

Performance Based Learning and Assessment Task

Picturing Lines

I. ASSESSMENT TASK OVERVIEW & PURPOSE:

In this activity, students will start off with a picture provided by the teacher. Each student will be asked to find lines with different types of slopes such as positive, negative, zero, and undefined. Next, the students will find the equation for each line they chose. From there, students will be finding or creating pictures with different slopes. They will place a grid on each example and find the equation of that line. After completing this activity, students will be able to describe different types of slopes and how to write an equation of a line.

II. UNIT AUTHOR:

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III. COURSE:

Algebra 1

IV. CONTENT STRAND:

Algebra

V. OBJECTIVES:

Given a graph of a line, the learner will be able to determine the type of slope (positive, negative, zero, undefined).

Given a graph of a line, the learner will be able to calculate the slope of a given line.

Given a graph of a line, the learner will be able to determine the y – intercept of a given line.

Given a graph of a line, the learner will be able to write the equation of a given line.

Given a picture, the learner will be able to visualize different line types in real – life situations.

VI. REFERENCE/RESOURCE MATERIALS:

- | | |
|------------------------|------------------------------|
| - Ruler | - Graphing calculator |
| - Attached worksheets | - Rubric |
| - Camera (optional) | - Computer/laptop/Chromebook |
| - Colored pencils/pens | |

VII. PRIMARY ASSESSMENT STRATEGIES:

The rubric for the project is attached. Students will complete all worksheets prior to starting their project. Students will also be evaluated on their presentation of their project and the accuracy of their project.

VIII. EVALUATION CRITERIA:

Students will be evaluated on finding and writing the equation for eight different lines in the picture provided by the teacher. Students will also be evaluated on their project and presentation. The rubric consisting of these criteria is attached.

IX. INSTRUCTIONAL TIME:

Two ninety minute blocks

Picturing Lines

Strand

Algebra

Mathematical Goals and Objective(s)

Students will first find lines in a given picture to represent four types of slope (positive, negative, zero, and undefined). They will then calculate the slope and y – intercept of each line. Next, students will write the equations of the lines they chose. Students will be required to successfully write the equation for eight lines of their choice (two of each type). Students will then create or find pictures to create examples of all types of lines and place these into a presentation. Students will then present their project to the class.

Related SOL

- Algebra 6.A (The student will graph linear equations and linear inequalities in two variables, including determining the slope of a line when given an equation of the line, the graph of the line, or two points on the line. Slope will be described as rate of change and will be positive, negative, zero, or undefined)
- Algebra 6.B (The student will graph linear equations and linear inequalities in two variables, including writing the equation of a line when given the graph of the line, two points on the line, or the slope and point on the line)

NCTM Standards

- Understand relations and functions and select, convert flexibly among, and use various representations for them
- Apply and adapt a variety of appropriate strategies to solve problems
- Communicate mathematical thinking coherently and clearly to peers, teachers, and others

Materials/Resources

- Ruler
- Graphing calculator
- Attached worksheets
- Rubric
- Camera (optional)
- Computer/laptop/Chromebook
- Colored pencils/pens

Assumption of Prior Knowledge

- Students will be expected to be able to determine if a line has positive, negative, zero, or undefined slope.
- Students should be able to calculate the slope of a line given the graph of the line.
- Students should be able to find or calculate the y – intercept of a line given the graph of the line.
- Students should be able to write the equation of a line given the graph of the line.
- Students should have some knowledge of how to create or find pictures.
- Students should know how to create a project presentation on a computer/laptop/Chromebook.

Introduction: Setting Up the Mathematical Task

In this activity, students will investigate the use of different types of lines in real – life settings. Students will work individually on “Lines in Real – Life Worksheet.” This worksheet should take approximately 45 minutes. When finished, the teacher should check their work to ensure understanding. If a student has misunderstandings, the teacher will prompt them with questions to fix their misunderstandings. Prompts may include “What do you know about positive/negative/zero/undefined slopes?”, “Explain to me what slope means and how you might go about finding the slope of a given graph?”, “How might you go about finding the y – intercept of a graph?”, etc. Students will then be given the project requirements along with the rubric. Students will be encouraged to use their resources (cell phone camera, laptop, etc.) to find or create pictures with different slopes. The creation of the project should take approximately 90 minutes. Upon completion of the project, students will present their project to the class. Each presentation should be no more than five minutes.

Student Exploration

Individual Work

- Students will complete “Lines in Real-Life Worksheet”
- Students will complete “Project Assignment” individually upon completion of the worksheet

Whole Class Sharing

- Students will present their “Project Assignment” to the class

Teacher Actions

- Teachers will
 - monitor progress on worksheet and steer students in the right direction
 - check the worksheet for correctness
 - monitor progress on the project assignment
 - grade presentation based on rubric

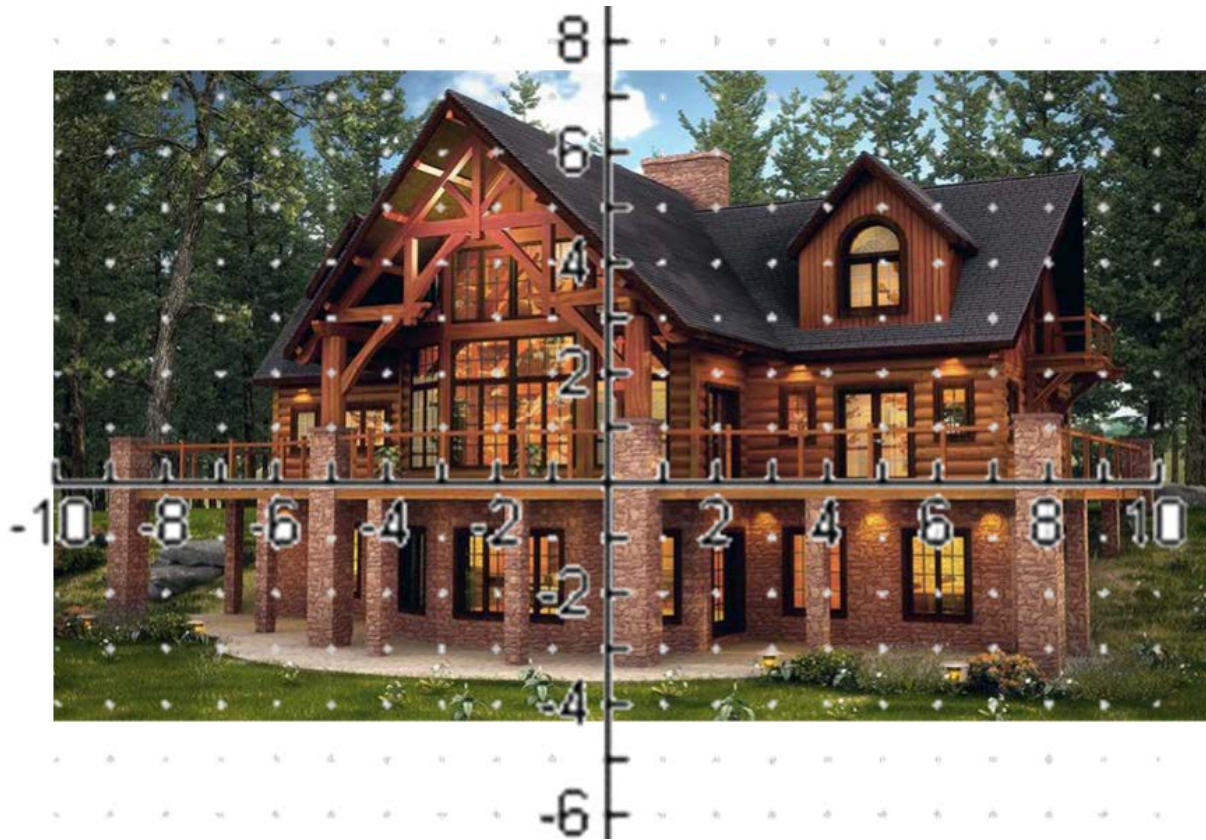
Monitoring Student Responses

- Teachers will prompt with the following questions
 - “What do you know about positive/negative/zero/undefined slopes?”
 - “Explain to me what slope means and how you might go about finding the slope of a given graph?”
 - “How might you go about finding the y – intercept of a graph?”
- Teachers will ask students to rate themselves on a scale of 1 to 5 (1 being not at all and 5 being perfectly) on how well they understand each type of slope

Assessment List and Benchmarks

Students will be assessed at each stage of the activity with the worksheet and rubrics that follow. As the worksheet is completed, it will be checked and discussed to ensure understanding for the main activity.

Lines in Real – Life Worksheet

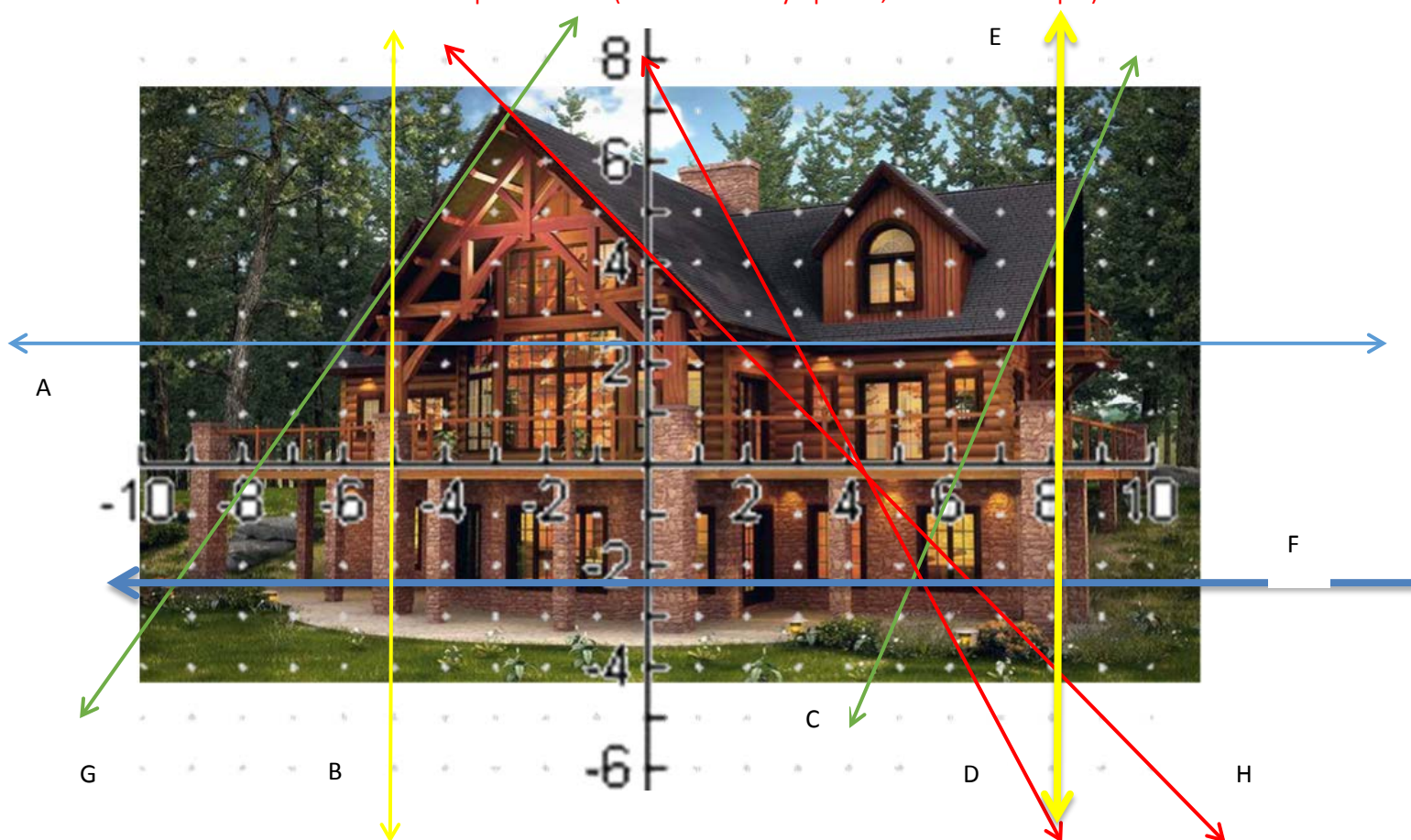


1. Using the above picture, mark two lines with positive slope using the color green. How do you know these lines have positive slope? Explain your reasoning. Show your calculations for each line.
2. Using the above picture, mark two lines with negative slope using the color red. How do you know these lines have negative slope? Explain your reasoning. Show your calculations for each line.
3. Using the above picture, mark two lines with a slope of zero using the color blue. How do you know these lines have a slope of zero? Explain your reasoning. Show your calculations for each line.
4. Using the above picture, mark two line with undefined slope using the color yellow. How do you know these lines have undefined slope? Explain your reasoning. Show your calculations for each line.

Label each line you chose using the letters A – H. Then fill in the table below.

	Type of Slope	Numerical Value of Slope	y – intercept	Equation of the Line
Line A				
Line B				
Line C				
Line D				
Line E				
Line F				
Line G				
Line H				

Lines in Real – Life Worksheet Sample Answers (There are many options, so this is a sample)



1. Using the above picture, mark two lines with positive slope using the color green. How do you know these lines have positive slope? Explain your reasoning. Show your calculations for each line.

When looking at the lines from left to right, the lines are going upward. The slope “m” would be a positive number. Line C passes through the points (6,0) and (7,2) so $m = \frac{2-0}{7-6} = \frac{2}{1} = 2$. Line G passes through the points (-9,-2) and (-7,1) so $m = \frac{1-(-2)}{-7-(-9)} = \frac{3}{2}$.

2. Using the above picture, mark two lines with negative slope using the color red. How do you know these lines have negative slope? Explain your reasoning. Show your calculations for each line.

When looking at the lines from left to right, the lines are going downward. The slope “m” would be a negative number. Line D passes through the points (2,4) and (3,2) so $m = \frac{2-4}{3-2} = \frac{-2}{1} = -2$. Line H passes through the points (4,0) and (5,-1) so $m = \frac{-1-0}{5-4} = \frac{-1}{1} = -1$.

3. Using the above picture, mark two lines with a slope of zero using the color blue. How do you know these lines have a slope of zero? Explain your reasoning. Show your calculations for each line.

Lines that have a slope of zero are horizontal lines. The slope “m” would be zero. Line A passes through the points (-8,2.5) and (0,2.5) so $m = \frac{2.5-2.5}{0-(-8)} = \frac{0}{8} = 0$. Line F passes through the points (0,-2.5) and (4,-2.5) so $m = \frac{-2.5-(-2.5)}{4-0} = \frac{0}{4} = 0$.

4. Using the above picture, mark two line with undefined slope using the color yellow. How do you know these lines have undefined slope? Explain your reasoning. Show your calculations for each line.

Vertical lines have undefined slope. The value of m is undefined. Line B passes through the points $(-5,2)$ and $(-5,4)$ so $m = \frac{4-2}{-5-(-5)} = \frac{2}{0} = \text{undefined}$. Line E passes through the points $(8,6)$ and $(8,0)$ so $m = \frac{0-6}{8-8} = \frac{-6}{0} = \text{undefined}$.

Label each line you chose using the letters A – H. Then fill in the table below.

	Type of Slope	Numerical Value of Slope	y – intercept	Equation of the Line
Line A	Zero	0	2.5	$y = 2.5$
Line B	Undefined	Undefined	No y – intercept	$x = -5$
Line C	Positive	2	-12	$y = 2x - 12$
Line D	Negative	-2	8	$y = -2x + 8$
Line E	Undefined	Undefined	No y – intercept	$x = 8$
Line F	Zero	0	-2.5	$y = -2.5$

Line G	Positive	$\frac{3}{2}$	12	$y = \frac{3}{2}x + 12$
Line H	Negative	-1	4	$y = -x + 4$

Project Assignment

Your project should consist of four pictures. Each picture should depict a different type of slope (positive, negative, zero, undefined). To illustrate the line in which you are using, draw a line to emphasize it. You are to determine the slope, y-intercept, and equation of each line. You are then to write the equation of each line. To do this, you will need to place a coordinate plane on the picture. You will be graded on the following criteria.

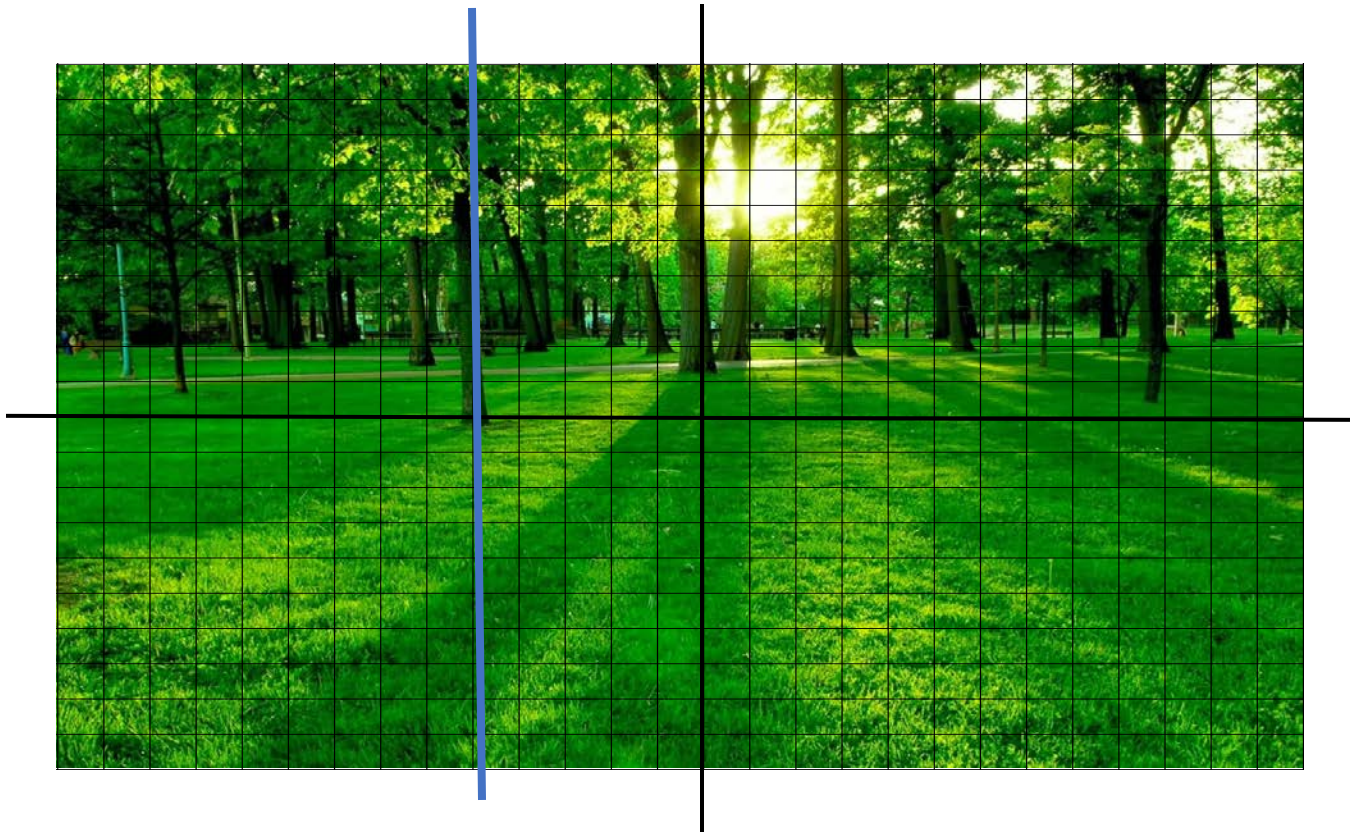
Worksheet	Self-Assessment	Your Grade	Points Possible
- Did you find all the types of slope?			12 Points (3 points per type)
- Did you find the correct number of lines?			8 Points (1 point per line)
- Was your slope for each line correct?			8 Points (1 point per line)
- Was your y-intercept for each line correct?			8 Points (1 point per line)
- Were your equations for each line correct?			16 Points (2 points per line)
Presentation Assignment			
- Did you find one picture for each type of slope?			8 Points (2 points per picture)
- Did you show the line on top of the picture with a grid?			4 Points (1 point per line)
- Were your equations for type of slope correct?			12 Points (3 points per line)
- Was your presentation creative and well thought out?			24 Points (12 points for presenting and 12 for creativity)
	Your Total Points	Your Total Points	Total Points Possible 100 Points

Horizontal Lines with slopes of 0



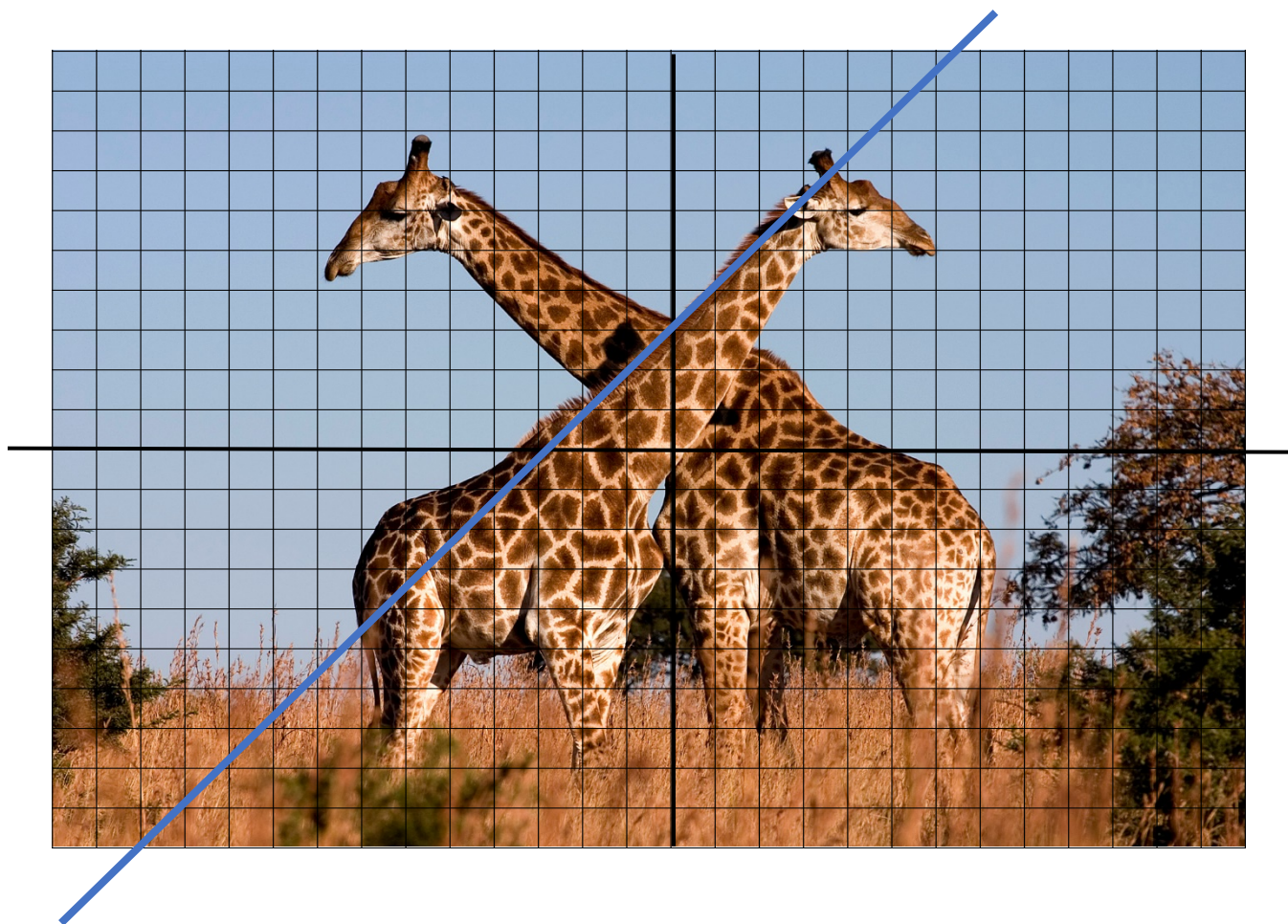
There is the top of the house indicated with the blue line that has a slope of zero and a y-intercept of 6. The equation of that line would be $y = 0x + 6$ or $y = 6$.

Vertical Lines with an undefined slope



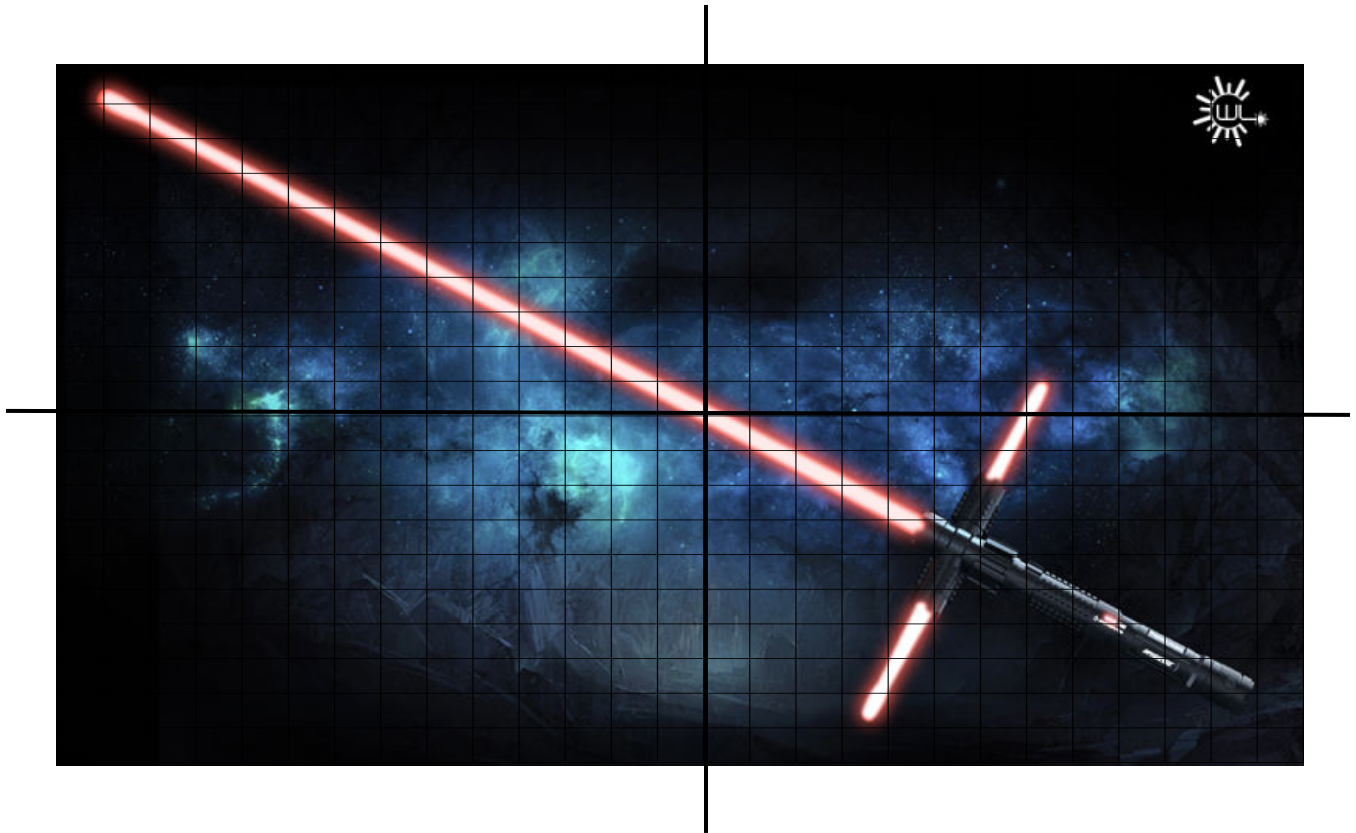
The trees are all vertical. The one indicated by the blue line has an undefined slope and does not have a y-intercept. The tree does have a x-intercept of -5. The equation would be $x = -5$ because for every y value the x value is always -5.

Positive Slope



The slope of the giraffes indicated by the blue line is positive. It has a slope 1 and a y-intercept of 3. The equation of the line is $y = 1x + 3$ or $y = x + 3$.

Negative Slope



The slope of the lightsaber is $-\frac{2}{3}$ and it has a y-intercept of 0. The equation of this line would be $y = -\frac{2}{3}x + 0$ or $y = -\frac{2}{3}x$.

Rubric for Project

Worksheet	Self-Assessment	Your Grade	Points Possible
- Did you find all the types of slope?			12 Points (3 points per type)
- Did you find the correct number of lines?			8 Points (1 point per line)
- Was your slope for each line correct?			8 Points (1 point per line)
- Was your y-intercept for each line correct?			8 Points (1 point per line)
- Were your equations for each line correct?			16 Points (2 points per line)
Presentation Assignment			
- Did you find one picture for each type of slope?			8 Points (2 points per picture)
- Did you show the line on top of the picture with a grid?			4 Points (1 point per line)
- Were your equations for type of slope correct?			12 Points (3 points per line)
- Was your presentation creative and well thought out?			24 Points (12 points for presenting and 12 for creativity)
	Your Total Points	Your Total Points	Total Points Possible 100 Points

Number	Element	Point Value	Self-Graded	Teacher Grade
1	The Template is complete	8	8	
2	All materials and answer keys for the task are included	12	12	
3	The Template and materials are organized and structured	8	8	
4	The task is inquiry based	4	4	
5	The task is connected to the real world	6	6	
6	The task requires higher order thinking skills/levels of cognitive demand	4	4	
7	The task is based on the SOL's and NCTM Standards	6	6	
8	The assessment is provided and is followed both by students and teacher	12	12	
9	The benchmark of exemplary student work is included	6	6	
10	The document is professionally presented	6	6	
Total		72	72	

Rubric