Slope

$$\text{Slope} = \frac{\Delta y}{\Delta x}$$

(x_2, y_2)

(x_1, y_1)

Δy
$y_2 - y_1$

ΔX
$x_2 - x_1$

Slope Worksheet and Activity

I. Model Problems
Modeling how to calculate slope (associated online demonstration here)

II. Student Exploration.
Exploring slope formula using an online interactive program.

III and IV. Practice Problems
Student practice calculating slope
(answers to problems online here)

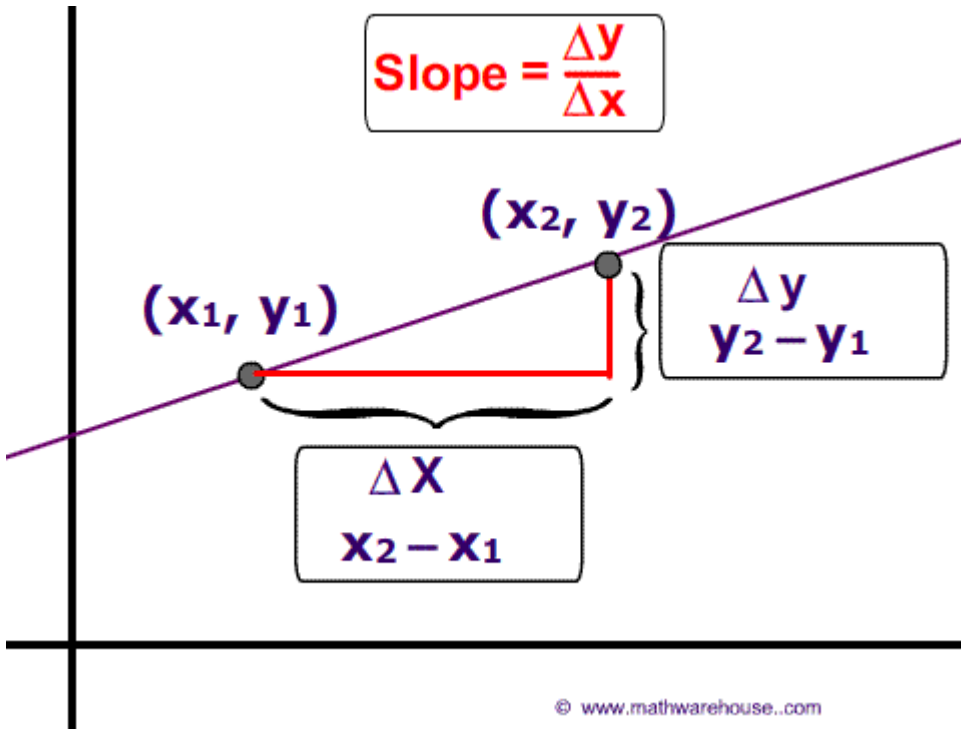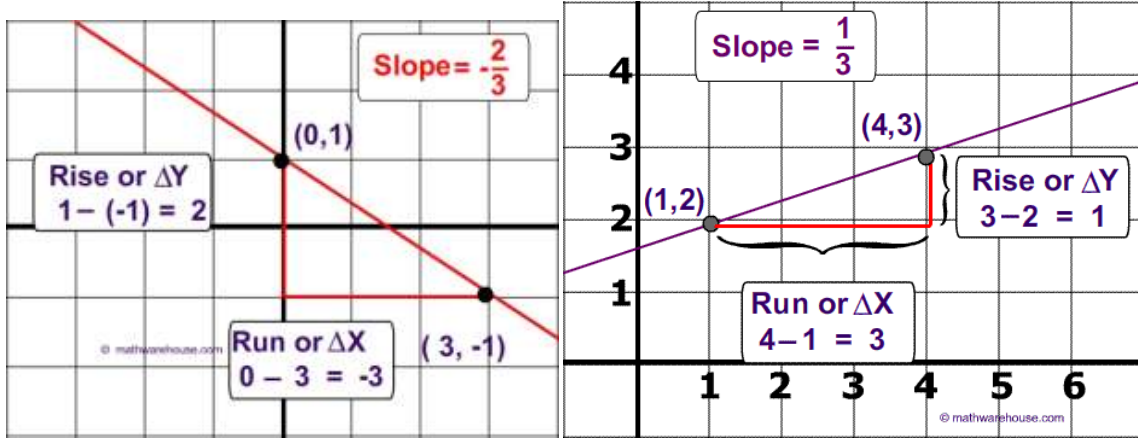### V. Answer Key

Answers to Part III and IV also online at http://www.mathwarehouse.com/slope2

The Slope Formula

$$\text{Slope} = \frac{Y_2 - Y_1}{X_2 - X_1} = \frac{\text{Rise}}{\text{Run}} = \frac{\Delta Y}{\Delta X}$$

Slope $= -\frac{2}{3}$
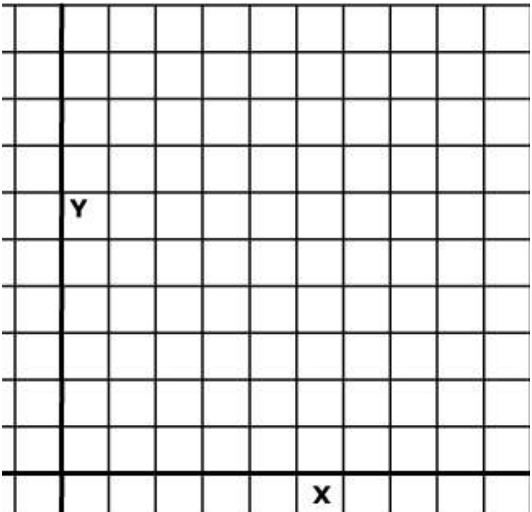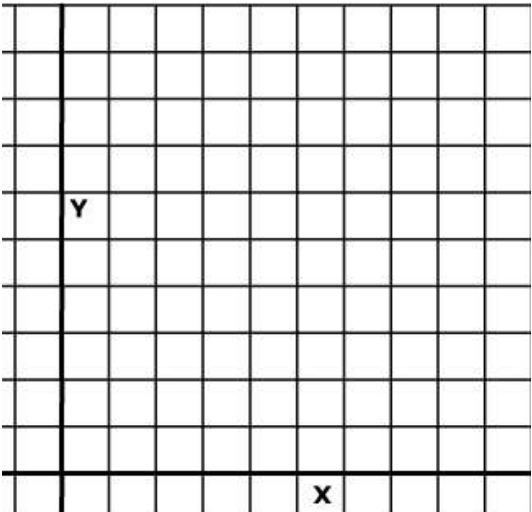
(0,1)

Rise or ΔY
$1 - (-1) = 2$

© mathwarehouse.com Run or ΔX
$0 - 3 = -3$

(3, -1)

Slope $= \frac{1}{3}$

(4,3)

(1,2)

Rise or ΔY
$3 - 2 = 1$

Run or ΔX
$4 - 1 = 3$

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Slope $= \frac{\Delta y}{\Delta x}$

(x_2, y_2)

(x_1, y_1)

Δy
$y_2 - y_1$

ΔX
$x_2 - x_1$

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Part I. Exploratory Activity

1) Go to the following web page http://www.mathwarehouse.com/slope

Drag the two points and change the direction of the line until you can answer questions A-D.

A) If a line has a **negative slope**, what is its general direction?

B) If a line has a **positive slope**, what is its general direction?

C) Describe the direction of a line with a slope of zero.

D) Describe the direction of a line whose slope is undefined

E) Sketch a line with a positive slope	F) Sketch a line with a negative slope

Part II.
What is the slope of a line passing through   (4, 3) and (3,1) ?

Find the slope of line P.

1) What is the rise (or ΔY) ?
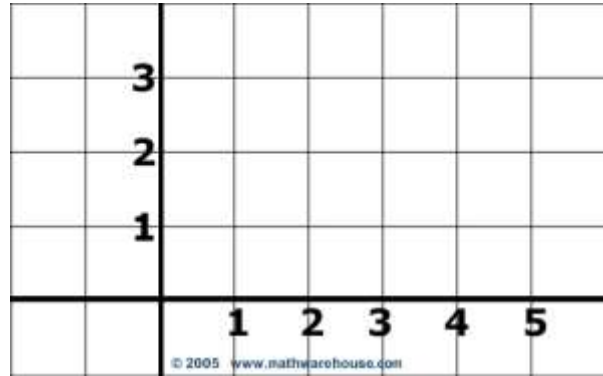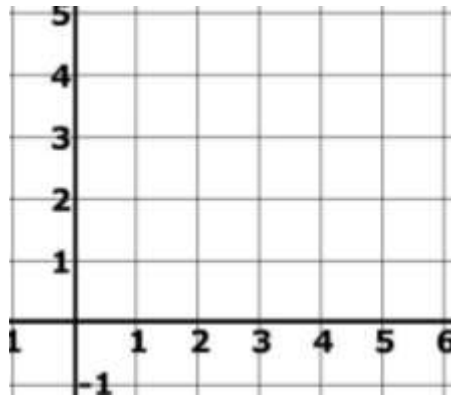   _____

2) What is the run (or ΔX) ?
   _____

3) What is the slope?
   _____

4) Find the slope of a line passing through
   the points (1,2) and (4, 3)

Directions: Use the slope formula (without graphing) to find the slope of a line passing through the points below. Answers at http://www.mathwarehouse.com/slope5

5) (10,3) and (7 , 9)   6) (4, -2) and (4, 3)

7) (2,10) and (8 , 7)   8) (7, 3) and (8, 5)
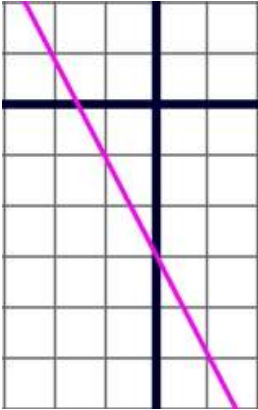
9) (12,11) and (9 , 5)   10) (6, 2) and (3, 2)

III. Finding the Slope from a Graph
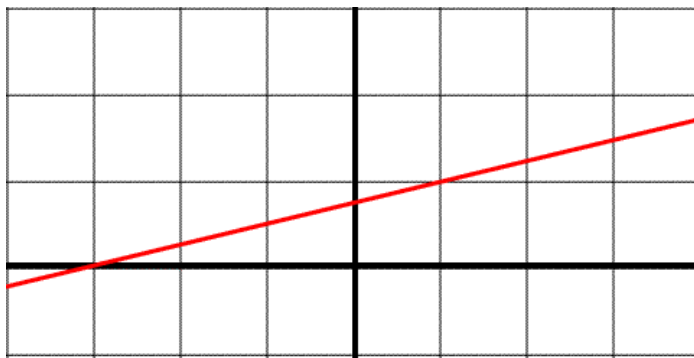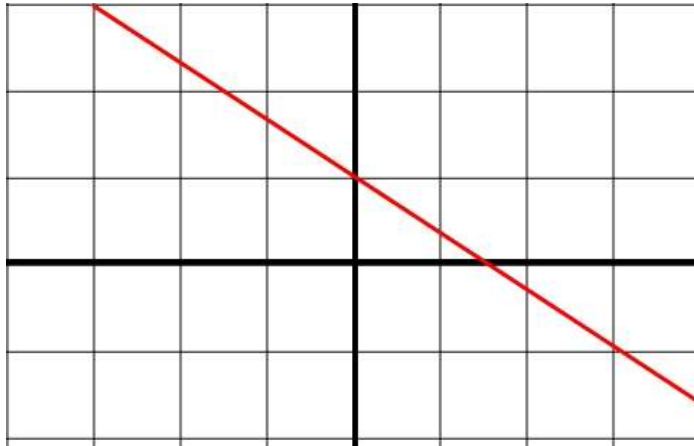
What is the slope of the lines in the graphs below?

11)

12)

13)

14)

IV. Find the Missing Coordinate

15) The slope of a line is $\dfrac{3}{2}$ and the line contains the points (5,9) and (3,a). What is the value of a?

16) The slope of a line is -2 and the line contains the points (7 ,4) and (x, 12). What is the value of x?

17) The slope of a line is $-\dfrac{2}{t}$ and the line contains the points (-2 ,4) and (-6, 10). What is the value of t?

Homework

Direction: *What is the slope of a line passing through the points below*

1) (2, 4) and (4 , 9)

2) (13, 6) and (3 , 1)

3) (12, 2) and (12 , 16)

4) (3, 2) and (12 , 2)

Online Homework

Visit both of the URLS below (you may want to turn off your computer's volume.) Both of these pages incorrectly calculate the slope. Explain what is wrong on each page

5) http://www.mathwarehouse.com/slope3
Explain the error with this page's use of slope formula

6) http://www.mathwarehouse.com/slope4

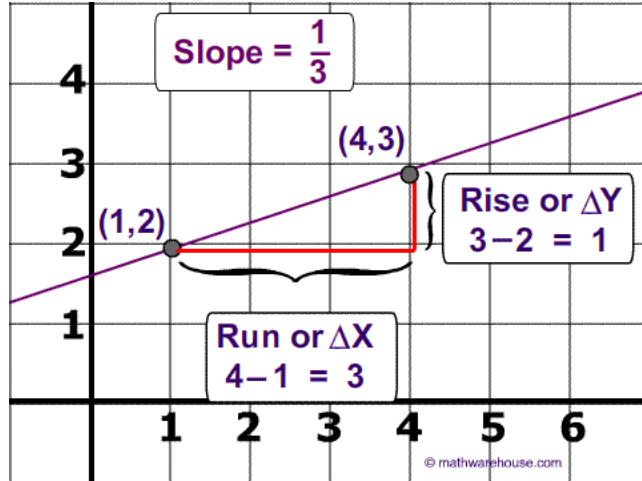Explain the error with this page's use of slope formula

Answer Key
Part II.

1) $\Delta y = 1 - 3 = -2$

2) $\Delta x = 3 - 4 = 1$

3) slope $= \dfrac{\Delta y}{\Delta x} = \dfrac{-2}{-1} = 2$

4)

$$\text{Slope} = \frac{1}{3}$$

(4,3)

(1,2)

Rise or ΔY
$3-2 = 1$

Run or ΔX
$4-1 = 3$

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5) $\dfrac{\Delta y}{\Delta x} = \dfrac{9-3}{7-10} = \dfrac{6}{-3} = -2$ or $\dfrac{3-9}{10-7} = \dfrac{-6}{3} = -2$

6) $\dfrac{\Delta y}{\Delta x} = \dfrac{3-(-2)}{4-4} = \dfrac{5}{0} = \textbf{\textit{undefined}}$ or $\dfrac{-2-3}{4-4} = \textbf{\textit{undefined}}$

this is the slope of a vertical line

7) $\dfrac{\Delta y}{\Delta x} = \dfrac{7-10}{8-2} = \dfrac{-3}{6} = -\dfrac{1}{2}$ or $\dfrac{10-7}{2-8} = \dfrac{3}{-6} = -\dfrac{1}{2}$

8) $\dfrac{\Delta y}{\Delta x} = \dfrac{5-3}{8-7} = \dfrac{2}{1} = 2$ or $\dfrac{3-5}{7-8} = \dfrac{-2}{-1} = 2$

9) $\dfrac{\Delta y}{\Delta x} = \dfrac{5-11}{9-12} = \dfrac{-6}{-3} = 2$ or $\dfrac{11-5}{12-9} = \dfrac{6}{3} = 2$

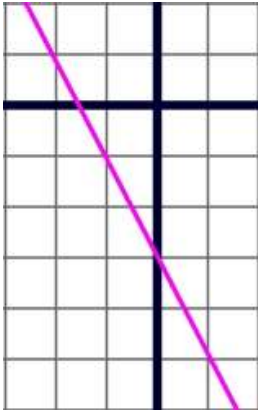10) $\dfrac{\Delta y}{\Delta x} = \dfrac{2-2}{3-6} = \dfrac{0}{-3} = 0$ or $\dfrac{2-2}{6-3} = \dfrac{0}{3} = 0$
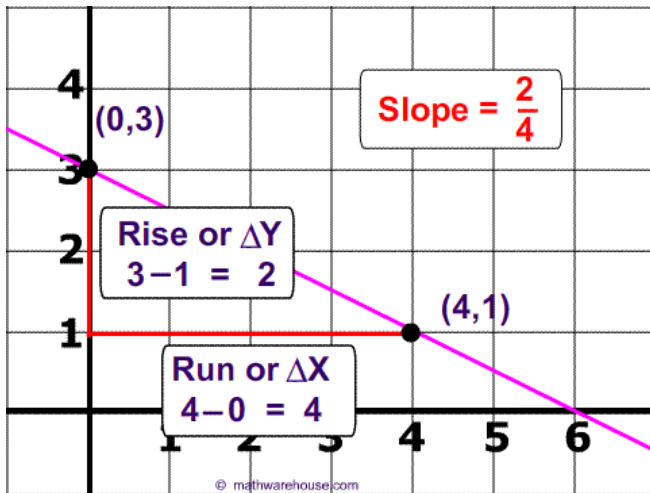
This is the slope of a horizontal line.

11) Plot any 2 points and find their slope . . For instance, you could use the points (0,-3) and (1,-5)
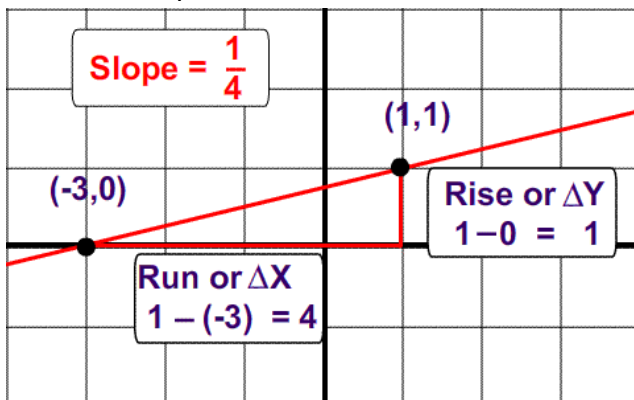
$$\frac{\Delta y}{\Delta x} = \frac{-5-(-3)}{1-0} = \frac{-2}{1} = -2 \text{ or } \frac{\Delta y}{\Delta x} = \frac{-3-(-5)}{0-1} = \frac{2}{-1} = -2$$
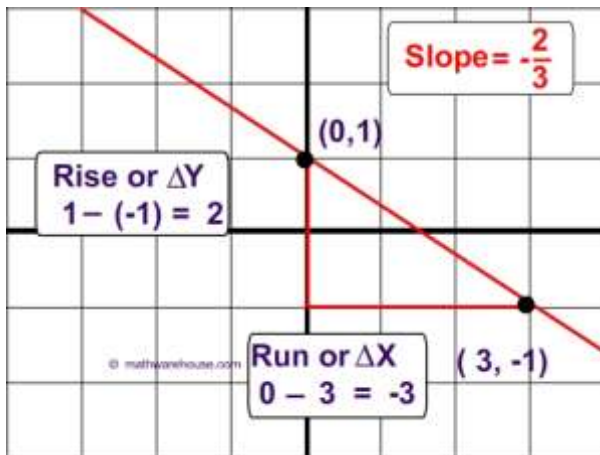
12) *slope* $= \frac{2}{4} = \frac{1}{2}$

Slope = $\frac{2}{4}$

(0,3)

Rise or ΔY
3−1 = 2

(4,1)

Run or ΔX
4−0 = 4

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13) *slope* $= \frac{1}{4}$

Slope = $\frac{1}{4}$

(1,1)

(-3,0)

Rise or ΔY
1−0 = 1

Run or ΔX
1 − (-3) = 4

14) *slope* $= -\dfrac{2}{3}$

The slope of a line is $\dfrac{3}{2}$ and the line contains the points (5,9) and (3,a). What is the value of a?

15) $\dfrac{3}{2} = \dfrac{y_2 - y_1}{x_2 - x_1}$

$\dfrac{3}{2} = \dfrac{a-9}{3-5}$

$\dfrac{3}{2} = \dfrac{a-9}{-2}$

$-6 = 2a - 18$

$12 = a$

16) $-2 = \dfrac{y_2 - y_1}{x_2 - x_1}$

$-2 = \dfrac{12-4}{x-7}$

$-2 = \dfrac{8}{x-7}$

$-2(x-7) = 8$

$-2x + 14 = 8$

$-2x = -6$

$x = 3$

17) $\dfrac{-2}{t} = \dfrac{y_2 - y_1}{x_2 - x_1}$

$\dfrac{-2}{t} = \dfrac{10-4}{-6-(-2)}$

$\dfrac{-2}{t} = \dfrac{6}{-6+2} \rightarrow \dfrac{-2}{t} = \dfrac{6}{-4}$

$8 = 6t$

$\dfrac{8}{6} = t \rightarrow t = \dfrac{4}{3}$

Slope Resources

1) Slope of a Line : http://www.mathwarehouse.com/algebra/linear_equation/slope-of-a-line.php

2) Interactive Slope: http://www.mathwarehouse.com/algebra/linear_equation/slope-of-a-line.php

3) Slope Intercept Form of a line:
http://www.mathwarehouse.com/algebra/linear_equation/slope-intercept-form.php
4) Common Slope Errors (interactive online activities)
   a. http://www.mathwarehouse.com/algebra/linear_equation/slope/slope_dilemna8.html
   b. http://www.mathwarehouse.com/algebra/linear_equation/slope/2nd-slope_dilemna8.htm

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Online Graphing Calculator(free): http://www.meta-calculator.com/online/