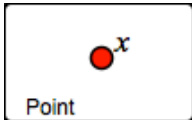
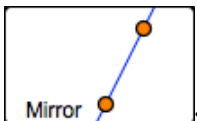


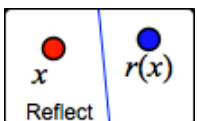
## REFLECT A POINT



1. In the toolbox, tap . Then tap in the sketch, and  $x$  is placed!

2. Drag variable  $x$  around the screen.

3. Tap . Tap or drag both glowing points.

4. Tap . Attach the glowing  $x$  to the original  $x$ . The dependent variable is the *reflection* across line  $j$  of  $x$ . It's called  $r_j(x)$  for short.

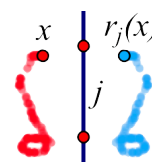
**Q1** Make mirror  $j$  vertical, and then drag variable  $x$  up. Which way does  $r_j(x)$  go? Draw a sketch to show what happened.



Drag independent variable  $x$  left. Which way does the dependent variable  $r_j(x)$  go? Draw a sketch to show what happened.



- Q2** Trace an interesting shape and describe it. How are the blue  $r_j(x)$  traces similar to the red  $x$  traces, and how are they different? Include a drawing showing your shapes.



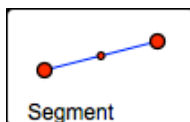
- Q3** Erase the tracing and do a new one. What happens when you drag  $x$  across the mirror? Describe the traced shapes, and include a drawing on your paper.



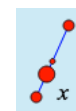
## MATCH THE TRACES



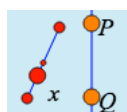
5. On page 2, construct a segment.

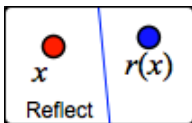


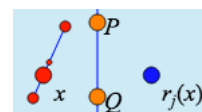
6. Construct  $x$  attached to the segment, **but not on the end points or midpoint**. Drag  $x$  to make sure it's attached.



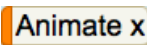
7. Construct a vertical mirror.

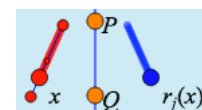


8. Tap . Attach the glowing  $x$  to the original  $x$ .

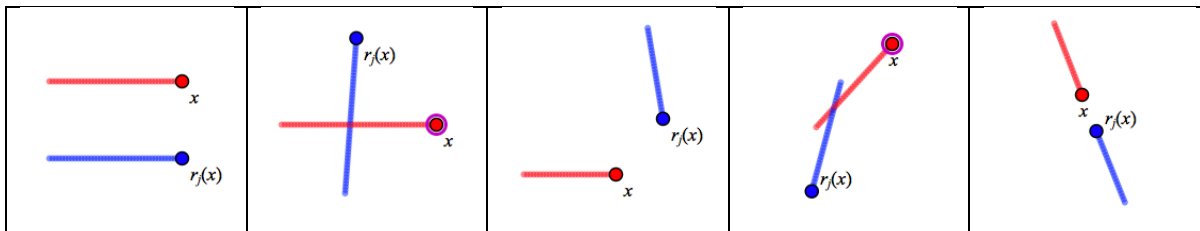


9. Tap  and attach the glowing  $x$  to the original  $x$ .

10. Notice the  button. Tap it. Then turn tracing on. The red traces show the *domain*. The blue traces show the *range*.



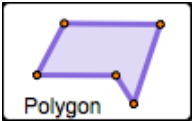
- Q4** Move the mirror and the segment, and use tracing to match the pictures below. In each box, draw a line to show where you put the mirror. Try to match all 5!



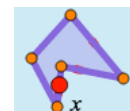
- Q5** Describe the method(s) you used to place the mirrors. Did you develop new tricks as you did the five challenges?

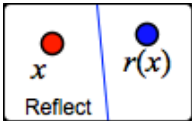
## RESTRICT THE INDEPENDENT VARIABLE TO A POLYGON

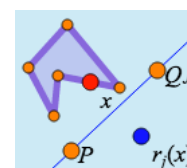


11. On page 3, tap  to make a polygon. Tap to place each glowing point.

12. Construct independent variable  $x$  on the polygon. Drag  $x$  to make sure it's attached. (The polygon is now the domain.)



13. Construct a mirror. Then tap  and attach the glowing  $x$  to the original  $x$ .



14. Turn on tracing and drag or animate  $x$ . Adjust the polygon to make an interesting shape.

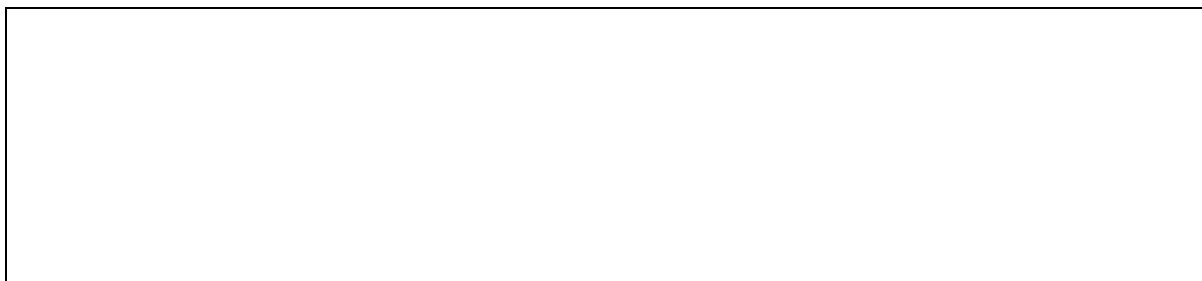
- Q6** Adjust your mirror so you can get  $x$  and  $r_j(x)$  in the same place at the same time. A place like this is called a *fixed point* of the function. Adjust your polygon and mirror so there are two fixed points. Erase your traces and then animate. Draw a sketch below to show what you did.

- Q7** Adjust the domain (the polygon) so that on one side of the polygon the variables move in the same direction, and on another side they move in opposite directions. Draw a sketch to show how you did it.



## REFLECTION CHALLENGES

- Q8** On page 4, figure out where the mirror is that is reflecting the domain and range. How can you check your guess to be sure? Draw your solution below.



- Q9** On pages 5 and 6, there are two more find-the-hidden-mirror challenges. Solve them, and describe your methods. Draw a sketch for each solution. Which challenge was harder? Why?



- Q10** On page 7, find the mirror that reflects independent variable  $x$  to dependent variable  $f(x)$ . Draw your solution below.

