4.3 Graphing Proportional Relationships

Minutes, x	1	2	3	4	6
Gallons, y	8.5	17	25.5	34	51

When 2 ratios are equivalent, we say they are in a proportional relationship.

ex: $\dfrac{8.5}{1} = \dfrac{17}{2}$ $\dfrac{25.5}{3} = \dfrac{34}{4}$

recall from last year $\dfrac{y}{x} = k$ (constant of proportionality)

We can also think of k as the slope (m) and rewrite the equation as $y = mx$

w/ a partner, complete RPJ p. 79-81

* recall also from last year, all proportional relationships are graphs that are straight lines that go through the origin.

Go back to RPJ p. 79 ~
* write an equation to represent: $y = mx$
   a) $y = 10x$ or $d = 10h$

   d) $y = 6x$ or $C = 6p$
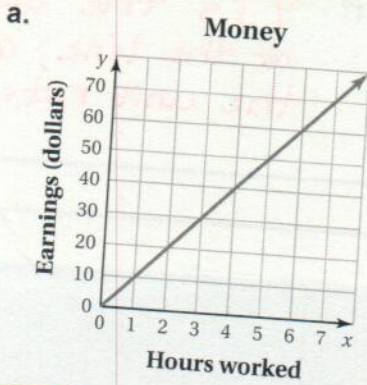
   f) $y = 2x$ or $F = 2s$

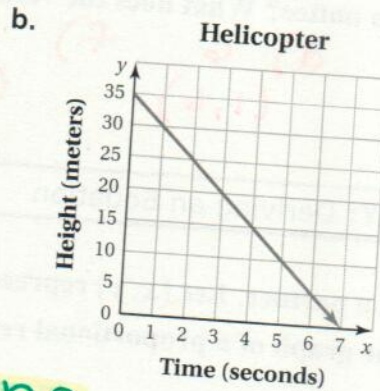## 4.3 Graphing Proportional Relationships
For use with Activity 4.3

Essential Question How can you describe the graph of the equation $y = mx$?
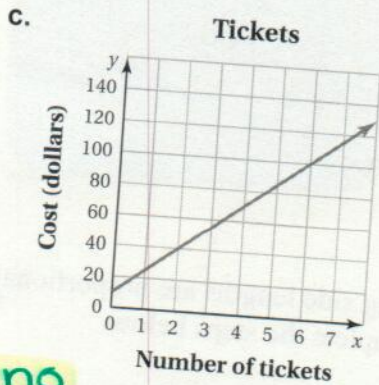
1 ACTIVITY: Identifying Proportional Relationships

Work with a partner. Tell whether x and y are in a proportional relationship. Explain your reasoning. *write yes or no*
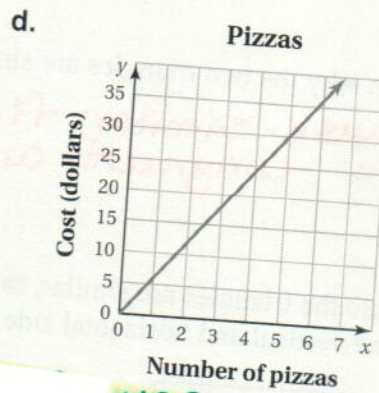
a.

Money

y-axis: Earnings (dollars) — 0, 10, 20, 30, 40, 50, 60, 70
x-axis: 0 1 2 3 4 5 6 7 *x*
Hours worked

yes

b.

Helicopter

y-axis: Height (meters) — 0, 5, 10, 15, 20, 25, 30, 35
x-axis: 0 1 2 3 4 5 6 7 *x*
Time (seconds)

no

c.

Tickets

y-axis: Cost (dollars) — 0, 20, 40, 60, 80, 100, 120, 140
x-axis: 0 1 2 3 4 5 6 7 *x*
Number of tickets

no

d.

Pizzas

y-axis: Cost (dollars) — 0, 5, 10, 15, 20, 25, 30, 35
x-axis: 0 1 2 3 4 5 6 7 *x*
Number of pizzas

yes

e.

Laps, x	1	2	3	4
Time (seconds), y	90	200	325	480

no

f.

Cups of Sugar, x	$\frac{1}{2}$	1	$1\frac{1}{2}$	2
Cups of Flour, y	1	2	3	4

yes

4.3 Graphing Proportional Relationships (continued)

2 **ACTIVITY:** Analyzing Proportional Relationships

Work with a partner. Use only the proportional relationships in Activity 1 to do the following.

- Find the slope of the line.

- Find the value of y for the ordered pair $(1, y)$.

What do you notice? What does the value of y represent?

a) 10   d) 6   f) 2

$(1, 10)$ $(1, 6)$ $(1, 2)$

Y is the slope of the line; also the unit rate

3 **ACTIVITY:** Deriving an Equation

Work with a partner. Let (x, y) represent any point on the graph of a proportional relationship.

Skip Activity 3 b/c we did not do Ch 3 yet

a. Explain why the two triangles are similar.

Because similar figures have congruent angles

b. Because the triangles are similar, the corresponding side lengths are proportional. Use the vertical and horizontal side lengths to complete the steps below.

$$\frac{\boxed{}}{\boxed{}} = \frac{m}{1}$$ Ratios of side lengths

$$\frac{\boxed{}}{\boxed{}} = m$$ Simplify.

$$\boxed{} = m \cdot \boxed{}$$ Multiplication Property of Equality

What does the final equation represent?

4.3 Graphing Proportional Relationships (continued)

c. Use your result in part (b) to write an equation that represents each proportional relationship in Activity 1.

What Is Your Answer?

4. **IN YOUR OWN WORDS** How can you describe the graph of the equation $y = mx$? How does the value of m affect the graph of the equation?

a line w/ slope m that passes through the origin

m is the steepness of the line; a greater slope, a steeper line and vice-versa

5. Give a real-life example of two quantities that are in a proportional relationship. Write an equation that represents the relationship and sketch its graph.

- cost of gas/ gallon
- earnings per hour
- distance ran /min
- # of correct answers to percentage on a test
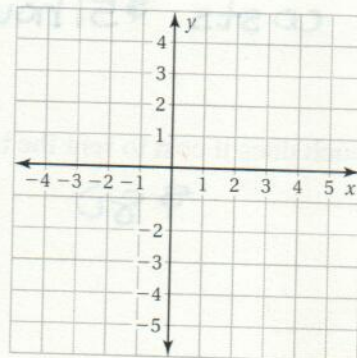
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<u>Direct Variation</u>: when two quantities x and y are proportional, the relationship can be represented by the direct variation equation $y = mx$, where m is the constant of proportionality\slope\unit rate.
The graph is a straight line that passes through the origin.

(direct variation is the same thing as proportional)

* see p.160 example 1

$y = 10x$

cost is $10/gb
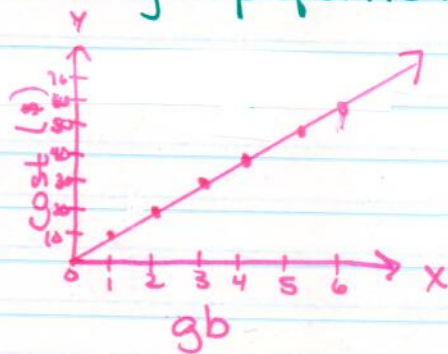
* see p 160 example 2

a) 15 y = weight on Titan
   105 x = weight on Earth

$y = mx$
$15 = m \cdot 105$
$\dfrac{15}{105} = m$ ← $\dfrac{1}{7} = m$ ←

$\boxed{y = \frac{1}{7}x}$
equation

b) $T = \frac{1}{7}E$ or $y = \frac{1}{7}x$

$3.5 = \frac{1}{7}E$

$3.5(7) = 24.5 = x$

The chunk of ice on Earth would weigh 24.5