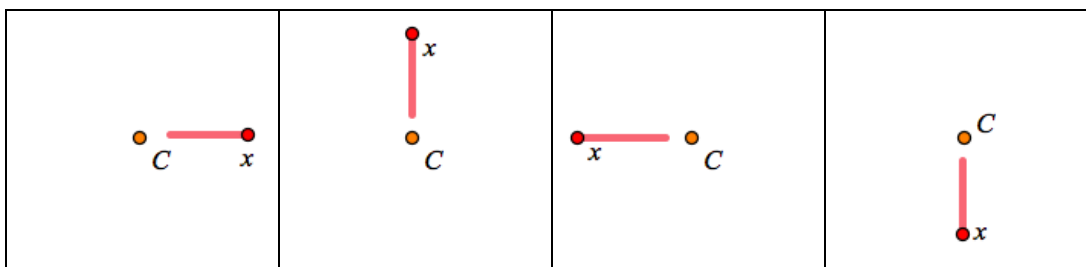
(Dragging  $C$  or  $\theta$  changes the function rule, so turn tracing off when you move them.)

## Rotation Challenges 1

- Q4** Choose a new angle and center point, and trace a new pattern. Try to include fixed points. How many fixed points could you find? Where were they?

$\theta =$ My traces:	What I noticed about rotation fixed points:
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- Q5** Set the angle to  $90^\circ$ . Then start with  $x$  near  $C$  and drag  $x$  to the right. Use the first box to draw where  $R_{C,\theta}(x)$  went. Fill in the other boxes the same way.



What do you notice about these four patterns?

- Q6** Trace a new pattern using  $\theta = 180^\circ$ . Draw your pattern on the left, and write what you noticed on the right. Don't forget to mark point  $C$  in your drawing.

My pattern:	What I noticed:
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- Q7** Change your function to try to match each picture below. In each box, draw a point to show where you put the center, and write the angle you used. Try to match all 5!

