$$(a + b)^2 = a^2 + 2ab + b^2$$

DESCRIPTION

Offers tips for working with linear equations and their slopes. Explains the concepts of "rise over run," slopes, graphs, and roots of linear equations in this comic presentation designed to make college algebra easier. Numerous repeated examples demonstrate terms and problems. Program 3 of 7.

ACADEMIC STANDARDS

Subject Area: Mathematics

★ Standard: Understands and applies basic and advanced properties of functions and algebra

- Benchmark: Understands appropriate terminology and notation used to define functions and their properties (e.g., domain, range, function compositions, inverses) (See Instructional Goal #1.)

- Benchmark: Solves linear equations using concrete, informal, and formal methods (e.g., using properties, graphing ordered pairs, using slope-intercept form) (See Instructional Goals #5 and 6.)

- Benchmark: Understands special values (e.g., minimum and maximum vales, x- and y-intercepts, slope, constant ratio or difference) of patterns, relationships, and functions (See Instructional Goals #2, 3, and 4.)

INSTRUCTIONAL GOALS

1. To explain the difference between linear and quadratic equations.
2. To demonstrate the use of the slope-intercept form, the slope formula, and the point-slope form of linear equations.
3. To find the equation for a line using only two points on the line.
4. To show how the graph of an equation is affected when the values for the slope and the y-intercept change.
5. To demonstrate how to solve for the root of a function.
6. To point out the relationship of the number of roots in an equation to the degree of that equation.

VOCABULARY

1. algebraic properties
2. degree of an equation
3. domain
4. gradient

5. linear equation
6. parallel lines
7. perpendicular lines
8. point slope form
9. quadratic equation
10. range
11. rise
12. root of a function
13. run
14. slope
15. slope formula
16. slope-intercept form
17. y-intercept

BEFORE SHOWING

1. Review the themes and plots of the Indiana Jones movies. (*Raiders of the Lost Ark*, *The Temple of Doom*, *The Last Crusade*)
    a. Using the name Indiana Jones, create other names substituting other states and words that rhyme with Jones.
    b. Explain that the video is a spoof of the Indiana Jones movies.
2. Discuss the importance of learning algebra and how it can be applied to real-life situations.
3. Review the meaning of slope. Show representations of positive, negative, zero, and undefined slopes on a graph.

DURING SHOWING

1. View the video more than once, with one showing uninterrupted.
2. Pause at the scene where the man in the black suit retrieves the golden "X" from Idaho Bones. Discuss the significance of his statement that there is more than one way to find x. Give examples of this.
3. Pause at the section explaining the slope-intercept form of linear equations. ($y = mx + b$) Compose a list of equations and determine the values for m and b in each equation.
4. Pause at the section explaining the slope formula. Discuss the two different methods of finding slope. (formula and using rise and run)
    a. Which seems easier and more convenient?
    b. What could be some common errors of each method?
5. Pause at the section relating to the slope formula. What would happen if the point 1 and point 2 values were mixed?
6. Pause at the section where b is isolated in the slope-intercept form so that its value can be found. Demonstrate what would happened if the values for x, y, and m were plugged in first before solving for b.
7. Pause at the sections comparing the slopes of parallel and perpendicular lines.
    a. Verify the rules by drawing parallel lines on an overhead grid and use the slope formula to calculate their slopes.
    b. Do the same for two perpendicular lines.

AFTER SHOWING

► Discussion Items and Questions

1. How does the graph of a linear equation compare with that of a quadratic equation?
2. What is the slope-intercept form of a linear equation? What do "m" and "b" represent in the slope-intercept form?
3. What does slope mean?
4. How can one find the slope of a line by looking at the graph?

5. What is the slope formula?
6. How can the equation of a line be determined when one knows only two points on the line?
7. What is the point-slope form? How is the point-slope form used to find the standard equation for a line?
8. How does changing the y-intercept affect the gradient of a line? How does changing the slope affect the gradient of a line?
9. How do the slopes of two parallel lines compare? How do the slopes of two perpendicular lines compare?
10. What is the root of a function?
11. How can the root of an equation be determined by looking at the graph of the line? By using the slope-intercept form?
12. What is a short cut method when using the slope-intercept form to find the root of an equation?
13. How many roots will a first degree equation have? A second degree equation? A third degree equation?

Applications and Activities

1. Complete a worksheet that reviews the contents of the video. (See Instructional Graphic.)
2. Use other tools to study linear functions and slopes.
   a. graphing calculators
   b. geoboards
   c. spreadsheets
   d. whiteboard grids
3. Measure the rise and run of certain incline planes and calculate the slope
   a. a wheelchair ramp
   b. a slide in a park
   c. a ramp for loading boxes into a truck
   d. a hill
   e. the roof of a small shed
   f. a staircase
4. Using a spinner to determine values for m and b, create five different equations in slope-intercept form. Compute the x- and y-intercepts for each equation. Try to create equations that meet these requirements:
   a. y-intercept less than or equal to 3
   b. y-intercept between –2 and 4
   c. x-intercept less than –1
   d. x-intercept greater than 3
   e. y-intercept positive and x-intercept negative
5. The slope of a road is called the road's grade. Grades are measured in percents. Research to find what criteria determine if a warning sign needs to be posted before a hill.
6. Obtain several pictures of slopes of objects seen in architecture or art. Use a millimeter rule to estimate the rise and run. Compute the slope.
7. Divide into two groups. Name two points and then graph them.
   a. Determine the slope of the line that passes through the points from the graph.
   b. One group writes the equation of the line in slope-intercept form and the other group writes it in point-slope form.
   c. Compare the two equations. Use algebraic properties to adjust them so that the two equations are identical.

8. Assign coordinates for a given point. Plot the point on the graph and draw a line through it.
   a. Using rise and run, find the slope of the line.
   b. Plot another point and draw a line parallel to the first line using the same slope.
   c. Compute the negative reciprocal value of the slope of the first line. Then draw a line perpendicular to it, using the value of the slope.
   d. Write equations for all three lines in slope-intercept form.

RELATED RESOURCES

- Algebra: A Piece of Cake! Part One #9544
- Algebra: A Piece of Cake! Part Two #9545
- Algebra: The Basics #9750
- Algebra: Functions #9745
- Algebra: Polynomials #9747
- Algebra: Quadratic Equations #9748
- Algebra: The Quadratic Formula #9751
- Algebra: Quadratic Roots #9749
- Let's Get It Straight: Linear Equations and Their Graphs: Part One #9552
- Slopes: That's A Bit Steep #9549

World Wide Web

The following Web sites complement the contents of this guide; they were selected by professionals who have experience in teaching deaf and hard of hearing students. Every effort was made to select accurate, educationally relevant, and "kid safe" sites. However, teachers should preview them before use. The U.S. Department of Education, the National Association of the Deaf, and the Captioned Media Program do not endorse the sites and are not responsible for their content.

- **MATH FORUM**

http://www.mathforum.com/

Contains links to math resources by subject and a question/answer section by Dr. Math. Topics covered in the video are included.

- **EXPLORE MATH**

http://www.exploremath.com/

Contains links to interactive sites relating to slope-intercept form and point-slope form. Includes lab activities and worksheets that can be printed.

- **PARALLEL LINES AND PERPENDICULAR LINES**

http://www.coe.tamu.edu/~strader/Mathematics/Algebra/Slope1/

Serves as an interactive site where the slope and y-intercept values can be changed. Lines parallel and perpendicular to the given line and their equations are shown.

INSTRUCTIONAL GRAPHICS

- LINEAR FUNCTIONS/SLOPE

Linear Functions/Slope

SLOPE—INTERCEPT FORM $y = mx + b$

Determine the slope and y-intercept for each of the following:

1. $y = 2/3x + 6$

2. $y = 7$

3. $3y = 6x - 9$

4. $5x + 4y = 10$

5. $2x - 3y = -18$

SLOPE FORMULA $m = \dfrac{y_2 - y_1}{x_2 - x_1}$

Find the slope of the line that passes through the following points:

1.   (2, -5) and (7, -10)

2.   (2, -1) and (5, -3)

3.   (-5, 4) and (-5, -1)

4.   (2, -1) and (5, -3)

5.   (-3, -4) and (5, -1)

POINT—SLOPE FORM $y - y_1 = m (x - x_1)$

Using the point-slope form, write the standard equation of a line that passes through points:

1.   (6, 1) and (7, -4)

2.   (2, 3) and (5, 1)

WORD PROBLEMS

1.   A line passes through points (-2, -7) and (1, 2). Write the
      equation of the line in slope-intercept form and plot it on a graph.

2.   Emily paid $500 down on a used car. Her car payments are $100 a month.
      Plot this data on a graph using the x-axis for the number of months and the
      y-axis for the amount paid. Write the equation of the function in
      slope-intercept form.

ROOT OF A FUNCTION

Find the root of each equation:

1.   0 = 4x - 3

2.   0 = 2/3x + 9

3.   0 = 5x

Captioned Media Program
VOICE 800-237-6213 **TTY** 800-237-6819 **FAX** 800-538-5636 **EMAIL** info@cfv.org **WEB** www.cfv.org
Funding for the Captioned Media Program is provided by the U.S. Department of Education