

STRAND 2: LINEAR FUNCTIONS

TOPIC 2.8: REFLECTIONS

Topic Notes

Mathematical focus

Participants will examine the effects of reflections on the slope of lines.

Topic overview

In this activity, participants will show how reflections about the x -axis, the y -axis, and the line $y=x$ affect the slope of a vertical line, a horizontal line, and a slanted line. The final activity instructs the participants in how to write a program in their graphing calculator to animate the quadrilaterals that are found in this activity.

This topic includes 6 tasks:

Task 2.8.1: Reflections

Task 2.8.2: Reflecting About the y -axis

Task 2.8.3: Reflecting About the x -axis

Task 2.8.4: Reflecting About the Line $y=x$

Task 2.8.5: Reflections Summary

Task 2.8.6: Animating Your Reflections

TE x ES standards focus

TE x ES Standard II.005 Patterns and algebra. The teacher understands attributes of functions, relations, and their graphs. The beginning teacher:

(D) Identifies and analyzes even and odd functions, one-to-one functions, inverse functions, and their graphs.

(E) Applies basic transformations [e.g., $k f(x)$, $f(x) + k$, $f(x - k)$, $f(kx)$] to a parent function, f , and describes the effects on the graph of $y = f(x)$.

TE x ES Standard III.014 Geometry and measurement. The teacher understands coordinate, transformational, and vector geometry and their connections. The beginning teacher:

(A) Identifies transformations (i.e., reflections, translations, glide-reflections, rotations, dilations) and explores their properties.

(C) Uses transformations to explore and describe reflectional, rotational, and translational symmetry.

TEKS/TAKS focus

TEKS A.6 Linear functions. The student understands the meaning of the slope and intercepts of the graphs of linear functions and zeros of linear functions and interprets and describes the effects of changes in parameters of linear functions in real-world and mathematical situations.

The student is expected to:

(D) graph and write equations of lines given characteristics such as two points, a point and a slope, or a slope and y-intercept.

High School TAKS Objective 3: The student will demonstrate an understanding of linear functions.

(8.6) Geometry and spatial reasoning. The student uses transformational geometry to develop spatial sense. The student is expected to:

(B) Graph dilations, reflections, and translations on a coordinate plane.

High School TAKS Objective 6: The student will demonstrate an understanding of geometric relationships and spatial reasoning.

Materials

Task	#1	#2	#3	#4	#5	#6
Copies of the Reflections task	x	x	x	x	x	x
Graphing calculator						x

Procedure

This activity may be done in groups or individually. Participants should be allowed to discover on their own what happens to the different segments of the quadrilateral.

Summary

After completing this task, participants will see that reflections about the x-axis or about the y-axis has no effect on the slope of a horizontal line or on a vertical line. Line segments with slopes of p/q will become line segments with slope $-p/q$. Reflections about the line $y=x$ will result is a horizontal line becoming vertical and vice versa. Participants also will see that lines with slope p/q will become lines with slope q/p .

Assessment/Transition to the classroom

Participants should complete the Teacher's Journal, recording their responses and making any modifications necessary to make the tasks completely classroom ready.