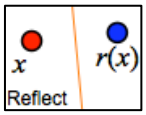
Reduce the Dimension 1 Names:

Geometric functions normally live in Flatland, but in this activity you will take them to visit Lineland. First you'll review how they behave in Flatland.

REFLECT AND DILATE IN FLATLAND

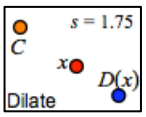
1. Open http://geometricfunctions.org/links/reduce-the-dimension/ and go to page 2.

2. Construct a 

function. Adjust the mirror so it's vertical, and turn on tracing.

Q1 Drag *independent variable x* and notice the rate of change of *dependent variable* $r_m(x)$. Draw a design with vertical and horizontal lines, and fill in the table below.

Reflect Sketch	**When I drag *x*…**	**the speed of $r_m(x)$ is… (faster, slower, the same)**	**and the direction of $r_m(x)$ is…**
	up		
	down		
	right		
	left		

Q2 On page 3 construct a 

function. Choose a scale factor, and fill in the table.

Dilate Sketch, s = _____	**When I drag *x*…**	**the speed of $D_{C,s}(x)$ is… (faster, slower, the same)**	**and the direction of $D_{C,s}(x)$ is…**
	up		
	down		
	right		
	left		

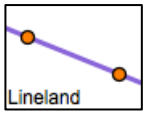
CONJECTURE

Q3 Think about your results for these two transformations (reflection and dilation). How hard would it be for each of them to fit into Lineland? Write your prediction below.

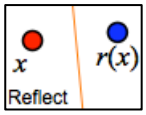
Reduce the Dimension 2 Names:

When you take the reflect and dilate functions to visit Lineland, you'll find that one of them will feel quite at home in Lineland, but the other won't fit in nearly as well.

REFLECT AND DILATE IN LINELAND

3. On page 4, construct 

. This is your restricted domain.

4. Use the 

tool and attach independent variable x to Lineland.

Q4 Turn on tracing, vary x. and draw your result on the left. Try to adjust the mirror so that $r_m(x)$ also stays on the line. Draw your best effort below on the right.

Reflect Sketch 1	**Reflect Sketch 2**

5. On page 5 do the same thing for a dilate function. (Attach point C to the line.)

Q5 Turn on tracing, vary x. and draw your result below in "Sketch 1." Independent variable x stays on the line. Try to adjust center point C so that $D_{C,s}(x)$ also stays on the line. Draw your best effort below in "Sketch 2."

Dilate Sketch 1	**Dilate Sketch 2**

Q6 Which function fits better into Lineland? Explain.

Reduce the Dimension 3 Names:

When you take the rotate and translate functions to visit Lineland, which one fits in better?

ROTATE AND TRANSLATE IN LINELAND

Q7 On pages 6 and 7 experiment with rotate and translate functions in Lineland. Attach point *C* (page 6) and vector *v* (page 7) to the line. Put your drawings below.

Rotate Sketch 1	**Rotate Sketch 2**
Translate Sketch 1	**Translate Sketch 2**

Q8 Which function fits better into Lineland? Explain.

Q9 To check your results, tap the link for the Mess-Up sketch. Follow the directions on each page, and write your conclusions below.

Reflection (p4):

Dilation (p5):

Rotation (p6):

Translation (p7):