

handheld

it's all in the numbers

six principles for school mathematics*

Equity. Excellence in mathematics education requires equity—high expectations and strong support for all students.

Curriculum. A curriculum is more than a collection of activities; it must be coherent, focused on important mathematics, and well articulated across the grades.

Teaching. Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well.

Learning. Students must learn mathematics with understanding, actively building new knowledge from experience and previous knowledge.

Assessment. Assessment should support the learning of important mathematics and furnish useful information to both teachers and students.

Technology. Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning.

* from *Principles and Standards for School Mathematics*:
www.nctm.org/standards



Photograph courtesy of GoKnow, Inc

Math Literacy

The No Child Left Behind Act targets math as one of the two primary areas for improvement so that students develop the math excellence required for global economic leadership. NCLB's goal is to ensure that schools use scientifically based methods, employ well-qualified teachers, and measure student progress annually.

Numeracy

Mathematics is important because it provides useful tools and language for describing, measuring, and predicting as well as for interpreting and reasoning with numbers. We use math every day when we shop, cook, or watch sports. Most of the time we don't even realize it. Yet developing math skills helps children make sense of the world. They learn to analyze, connect ideas, and think logically.

NCTM Standards

The National Council of Teachers of Mathematics developed national math standards that form the basis of many state standards. The council advocates study of both traditional basics, such as multiplication facts, and new basics, such as reasoning and problem solving as the key to all learning.

Content and Process Standards

There are Content Standards, the subjects that students should learn, and Process Standards, the ways of acquiring and applying content knowledge. Content Standards include number and operations, algebra, geometry, measurement, data analysis and probability. The Process Standards are problem solving, reasoning and proof, communications, connections, and representations.

The Role of Technology

Technology plays a powerful role in mathematics learning because it frees students to perform tasks requiring higher order thinking skills. When technology does the arithmetic, students can do the thinking. Using spreadsheets and math software, students can improve their ability to do challenging problems. Handhelds by palmOne™ take the process one step further. With software such as ImagiWorks' ImagiMath™ and Infinity Softworks' powerOne™ Graph, for example, students in every grade have access to powerful tools to help them think beyond the mechanics of arithmetic.

slippery slope

Grade Level(s): 9-12

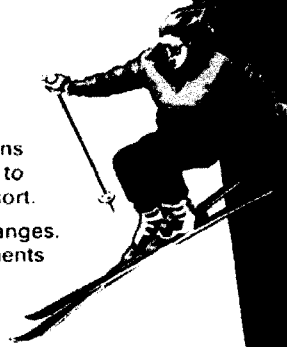
Subject Area: Math (Algebra)

Software: powerOne™ Graph (Infinity Softworks, Inc.)

Technology: Handhelds by palmOne

Lesson Description: Students will enter algebraic expressions and analyze the corresponding graphs to find the best slopes to use for a ski resort.

Objectives: Students will test theories about how slope changes. Students will graph solutions for algebra statements to find slopes. Students will use a real-world application to learn the relevance of math problems.

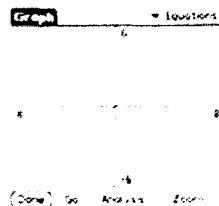


Before the Lesson

You are building a new ski resort and you want to design ski slopes for families to use. You'll need at least three different slopes to accommodate different abilities: an easy slope for children and novice skiers, a moderate slope for those who know the basics, and a challenging slope for the experts.

Lesson:

1. What would an equation that helps you to design the slope look like? Answer in words.
2. Open powerOne Graph. The main calculator should be visible.
3. Tap the Graph button (second icon at the top) or tap "powerOne" and then "My Graphs." Tap "New" at the bottom of the My Graphs screen. Tap "Function" from the pop-up list. We'll use the equation $y=x$, so tap 'x' and it will appear on the entry line. Tap "OK" at the bottom of the screen. Tap "Graph" at the bottom of the My Graphs screen.
4. The Graph screen should be visible. What does the slope look like? Tap "Done" to go back to the My Graphs screen.
5. The next step is to create another slope and compare it to this one. Let's use addition to find out what kind of slope we'll get. Tap "New" at the bottom of the screen. Tap "Function." Enter $x+1$. Select a different line pattern; select a different color if you have a color screen. Tap "OK." Tap "Graph" at the bottom of the screen. Look at the graph to see the results and then tap "Done."
6. Let's use subtraction. Use the same process and enter $x-2$. What did you learn? (Answer: Using addition and subtraction just moves the slope somewhere else across the mountain, but it is the same slope with the same incline.) Tap "Done." Uncheck the equations for $x+1$ and $x-2$.
7. Let's use multiplication to create another slope. Use the same process as before and enter these equations one at a time: $2x$ and then $3x$. Look at the graphs to see the results. Tap "Done."
8. Let's use division. Enter $.5x$. Compare the graphs and explain what happened. (Answer: the slope is different for each equation.)
9. Explain why: The smaller the number (slope number), the less the slope inclines. The larger the number, the greater the slope inclines.
10. What equations would you use to create the slopes for your ski resort? (Sample answers: $y=.5x$ for the beginner's slope, $y=x$ for the moderate slope, and $y=2x$ for the challenging slope.)



Assignment:

- What would these slopes look like? $y=(1/5)x$, $y=-(5/1)x$, $y=-(1/5)x$, $y=(5/1)x$
- What skill level would skiers need to use each of them?
- Try other equations to create other slopes.

**powerOne
GRAPH FEATURES**

Copy: Copy contents of view window to the system clipboard.

Paste: Paste the system clipboard to the view window.

Calculation Log: Log of previous calculations.

Preferences: Calculator settings and preferences.

Skins: Change the calculator interface (colors and layout).

My Data: Location to see all calculator data including constants, macros, and variables. Create new data, whether constants, macros, variables, tables or matrices.

My Graphs: Location to see all graph equations, create new equations, set window coordinates and graph.

My Templates: Location to see all templates, whether created or pre-installed.

Data Button: Displays My Data. View or create data as a variable, macro, constant table or matrix.

Graph Button: Displays My Graphs.

Template Button: Displays list of available templates.

Last Template Button: Select to go to the previously used template.

Choose from trigonometry, calculus, graphing and plotting in color, descriptive and inferential statistics, regressions, matrices, complex numbers, fractional math, unit conversions and more.

www.purplemath.com/modules/slope.htm

