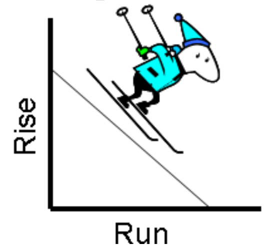
Slippery Slopes!

How does the slope of a ski path affect the swiftness of the skier?



Design a ski path that is as easygoing as possible without causing the skier to slow down. How does the slope of the path affect how fast the skier goes?

Assembly

1. Place 2 craft sticks “skis” flat, long sides touching.
2. Glue the object (the “skier”) to the middle of both flat skis. (Option: use only one craft stick to make a “snowboard”)

To Do and Notice

1. Position the binder cover “ski path” at an angle next to a wall so that it forms the hypotenuse of a right triangle with the right angle between the wall and the floor.
2. The vertical distance (“rise”) from floor to top of ski path is the y-intercept. The horizontal distance (“run”) distance from wall to bottom of ski path is the x-intercept. The slope is the rise over run.
3. Experiment to discover which ski path will cause the skier to ski downhill the slowest without stopping along the path. Record the results of trials of 5 different “ski paths” with different slopes. Have one trial with slope = 1 (rise =run), at least one with the slope > 1 and at lease one with slope < 1. For each trial:
   a. Position the ski path, place the skier at the top (skis pointing downhill), and release. The skis must completely clear the base of the ski path to count.
   b. Record the rise, run, and slope. Determine the coordinates of the y-intercept, x-intercept and another point on the path. Write the equation of the line in slope-intercept form. Note whether the skier slows down or speeds up.
   c. Graph and label the linear equation representing the line.
4. How do the different graphs compare? What do they show?
5. For the ski path when the skier goes as slowly as possible, but still goes all the way down:
   a. Solve for X when the value of Y is equal to 1/2 the Y-intercept value.
   b. Solve for X when the value of Y is equal to 1/4 the Y-intercept value.

The Math Behind the Activity

Students learn more if they associate real-life meaning to situations represented graphically. In this activity, students investigate various changes in the slope of a ski trail, then graph these linear functions and analyze the results. The slope of a line is a ratio of rise to run, and is a number that measures its "steepness", or rate of change, usually denoted by the letter m. On a coordinate graph, slope is the change in the y direction for a unit change in the x direction along a given line.

Taking it Further

- Try different types of surfaces for the ski path or the skis. What happens?

Web Resources (Visit www.raft.net/raft-idea?isid=658 for more resources!)

- Slope examples - http://www.themathpage.com/alg/slope-of-a-line.htm
- Teacher designed math courses – https://njctl.org/courses/math

Topics: Slope of a Line, Graphing Linear Equations

Materials List

- ✓ Binder cover or other sturdy flat surface
- ✓ Craft sticks, 2 per person
- ✓ Glue
- ✓ Small object for skier, identical per person
- ✓ Ruler, inches or cm
- ✓ **Slippery Slopes Recording Sheet** (page 2)
- ✓ Graph paper

This activity can be used to teach:
Common Core Math Standards:

- Equivalent Expressions (Grade 7, Expressions and Equations, 1)
- Linear Equations (Grade 8, Expressions and Equations, 5, 6, &7; Functions, 3)
- Problem Solving and Reasoning (Mathematical Practices Grades 6-12)

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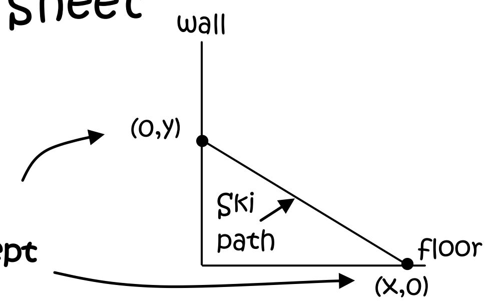
Slippery Slopes Recording Sheet



In this activity:
Rise = distance from floor to top of ski path = Y-intercept
Run = distance from wall to bottom of ski path = X-intercept
Slope = Rise/Run

Trial 1
Rise = **Run =**
Slope =

	X	Y
Y-intercept	0	
X-intercept		0
Another point on path		

Equation of the line:

Skier's speed ________________

Trial 2
Rise = **Run =**
Slope =

	X	Y
Y-intercept	0	
X-intercept		0
Another point on path		

Equation of the line:

Skier's speed ________________

Trial 3
Rise = **Run =**
Slope =

	X	Y
Y-intercept	0	
X-intercept		0
Another point on path		

Equation of the line:

Skier's speed ________________

Trial 4
Rise = **Run =**
Slope =

	X	Y
Y-intercept	0	
X-intercept		0
Another point on path		

Equation of the line:

Skier's speed ________________

Trial 5
Rise = **Run =**
Slope =

	X	Y
Y-intercept	0	
X-intercept		0
Another point on path		

Equation of the line:

Skier's speed ________________

For the ski path when the skier goes as slowly as possible – but still goes all the way down:

Solve for X when the value of Y is equal to 1/2 the Y-intercept value.

Solve for X when the value of Y is equal to 1/4 the Y-intercept value.

Observations: