SECTION 2.4 APPLICATIONS AND FUNCTIONS

Name: Key **Date:** _____ **Period:** _____

Vocabulary

DEFINITION	EXAMPLE
Unit Rate a ratio where the denominator is 1	40 miles per 1 hour $\frac{40 \text{ miles}}{1 \text{ hour}}$

What is a *unit rate*? In the following exploration, we will connect these ideas to functions.

EXPLORATION 1

Individually, make a list of 5 rates that you might hear or read about. In groups, share your list. Each group should choose 4 unit rates. For each unit rate: miles per hour, meters per second, miles per gallon, pounds per inch, dollars for an item sold, etc.

1. Define an independent variable (the input).
2. Define the dependent variable (the output).
3. Name the function and find a rule for the function.
4. What is the set of inputs (domain) and the set of outputs (range)?
5. Sketch a graph of each function. You may use a graphing calculator to check these graphs. Should you put these graphs on the same coordinate system? Why?

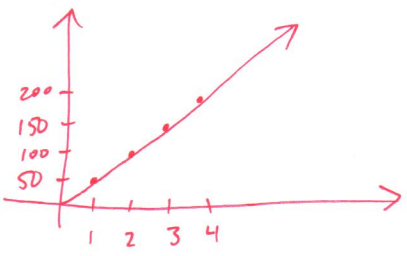
Answers will vary.

Ex: 1) hours driven 2) miles travelled

3) $M(h) = 50h$

4) domain: non-negative numbers
range: non-negative numbers

5)



EXAMPLE 1

Mary receives her first music DVDs when her brother gives her 14 of them at the beginning of summer. From then on, at the end of each week, she buys 3 more DVDs. When will she have 50 DVDs in her collection?

Solution We denote the function describing the number of DVDs Mary has after x weeks with $N(x)$. In the beginning, when no weeks have passed, she starts with 14. Making a table of inputs and outputs, we get

Week x	# of DVDs $N(x)$
0	14
1	$17 = 14 + 3$
2	$20 = 14 + 3 + 3 = 14 + 2 \cdot 3$
3	$23 = 14 + 3 \cdot 3$
4	$26 = 14 + 4 \cdot 3$
x	$N(x) = 14 + 3x$

$14 = 14 + (0) \cdot 3$

Now we need to find the number of weeks x it takes Mary to have 50 DVDs.

$N(x) = 50$
$14 + 3x = 50$
$14 + 3x - 14 = 50 - 14$
$3x = 36$

$\frac{3x}{3} = \frac{36}{3}$
$x = 12$

It takes 12 weeks for Mary to have 50 DVDs.

EXAMPLE 2

Jack sells caps for \$12 per cap and Bethany sells T-shirts for \$16 per shirt.

$H(x)$ = cost of x hats $T(x)$ = cost of x T-shirts

1. If a soccer coach has \$576 to spend on her team, how many caps could she buy?

$H(x) = 12x$
So $576 = 12x$ $\frac{576}{12} = \frac{12x}{12}$ $48 = x$ She can buy 48 caps.

2. How many T-shirts could she buy?

$T(x) = 16x$
$576 = 16x$ $\frac{576}{16} = \frac{16x}{16}$ $x = 36$ She can buy 36 T-shirts.

3. How would your answers change if the coach had \$588 to spend?

$H(x) = 12x$
$\frac{588}{12} = \frac{12x}{12}$ (49) $= x$

$T(x) = 16x$
$\frac{588}{16} = \frac{16x}{16}$ $x = 36.75$ (can't buy a partial shirt)

(36)

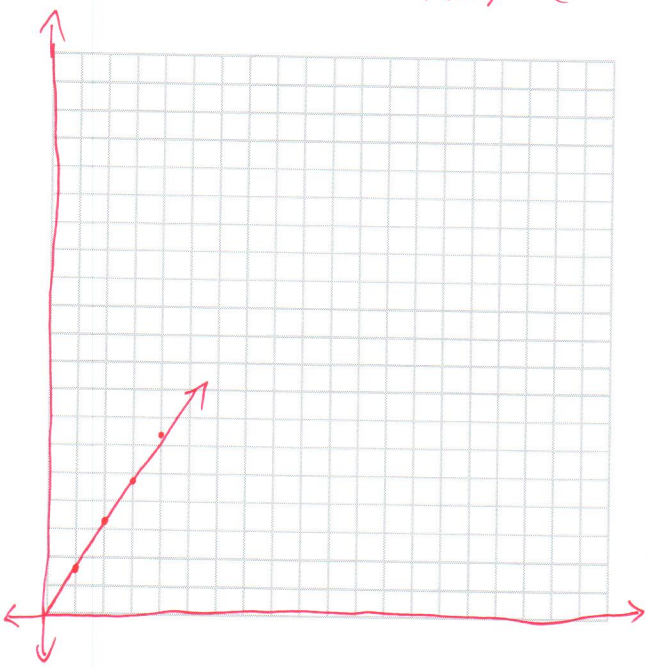
EXAMPLE 3

Jack is participating in School Walk for Diabetes to raise money for the American Diabetes Association (ADA). He raises $1.60 for each mile he walks.

Jack has raised $50 for ADA. How many miles did he need to walk for this?

1. Write a function that relates the number of miles he walks with the total amount of money he raises in his walk.

$f(x) = (1.6)x$



2. Represent the function as ordered pairs.

x	$f(x)$
0	0
1	1.60
2	3.20
3	4.80
4	6.40
⋮	⋮
x	1.6 x

3. Graph the function.
4. What is the domain? What is the range?

domain is all non-negatives
range is all non-negatives

SUMMARY (What I learned today)