



**8th Grade
Math**
Comparing
Functions

Name: Key #:
Date: _____
Homeroom:  Cleveland State University  KENTUCKY STATE UNIVERSITY



Functions 7

AIM(S):

- ✓ SWBAT compare two functions when given tables, graphs, or written descriptions

DO NOW

Directions: Complete the following questions.

1. The table below shows the costs of purchasing certain numbers of tablets. We can assume that the total cost is a linear function of the number of tablets purchased.

Number of tablets (x)	17	22	25
Total cost in dollars (y)	10,183.00	13,178.00	14,975.00

- a. Write an equation that describes the total cost, y , as a linear function of the number, x , of tablets purchased.

$$y = 599x$$

- b. Is the function discrete? Explain.

yes: we can only have "whole numbers" tablets

- c. What number does the function assign to 7? Explain.

$$599 \times 7 = \$4193$$

2. A function C assigns to each word in the English language the number of letters in that word. For example, C assigns the number 6 to the word action.

- a. Give an example of an input to which C would assign the value 3.

ex: cat, hat, car...

- b. Is C a discrete function? Explain.

yes: only whole # of letters.

Class Notes: Writing Constant Rate Equations REVIEW

Directions: Board Equals Paper!

Rate: When you are given two different units (example: miles and hours, wall painted and days, price for bananas), this is a rate.

In equations, rate is your slope (m)! For each of the following, write a linear equation for the scenario.

Value at time (or amount) zero. Whatever the value at time/amount zero is, is the y intercept! Remember, the y-intercept is b in $y = mx + b$

- 1) Sam can paint fifteen portraits each day. If he paints at a constant rate, write a linear equation to describe the situation.

$x =$ # of days

$y =$ # of portraits

Linear Equation

$$y = 15x$$

Discrete

Continuous

- 2) The temperature rises 2.5 degrees Celsius for every two meters deeper into the earth's crust. The surface temperature is 14 degrees Celsius, write a linear equation to describe the situation.

$x =$ # of meters below surface level

$y =$ temperature

Linear Equation

$$y = \frac{2.5}{2}x + 14 \quad \text{or} \quad y = 1.25x + 14$$

Discrete

Continuous

3) A flower grows 1 millimeter every 3 hours. If we assume it grows at a constant rate, write a linear equation to describe the situation.

$x =$ # of hours since planted

$y =$ height in millimeters

Linear Equation

$$y = \frac{1}{3}x$$

Discrete Continuous

4) Karl can build five birdhouses in three days. If we assume he works at a constant rate, write a linear equation to describe the situation.

$x =$ # of days

$y =$ # of birdhouses

Linear Equation

$$y = \frac{5}{3}x$$

Discrete Continuous

5) Savannah is writing a 50,000 word novel for National Novel Writing Month (NaNoWriMo). She types about 3,000 words every 2 days, and so far she has typed 23,000 words. If we assume she works at a constant rate, write a linear equation to describe how long it will take her to finish her novel.

$x =$ # of days

$y =$ # of words typed

Linear Equation

$$y = \frac{3000}{2}x + 23000 \text{ or } 50000 = \frac{3000}{2}x + 23000$$

Discrete Continuous

6) It takes Allan 140 minutes to drive the 139 miles from his parent's house to his college. If we assume he drives at a constant rate, write a linear equation to represent the situation.

$x =$ # of minutes driven

$y =$ # of miles driven

Linear Equation

$$y = \frac{139}{140}x$$

Discrete Continuous

Class Notes: Comparing Functions

To **compare functions** can mean multiple things in math. Today, it means to see which one is better for a specific situation.

When would we compare functions in real life?

Examples:

prices, speeds, competitions (money donations, hotdogs eaten, etc)

How to compare linear functions:

Step 1: _____

Step 2: _____

Step 3: _____

Often times, we are actually solving a system of linear equations!

Example 1:

- 1) Alan and Margot each drive from City A to City B, a distance of 147 miles. They take the same route and drive at constant speeds. Alan begins driving at 1:40 p.m. and arrives at City B at 4:15 p.m. Margot's trip from City A to City B can be described with the equation $y=64x$, where y is the distance traveled in miles and x is the time in ^{minutes} hours spent traveling. Who gets from City A to City B faster?

Alan

1:40 - 4:15 (155 min.)

~~9:15~~

Margot

$$y = 64x$$

$$147 = 64 \frac{x}{60}$$

$$147 = \frac{64}{60}x$$

137.8 min

Margot gets there faster
(137.8 min vs 155 min)

Guided Practice

Directions: Board=Paper!

- 1) You have recently begun researching phone billing plans. Phone Company A charges a flat rate of \$75 a month. A flat rate means that your bill will be \$75 each month with no additional costs. The billing plan for Phone Company B is a linear function of the number of texts that you send that month. That is, the total cost of the bill changes each month depending on how many texts you send. The table below represents some inputs and the corresponding outputs that the function assigns.

Input (number of texts)	Output (cost of bill in dollars)
50	50
150	60
200	65
500	95

At what number of texts would the bill from each phone plan be the same? At what number of texts is Phone Company A the better choice? At what number of texts is Phone Company B the better choice?

Company A

$$y = 75$$

Company B

$$m = \frac{60 - 50}{150 - 50} = \frac{10}{100} = \frac{1}{10}$$

$$y = mx + b$$

$$y = \frac{1}{10}x + b$$

$$50 = \frac{1}{10}(50) + b$$

$$50 = \frac{5}{10} + b$$

$$45 = b$$

$$y = \frac{1}{10}x + 45$$

Solve the system

$$\begin{cases} y = 75 \\ y = \frac{1}{10}x + 45 \end{cases} \text{ Substitute}$$

$$(75) = \frac{1}{10}x + 45$$

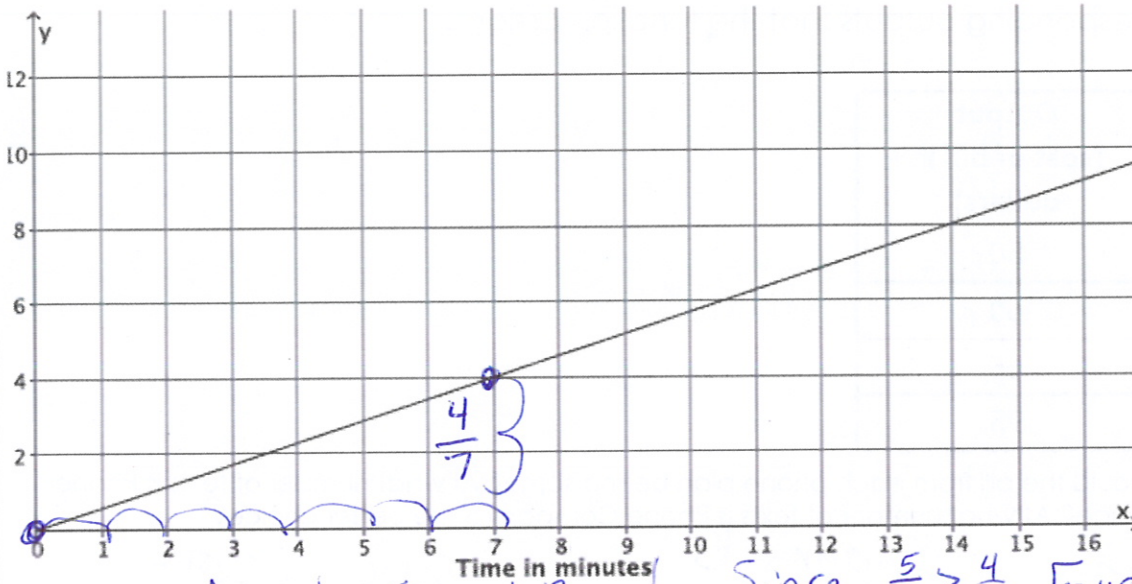
$$30 = \frac{1}{10}x$$

$$300 = x$$

$$\boxed{(300, 75)}$$

Prior to 300 texts, Company B is the better choice. After 300 texts, Company A is better. At 300 they are both \$75.

- 2) The function that gives the volume of water, y , that flows from Faucet A in gallons during x minutes is a linear function with the graph shown. Faucet B's water flow can be described by the equation $y = \frac{5}{6}x$, where y is the volume of water in gallons that flows from the faucet during x minutes. Assume the flow of water from each faucet is constant. Which faucet has a faster rate of flow of water? Each faucet is being used to fill a tub with a volume of 50 gallons. How long will it take each faucet to fill its tub? How do you know?



Faucet A
 $y = \frac{4}{7}x$
 $(50) = \frac{4}{7}x$

$x = 87.5 \text{ min}$

Faucet B
 $y = \frac{5}{6}x$
 $50 = \frac{5}{6}x$

$x = 60 \text{ minutes}$

Since $\frac{5}{6} > \frac{4}{7}$, Faucet B fills the tub faster.
 It will take $87\frac{1}{2}$ minutes for Faucet A & 60 for Faucet B

Suppose the tub being filled by Faucet A already had 15 gallons of water in it, and the tub being filled by Faucet B started empty. If now both faucets are turned on at the same time, which faucet will fill its tub fastest?

Faucet B,
 still
~~80~~ 60.5 min

Faucet A
 $y = \frac{4}{7}x + 15$
 $(50) = \frac{4}{7}x + 15$
 $35 = \frac{4}{7}x$
 $61.25 = x$

Faucet B will still fill the tub faster, by $1\frac{1}{4}$ min.

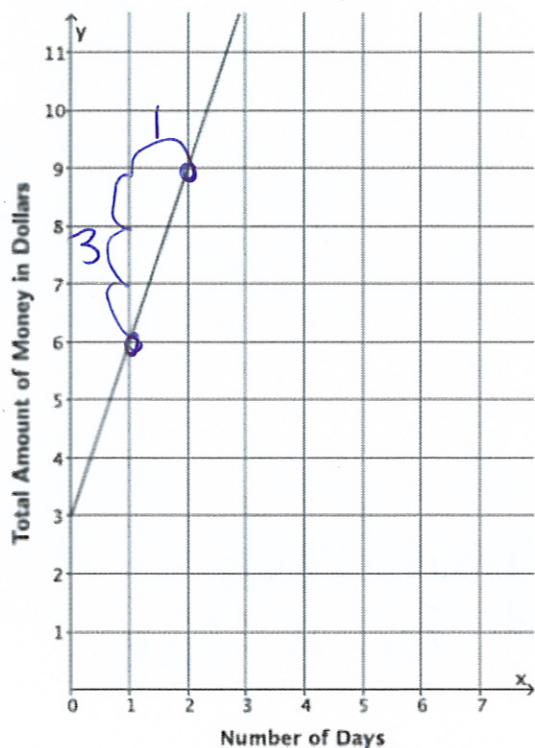
Independent Practice

Directions: Complete every question below! Do your best! When done, you may work on the
ADVANCED WORK ONLY (not homework 😊)

Two people, Adam and Bianca, are competing to see who can save the most money in one month. Use the table and the graph below to determine who will save the most money at the end of the month. State how much money each person had at the start of the competition. (Assume each is following a linear function in his or her saving habit.)

Adam's Savings:

Bianca's Savings:



Input (Number of Days)	Output (Total amount of money in dollars)
5	17
8	26
12	38
20	62

Adam started with \$3, Bianca started with \$2

Adam
 $y = 3x + 3$

Bianca
 $\frac{26-17}{8-5} = 3$ $y = 3x + 2$

$m = 3$

$y = mx + b$

$y = 3x + b$

$(5, 17)$

$17 = 3(5) + b$

$17 = 15 + b$

$b = 2$

Keep going! There are more challenges ahead!

The equation $y=123x$ describes the function for the number of toys, y , produced at Toys Plus in x minutes of production time. Another company, #1 Toys, has a similar function, also linear, that assigns the values shown in the table below. Which company produces toys at a slower rate? Explain.

Time in minutes (x)	Toys Produced (y)
5	600
11	1,320
13	1,560

#1 Toys ~~120x~~

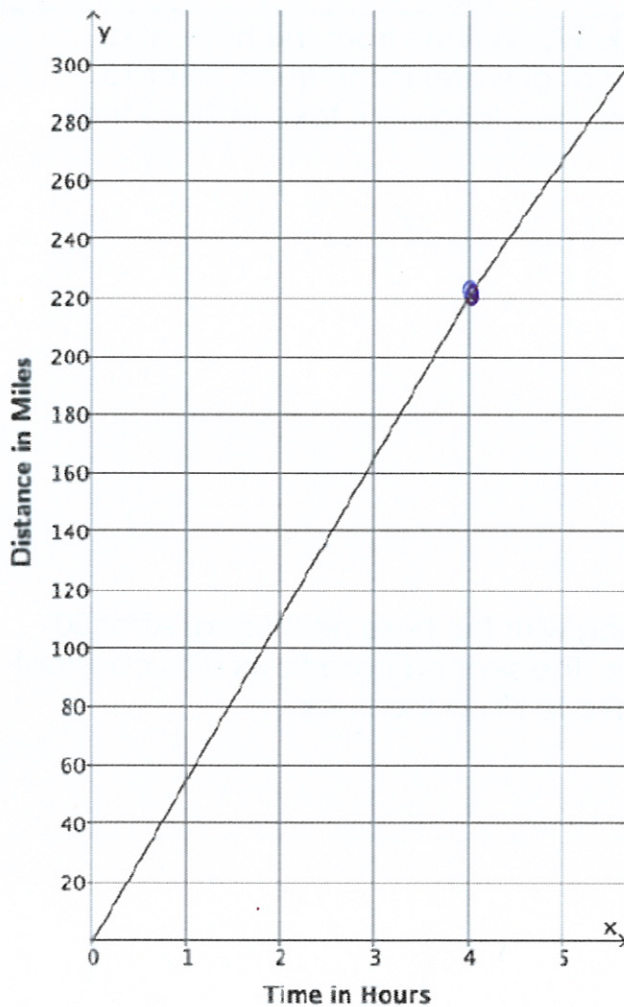
$$\frac{1560 - 1320}{13 - 11} = \frac{240}{2} = 120 \text{ toys/minute}$$

$$y = m \cdot x + b$$

$$y = 120x$$

Since #1 toys makes 120 toys/minute versus 123 toys/minute at Toys Plus, #1 Toys is slower.

A train is traveling from City A to City B, a distance of 320 miles. The graph below shows the number of miles, y , the train travels as a function of the number of hours, x , that have passed on its journey. The train travels at a constant speed for the first four hours of its journey and then slows down to a constant speed of 48 miles per hour for the remainder of its journey.



a. How long will it take the train to reach its destination?

The train goes 220 miles in the first 4 hours $320 - 220 = 100$, so the train has 100 miles left at 48 mph.

$$100 = 48x$$

$$x \approx 2.1 \text{ hrs.}$$

$$4 + 2.1 = 6.1 \text{ hours.}$$

The train will take 6.1 hours.

b. If the train had not slowed down after 4 hours, how long would it have taken to reach its destination?

$$m = \frac{220}{4} = 55 \text{ mph}$$

$$320 = 55x$$

$$5.8 \approx x$$

If the train didn't slow, it would take 5.8 hrs.

c. Suppose after 4 hours, the train increased its constant speed. How fast would the train have to travel to complete the destination in 1.5 hours?

$$100 = m(1.5)$$

$$m \approx 66.6 \text{ mph}$$

The train must increase to $66\frac{2}{3}$ mph to finish the journey in $1\frac{1}{2}$ hrs.

8th Grade Math Advanced Work (Due XYZ)

Directions: Complete this for dollars! Turn in advanced work with your homework.

Name: _____ #: _____ HR: _____

- a. A hose is used to fill up a 1,200 gallon water truck. Water flows from the hose at a constant rate. After 10 minutes, there are 65 gallons of water in the truck. After 15 minutes, there are 82 gallons of water in the truck. How long will it take to fill up the water truck? Was the tank initially empty?
- b. The driver of the truck realizes that something is wrong with the hose he is using. After 30 minutes, he shuts off the hose and tries a different hose. The second hose flows at a constant rate of 18 gallons per minute. How long now does it take to fill up the truck?

Name and Number: _____

Is this a re-submit? _____

Ms. Huber
614-859-0019
Mshubersmath.weebly.com



HOMWORK

8th Grade Math

Functions 7

Comparing Functions

____ / 5 = ____ % DNG
A B C D F

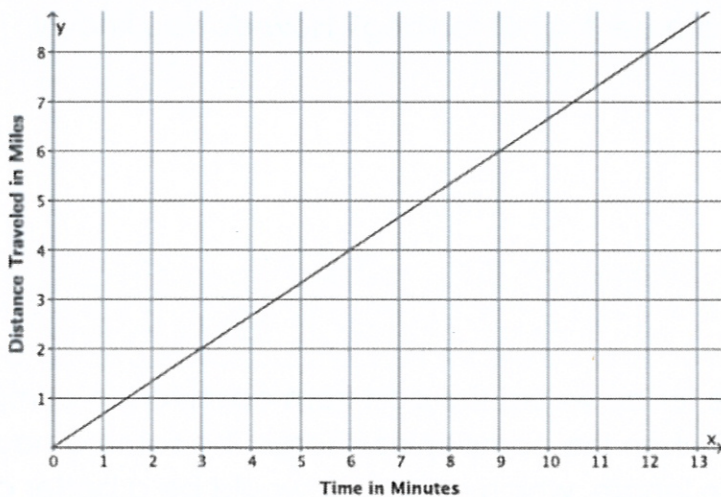
STRIVE Due Date:
XYZ

Accepted Until:
LALA

Directions: Complete all of the below problems (FRONT AND BACK). If you have questions, first check the examples in your packet. Then, check the class website or ask a classmate or guardian for help. Then, you can call your teacher if you still have questions.

The graph below represents the distance in miles, y , Car A travels in x minutes. The table represents the distance in miles, y , Car B travels in x minutes. It is moving at a constant rate. Which car is traveling at a greater speed? How do you know? Show all work and answer in a complete sentence.

Car A:



Car B:

Time in minutes (x)	Distance in miles (y)
15	12.5
30	25
45	37.5

FLIP OVER!

The local park needs to replace an existing fence that is 6 feet high. Fence Company A charges \$7,000 for building materials and \$200 per foot for the length of the fence. Fence Company B charges are based solely on the length of the fence. That is, the total cost of the six-foot high fence will depend on how long the fence is. The table below represents some inputs and their corresponding outputs that the cost function for Fence Company B assigns. It is a linear function.

Input (length of fence in feet)	Output (cost of bill in dollars)
100	26,000
120	31,200
180	46,800
250	65,000

- a. Which company charges a higher rate per foot of fencing? How do you know?
- b. At what number of the length of the fence would the cost from each fence company be the same? What will the cost be when the companies charge the same amount? If the fence you need were 190 feet in length, which company would be a better choice?