Name: _____ Date: _____

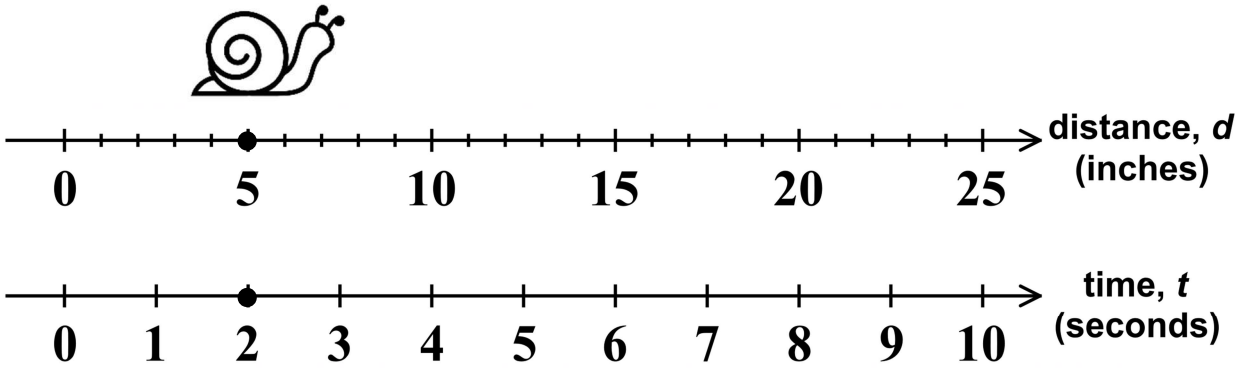
PROPORTIONAL RELATIONSHIPS
N-GEN MATH® 7

In the last lesson we used algebra to help solve ratio problems. In this lesson we look at situations where two variables always have a constant ratio. When this occurs, we say the two variables have a **proportional relationship** or are **proportional.**

***Exercise* #1:** A snail is moving along the ground at a steady pace such that the distance it has traveled, represented by the variable *d*, is given in the table below as a function of the minutes it has been moving.

time, *t* (seconds)	2	4	6	8	10
distance, *d* (inches)	5	10	15	20	25

(a) Plot points on the double number line below that represent the snail's distances and times. The first is done for you.



(b) Form the ratio, as a fraction, of the distance to the time for each of the five columns of the table below. Reduce each fraction to lowest terms.

(c) What is the unit rate associated with the ratio(s) in letter (b)? Include proper "per" units.

The snail's distance and time in *Exercise* #1 showed a **proportional relationship**:

PROPORTIONAL RELATIONSHIPS

Two variables m and n have **a proportional relationship** or are **called proportional** if their ratio (or quotient) is always the same. In equation form:

$$\frac{m}{n} = \text{ a constant}, \text{ i.e. } m \div n = \text{ a constant}$$

The **constant** or **unit rate** is known as the **constant of proportionality.**

***Exercise* #2:** For *Exercise* #1, what was the **constant of proportionality?** What is this constant better known as?

***Exercise* #3:** Janelle bought cupcakes three different times at a bakery. The number of cupcakes she bought, n, and the total cost, c, is given in the table below.

number of cupcakes, n	3	5	8
total cost, c	\$6.75	\$11.25	\$18.00

(a) Using long division, find the ratio of the cost to the number of cupcakes for each of the three columns using long division. Show your work.

(b) Does your work from (a) suggest that there is a proportional relationship between the total cost and the number of cupcakes? If so, what is the constant of proportionality and what does it represent?

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PROPORTIONAL RELATIONSHIPS
N-GEN MATH® 7 HOMEWORK

FLUENCY

1. When two variables are in a proportional relationship, which of the following is true about their values.

   (1) their sums are a constant

   (2) their differences are a constant

   (3) their products are a constant

   (4) their quotients are a constant

_____

USING YOUR MATH

2. Cards and chips are being created for a boardgame by a company. The number of cards produced is proportional to the number of chips that are produced. Over a short period of time the company produced 32 cards and 4 chips.

   (a) What is the ratio of cards to chips produced? State in simplest form as a unit rate in cards per chip.

   (b) If 11 chips were produced, how many cards would be produced? Use your answer from (a).

3. Donna orders boxes of batteries for calculators in the math class she teaches. She knows that the number of batteries she gets, n, is proportional to how many boxes, b, of batteries she buys. In previous years she has recorded the following:

number of boxes, b	11	15	21
number of batteries, n	44	60	84

   What is the ratio of the number of batteries to the number of boxes? What does it represent?

4. Gabriela is weighing quarters on a scale. She weighs various numbers of quarters, n, and records their total weight, w, in grams.

number of quarters, n	4	10	24
total weight, w (grams)	22	55	132

(a) Find the ratio of the weight of the quarters to the number of quarters for all three columns of the table. Use long division. Express your answer using decimals.

(b) Explain why the ratios (quotients) in (a) show that there is a **proportional relationship** between the number of quarters and the weight.

(c) What is the constant of proportionality between the two variables? What does it represent?

(d) If Gabriela placed 30 quarters on the scale, what would the weight, w, be?

(e) Based on (d), try to write an equation that relates the weight, w, of the coins based on the number of coins, n, and the constant of proportionality.