Get out your book and turn to page 175! Warm Up on #1,2, and 8. We will have target check on Friday over rate of change and slope.

Classwork - Slope

Independent Practice

Go online for Step-by-Step Solutions eHelp

Determine whether the relationship between the two quantities shown in each table or graph is linear. If so, find the constant rate of change. If not, explain your reasoning. (Example 1)

8. It is Proportional

1.

Cost of Electricity to Run Personal Computer	
Time (h)	**Cost (¢)**
5	15
8	24
12	36
24	72

+3, +4, +12   +9, +12, +36

$\frac{9}{3} = \frac{3}{1}$ $\frac{12}{4} = \frac{3}{1}$ $\frac{36}{12} = \frac{3¢}{1h}$

2.

Distance Traveled by Falling Object				
Time (s)	1	2	3	4
Distance (m)	4.9	19.6	44.1	78.4

+1 +1 +1

+14.7   +24.5

Not Linear

3.

Italian Dressing Recipe				
Oil (c)	2	4	6	8
Vinegar (c)	$\frac{3}{4}$	$1\frac{1}{2}$	$2\frac{1}{4}$	3

$\frac{\frac{3}{4}}{2} = \frac{3}{8}$ $\frac{1\frac{1}{2}}{4} = \frac{3}{8}$

$\frac{2\frac{1}{4}}{6} = \frac{3}{8}$ $\frac{3}{8} = \frac{3}{8}$

Problems #1-3 represent linear relationships with a constant rate of change. Find the constant rate of change.

1.

Age (yr)	Height (in.)
9	54
10	56
11	58
12	60

+1 +1 +1

+2 +2 +2

Rate of change = 2 in/yr

2.

Time (h)	Temperature (°C)
0	0
4	3
8	6
12	9

+4 +4 +4

+3 +3 +3

$\frac{3°C}{4h}$

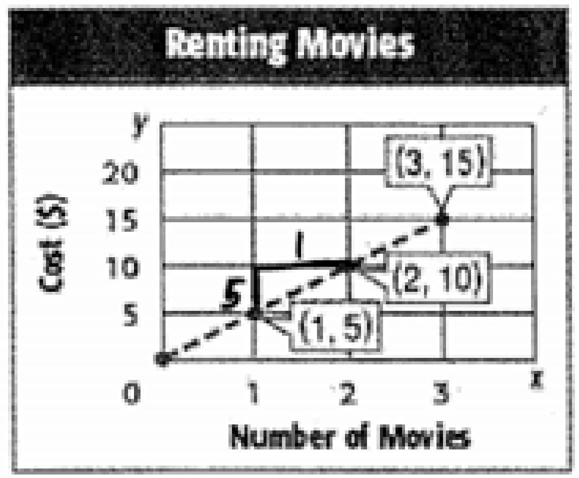
Rate of change = 0.75 °C/h

$\frac{3}{4}$ °C/h

3. The graph shows the cost of renting movies.

A) Find the constant rate of change for the graph.

$\frac{\$5}{1 \text{ movie}}$



B) Explain what the point (2, 10) represents in this situation..

2 Movies will cost $10

Determine whether the relationship between the two quantities described in each table is linear. If so, find the constant rate of change. If not, explain your reasoning.

4. Fabric Needed for Costumes

+2 +2 +2

Number of Costumes	2	4	6	8
Fabric (yd)	7	14	21	28

+7 +7 +7

Yes, 3.5yd/costume

5. Distance Traveled on Bike Trip

+1 +1 +1

Day	1	2	3	4
Distance(mi)	21.8	43.6	68.8	90.6

+21.8 +25.2 +21.8

No, increases by different distance between day 2 and 3.

For Exercises 3 and 4, refer to the graphs below.

6. Use the graph shown to the right.

a. Find the constant rate of change and interpret its meaning

$\frac{-30}{3} = -10 ft/s$

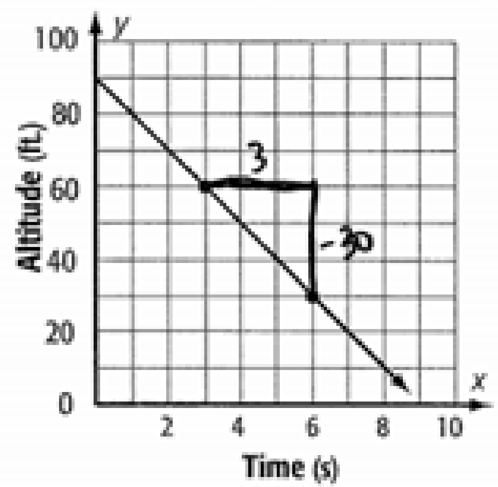
The hawk dives down 10 ft every second.

b. Determine whether a proportional linear relationship exists between the two quantities shown in the graph. Explain your reasoning.

$\frac{60}{3} = \frac{20}{1}$ $\frac{30}{6} = \frac{5}{1}$

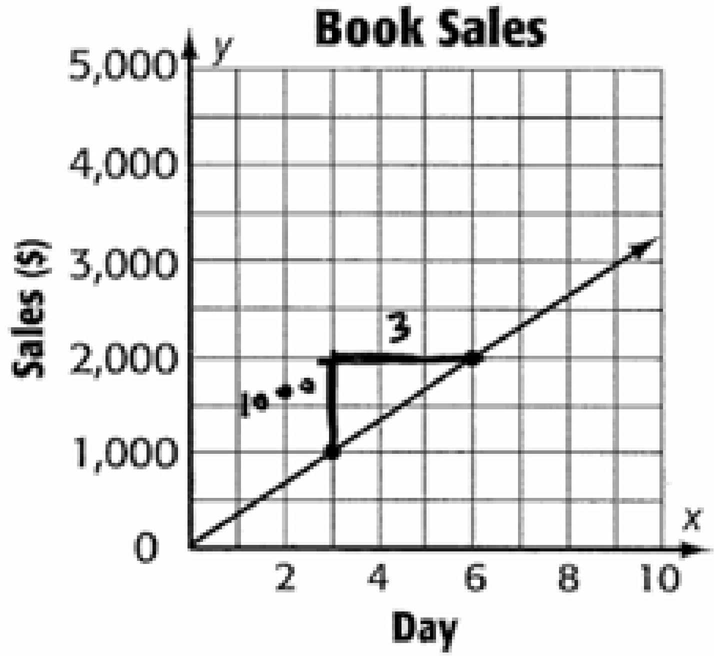
Not proportional. Points on the graph simplify to different ratios.

Hawk Diving Toward Prey



7. Use the graph shown to the right.

a. Find the constant rate of change and interpret its meaning.



$$\frac{1000}{3} = \frac{\$333.33}{1 \text{ day}}$$

They make $333.33 in book sales every day that passes.

b. Determine whether a proportional linear relationship exists between the two quantities shown in the graph. Explain your reasoning.

$$\frac{1000}{3} = \frac{333.\overline{33}}{1} \qquad \frac{2000}{6} = \frac{333.\overline{33}}{1}$$

Yes, the points on the graph simplify to the same ratio so they are equivalent.

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Vocabulary Start-Up

The term *slope* is used to describe the steepness of a straight line. **Slope** is the ratio of the **rise**, or vertical change, to the **run** or horizontal change.

Complete the graphic organizer.

I think this word means...	How is this concept related to other math concepts?
slope	
Where have I heard this word in my life?	What makes this an important word for me to know?

Real-World Link

A ride at an amusement park rises 8 feet every horizontal change of 2 feet. How could you determine the slope of the ride?

Find Slope Using a Graph or Table

Slope is a rate of change. It can be positive (slanting upward) or negative (slanting downward).

$$\text{slope} = \frac{\text{rise}}{\text{run}}$$

rise ← vertical change between any two points

run ← horizontal change between the same two points

m

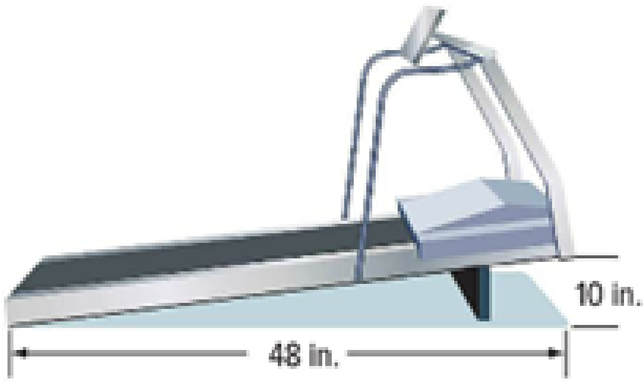
$\frac{y}{x}$

Real World

Example

1. Find the slope of the treadmill.

$\text{slope} = \frac{\text{rise}}{\text{run}}$	Definition of slope
$= \frac{10 \text{ in.}}{48 \text{ in.}}$	rise = 10 in., run = 48 in.
$= \frac{5}{24}$	Simplify.



The slope of the treadmill is $\frac{5}{24}$.

Got it? **Do this problem to find out.**

a. A hiking trail rises 6 feet for every horizontal change of 100 feet. What is the slope of the hiking trail?

$\frac{6}{100} = \frac{3}{50}$

Examples

2. The graph shows the cost of muffins at a bake sale. Find the slope of the line.

Choose two points on the line. The vertical change is 2 units and the horizontal change is 1 unit.

$$m = \frac{6}{3} = \frac{2}{1} = 2$$

slope $= \dfrac{\text{rise}}{\text{run}}$ Definition of slope

$= \dfrac{2}{1} = 2$ rise = 2, run = 1

The slope of the line is $\frac{2}{1}$ or 2.

3. **The table shows the number of pages Garrett has left to read after a certain number of minutes. The points lie on a line. Find the slope of the line.**

Time (min), x	Pages left, y
1	12
3	9
5	6
7	3

+2 +2 +2

-3 -3 -3

$\frac{y}{x}$

Choose any two points from the table to find the changes in the x- and y-values.

$$\text{slope} = \frac{\text{change in } y}{\text{change in } x} \quad \text{Definition of slope}$$

$$= \frac{9 - 12}{3 - 1} \quad \text{Use the points (1, 12) and (3, 9).}$$

$$= \frac{-3}{2} \text{ or } -\frac{3}{2} \quad \text{Simplify.}$$

$m = \frac{-3}{2}$ OR $-1\frac{1}{2}$

To check, choose two different points from the table and find the slope.

Check $\text{slope} = \frac{\text{change in } y}{\text{change in } x}$

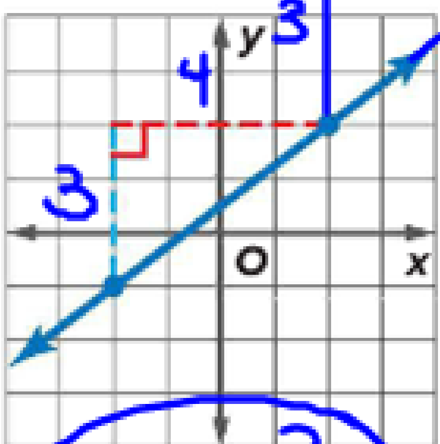
$$= \frac{3 - 6}{7 - 5}$$

$$= \frac{-3}{2} \text{ or } -\frac{3}{2} \checkmark$$

Got it? Do these problems to find out

Find the slope of each line.

b.



3 4 3 4 3 4

$m = \frac{3}{4}$

c.

+4 +4 +4

x	−6	−2	2	6
y	−2	−1	0	1

+1 +1 +1

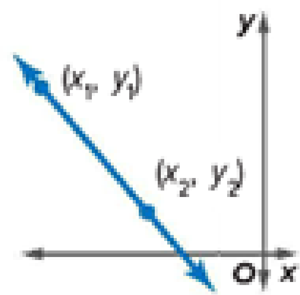
$m = \frac{1}{4}$ $\frac{y}{x}$

Slope Formula

Words The slope m of a line passing through points (x_1, y_1) and (x_2, y_2) is the ratio of the difference in the y-coordinates to the corresponding difference in the x-coordinates.

Symbols $m = \frac{y_2 - y_1}{x_2 - x_1}$, where $x_2 \neq x_1$

Model



It does not matter which point you define as (x_1, y_1) and (x_2, y_2). However the coordinates of both points must be used in the same order.

Example

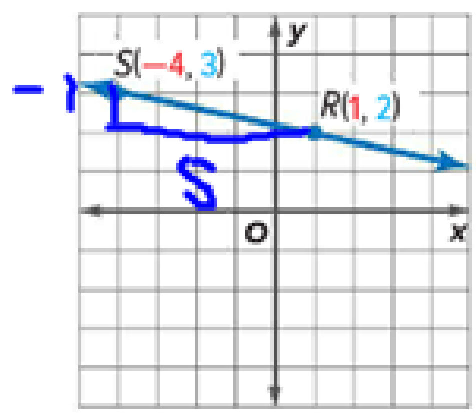
Watch Tutor

4. Find the slope of the line that passes through $R(1, 2)$, $S(-4, 3)$.

$m = \frac{y_2 - y_1}{x_2 - x_1}$ Slope formula

$m = \frac{3 - 2}{-4 - 1}$ $(x_1, y_1) = (1, 2)$; $(x_2, y_2) = (-4, 3)$

$m = \frac{1}{-5}$ or $-\frac{1}{5}$ Simplify.



(x, y)

#1 $(1,2)$

#2 $(-4,3)$

$\frac{3-2}{-4-1} = \frac{1}{-5}$

$m = -\frac{1}{5}$

Got it? **Do these problems to find out.**

#1 #2

d. $A(2, 2)$, $B(5, 3)$

e. $J(-7, -4)$, $K(-3, -2)$

$$\frac{y_2 - y_1}{x_2 - x_1}$$

$$\frac{3-2}{5-2} = \boxed{\frac{1}{3}} = m$$