

DISCOVERING ALGEBRA WITH GRAPHING CALCULATORS

Finding the Slope of a Line Teacher's Guide



Grade Level: 9–12 **Curriculum Focus:** Math **Running Time:** 25 minutes

Program Description

Investigates how slope measures change in linear relationships. Students learn how to use the graphing calculator to find the slope using graphs, a selection of two points, or an equation. A pilot discusses the importance of slope in flying a plane.

Learning Objectives

After viewing the program and participating in discussion, students will be able to:

- Define the concept of slope;
 - Identify the slope-intercept form of a linear equation as $y = mx + b$;
 - Use point-slope form to determine the equation of a line;
 - Illustrate positive and negative slope graphically;
 - Apply algebra to real-world situations and develop logical reasoning skills.
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Classroom Connections

What is slope? Use concept mapping to associate mathematical and science terms with slope.

How does a negative or positive coefficient of x in an equation in slope-intercept form affect the slope of line? Why can't the equation of a vertical line be written in slope-intercept form?

What is the equation of the line L that contains the point $(4, -4)$ and is perpendicular to the line that has the equation $2x - 5y + 3 = 0$? Have students work in pairs to solve the problem.

How can slope be described verbally, graphically, and algebraically? (examples: rise over run, change in y over change in x)

In addition to determining proper slopes for wheelchair ramps and airplane descents, how else is slope used in everyday life?

Classroom Activities

Have students determine the slope of a set of stairs. Break the class into groups and give each group a tape measure or ruler. Measure the height of the step or incline (rise) and the length of the step (run), then calculate the slope.

Assign each group a different step pyramid from the Maya, Aztec, or Inca civilizations (a list can be found at: <http://www.crystalinks.com/pyramidmesoamerica.html>). The groups should research the histories of their pyramids and present a brief (two–five minute) presentation on their structures.

- If the steps of a typical pre-Columbian period are nine inches high and six inches wide, how does the slope of these stairs compare to the slope of modern stairs?
- Why would the stairs on an Aztec pyramid be steeper than those found in a modern school?

Pretend your town has decided to build a skate park near your school. The park will feature a half-pipe, quarter pipe, and several trick boxes. The city has asked your class to determine a safe height for the half-pipe and quarter pipe assuming that users of different skating levels will use the park.

-If the proposed quarter pipe will be 37 inches tall and 75 inches long and the half-pipe will be 60 inches tall and 384 inches long, what are the slopes of the two pipes? (Round the answer to the nearest hundredth.)

-If the height and the length of each pipe were points on the x and y axis and the ground is the point (0, 0), what would be the equation of the line connecting the two points for each piece of equipment?

Graph these equations on your calculators. Using the “Trace” function, find other points on the lines that represent other lengths and heights for the ramps.

Target Vocabulary*

Cartesian coordinate - either of two coordinates that locate a point on a plane and measure its distance from either of two intersecting straight-line axes along a line parallel to the other axis

coefficient - a constant factor of a term as distinguished from a variable

function - a: a mathematical correspondence that assigns exactly one element of one set to each element of the same or another set; b: a variable (as a quality, trait, or measurement) that depends on and varies with another

linear equation - an equation of the first degree in any number of variables

quadrant - any of the four parts into which a plane is divided by rectangular coordinate axes lying in that plane

slope - upward or downward slant or inclination or degree of slant

slope-intercept form - the equation of a straight line in the form $y = mx + b$ where m is the slope of the line and b is its y-intercept

y-intercept - the y-coordinate of a point where a line, curve, or surface intersects the y-axis

*All definitions from Merriam-Webster Online: <http://www.m-w.com>

Academic Standards

The National Council of Teachers of Mathematics (NCTM) has developed national standards to provide guidelines for teaching mathematics. To view the standards online, go to <http://standards.nctm.org/>.

This lesson plan addresses the following math standards:

- Represent and analyze mathematical situations using algebraic symbols
- Understanding patterns, relations, and functions