APPLICATIONS

1. A nutrition company is marketing a low-calorie snack brownie. A serving size of the snack is 3 brownies and has a total of 50 calories.

(a) Determine how many calories 6 brownies would have.

100

(b) Determine how many calories 21 brownies would have.

350

(c) Determine how many calories 14 brownies would have. Round to the nearest calorie.

$\frac{y}{x} = c$ $\frac{3}{50}$ $\frac{50}{3}$

0.06

16.67

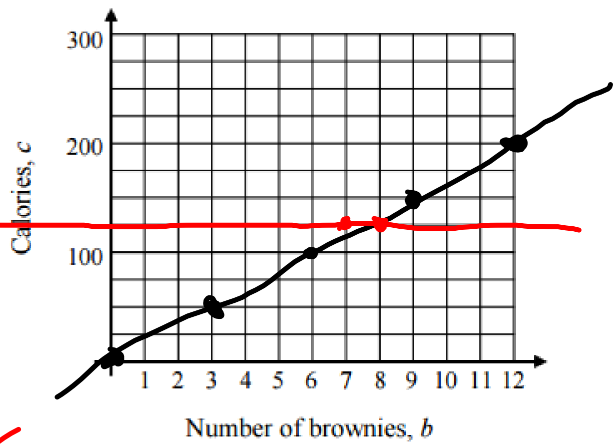
233 38

(d) If c represents the number of calories and b represents the number of brownies, write a proportional relationship involving c and b and solve it for c.

$c = \frac{50}{3}b$

$c = 16.67b$

(e) Graph the proportional relationship you found in part (d) on the grid shown.



(f) Using the graph, what is the smallest whole number of brownies a person would need to eat in order to consume 125 calories? Illustrate on your graph.

8

(g) Algebraically determine the number of brownies a person would need to eat in order to consume 300 calories.

$c = \frac{50}{3}b$

$300 = \frac{50}{3}b$

$300 \cdot \frac{3}{50}$

18 brownies

2. A local animal feed company makes its feed by the ton, which is 2000 pounds. They want to include a medication in the feed. Each cow needs 300 milligrams (mg) of this medication a day and each cow consumes 15 pounds of the feed per day. If there are 1,000 milligrams in a gram, how many grams of the medication should the feed company add for each ton of feed they produce?

~~2000 · 15~~

$\frac{2000}{15} \Rightarrow 133\frac{1}{3} \cdot 300 = \frac{40{,}000 \text{ mg}}{1{,}000} \text{ g}$

40 g

$\frac{D}{R \mid T}$

3. Kwan is driving at a constant speed. After $1\frac{1}{4}$ hours he has driven a total distance of 90 miles.

(a) How far will Kwan drive in 2 hours at this rate?

$R = \frac{D}{T} = \frac{90}{\frac{5}{4}} \Rightarrow 90 \cdot \frac{4}{5}$

72 mph

144

(b) If D represents the distance Kwan has driven in miles and t represents the time he has been driving, in hours, then write an equation for D in terms of t.

$R = \frac{D}{T} = 72 \text{ m/hr}$

$D = RT$

$D = 72t$

(c) Use your equation from (b) to determine how far Kwan drives in 15 minutes.

$D = RT = 72t$

$72 \cdot \frac{1}{4}$

$72 \cdot 0.25$

$D = 18 \text{ m} / 15 \text{ min}$

(d) Kwan is driving a total of 234 miles. How long will his trip take him, to the nearest tenth of an hour, assuming he travels at this constant rate? Use proper units.

$D = RT$

$\frac{234 = 72t}{72}$

$t = 3.25$

t = 3.3 hrs

REASONING

Unit rates are proportions where we compare the change in one variable to a change of one unit in the other variable. When we typically report speeds in miles per hour, that is a unit rate. A speed of 65 miles per hour should be interpreted as 65 miles traveled per 1 hour of time. When we say that fat has 9 calories per gram, that is a unit rate because we are comparing 9 calories to 1 gram.

4. Convert each of these into unit rates. Some will be decimal unit rates.

(a) 24 feet per 3 seconds (b) 30 pounds per 8 boxes (c) 50 calories per 20 chips

$\frac{24}{3} \to \frac{8}{1} \to 8\text{ ft/s}$ $\frac{30}{8} \to 3.75\text{ lbs/box}$ $\frac{50}{20} \to 2.5\text{ c/chip}$

Mindfulness:

Choose Your Breath:

Initial (monitor/keep rhythm)

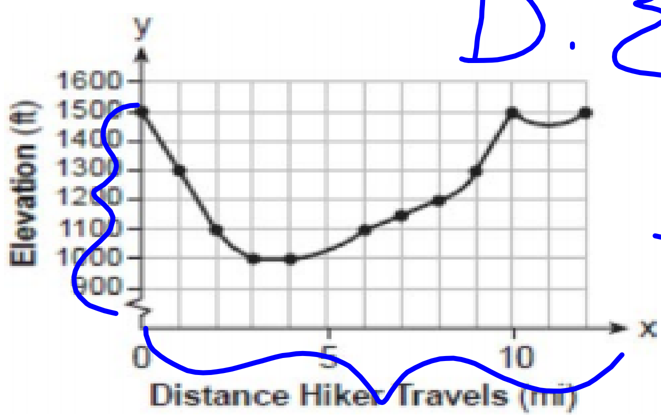
Heart/Belly

Calming (2 in, 4 out)

Energizing (4 in, 2 out)

Bell Ringer:

The accompanying graph shows the elevation of a certain region in New York State as a hiker travels along a trail.



$D: \{x \mid 0 \le x \le 12\}$

What is the domain of this function?

−2 is NOT a solution of which inequality?

[A] $b-3<4$ [B] $\frac{x}{3}>1$

[C] $p-1<2$ [D] $m+4>-1$

$-2-3<4$ ✓

$\frac{-2}{3}>1$ X

$-2-1<2$ ✓

$-2+4>-1$ ✓

UNIT CONVERSIONS
COMMON CORE ALGEBRA I

Units are amazingly important in mathematics, science, and engineering. They are how we decide on what constitutes the number 1 (i.e. 1 gallon, 1 pound, etcetera). We often need to **convert** from one unit to another in practical problems. In this situation we can almost always use proportional reasoning to do the job.

***Exercise* #1:** John has traveled a total of 4.5 miles. If there are 5,280 feet in each mile, how many feet did John travel? Set up and solve a proportion for this problem. Also, do the problem by multiplying by a ratio.

$\frac{4.5m}{1} \cdot \frac{5280 ft}{1 mile}$ 23,760ft

***Exercise* #2:** If there are exactly 2.54 centimeters in each inch, how many centimeters are in one foot? Show the work that leads to your answer.

$\frac{2.54cm}{1 inch} \cdot \frac{12 inch}{1 ft.} = 30.48 cm/ft.$

Sometimes it is helpful to be able to convert so that a rate makes more sense. Take a look at the next problem.

***Exercise* #3:** A bathtub contains 14.5 cubic feet of water. If water drains out of the bathtub at a rate of 4 gallons per minute, then how long will it take, to the nearest minute, to drain the bathtub? There are 7.5 gallons of water per cubic foot. Show the work that leads to your answer.

$$\frac{14.5\,ft^3}{1}\cdot\frac{7.5\,g}{1\,ft^3}\cdot\frac{1\,min.}{4\,g}$$

27.1875

27 minutes

***Exercise* #4:** The mile and the kilometer are relatively close in size. Can you convert 1 mile into an equivalent in kilometers? Here's what I'll give you. There are 2.54 centimeters in an inch, 5,280 feet in a mile, 100 centimeters in a meter, and 1000 meters in a kilometer. All else you should be able to do for yourself. Round your answer to the nearest tenth of a kilometer. This takes quite a string of multiplications, but you can do it!

30.48 cm/ft

$$\frac{100}{30.48} \Rightarrow 3.28\ ft/meter$$

$$\frac{3.28\,ft}{1\,m}\cdot\frac{1000\,m}{1\,km} \rightarrow \frac{3280\,ft}{km}$$

$$1\,mile = \frac{5280\,ft}{1\,mile}\cdot\frac{1\,km}{3280\,ft} = 1.609$$

1.6 km/mile