Name: Key Date: _____ Class: ____

I can compare linear functions in multiple representations.

A linear function is a function with a constant rate of change. This means that the rate of change does not change. Sounds crazy, right? There are many examples of real world scenarios where linear functions are used. Below you will find several of these. In each, keep in mind that you are trying to determine a slope (rate of change) and a y intercept (initial value).

To find a slope, think about which amount is being repeated daily, weekly, monthly, each shirt, each hour, etc. This number will be your rate of change or slope.

The y intercept or initial value is a starting value. It is a one-time deal. It may be a fee that is charged once (like a deposit or a price for the shipping of an order or a starting weight).

To compare rates of change, you must first decide whether the rate of change is increasing (positive) or decreasing (negative). Then, determine which is changing at a faster rate.

Scenario A: Sandra is a house painter. She charges an hourly rate for painting a house. The equation $y = 13x$ shows the total charge, c, in dollars for hiring Sandra to paint a house for t hours. Emil is also a house painter. He charges an hourly rate for painting a house. The information below represents Emil's total charges, c, for painting a house for t hours.

t	2	4	6	8
c	46	72	98	124

Sandra $y = 13x$

$y = 13x + 20$

1. What is Sandra's hourly rate? $13
2. What is Emil's hourly rate? $13
3. Which is cheaper for a house that takes 12 hours to paint? Show your work or explain how you know.

They are: Sandra $156.00 Emil $176

Jose also submits a bid for the job. He offers a base rate of $12 and an hourly rate of $10. Who has the greatest rate of change?

$y = 10x + 12$ Emil & Sandra both have $13

Scenario B: Sam is saving money for vacation. He has $40 from his birthday money. He can save an additional $24 per week. Brad is also saving for vacation. He can save $35 per week. Create a table for each boy. Show how much each would have at 0, 2, 4, 6, and 8 weeks.

Sam ($)	40	$88	$136	$184	$232
Brad ($)	0	$70	$140	$210	$280
weeks	0	2	4	6	8

Sam = $y = 24x + 40$

Brad $y = 35x$

Scenario C: There are three trees growing in a garden. Their growth is recorded below.

A.

The first tree was five inches tall when planted. It has grown four inches every month since being planted.

$y = 4x + 5$

B.

Measurements were taken of the second tree and given below:

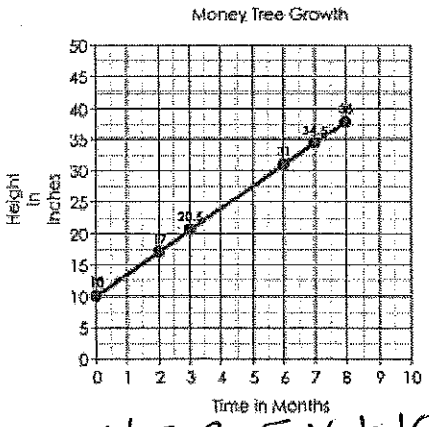
Months	0	2	3	5
Height	3	12	16.5	25.5

+1 +2

+4.5 +9

$y = 4.5x + 3$

C.



$y = 3.5x + 10$

1. Which tree is growing the fastest? Tree B
2. Which tree was the tallest when it was planted? Tree C
3. Which tree is the tallest at 3 months? Tree C

Scenario D: Jonathan planted two plants. After each plant had grown a little, he began using them for his science fair project. The table shows the growth of plant 1 over several days. The equation f(x) = 1.5x +3 represents the height in centimeters as a function of days for Plant 2.

Plant 1:

Number of days (x)	0	1	2	3
Height (in cm.) f(x)	1.5	3.5	5.5	7.5

Plant 2:

f(x) = 1.5x + 3

1. Which plant was the smallest when he planted it?
   Plant 1: 1.5cm Plant 2: 3 cm so, plant 1 is smallest
2. Which of the following describes the rates of change?

   a. The rate of change of plant 1 is decreasing at a faster rate than that of plant 2.
   (b.) The rate of change of plant 1 is increasing at a faster rate than that of plant 2.
   c. The rate of change of plant 2 is decreasing at a faster rate than that of plant 1.
   d. The rate of change of plant 2 is increasing at a faster rate than that of plant 1.

   Plant 1 = $\frac{2\text{ cm}}{1\text{ day}}$
   Plant 2 = $\frac{1.5\text{cm}}{1\text{ day}}$
   both increasing

3. How tall will each plant be after 5 days?
   Plant 1: 11.5cm Plant 2: 10.5cm

I can write equations given verbal descriptions.

1. Margaret is graduating from college this spring. She has saved $1000 from her part time job. She anticipates receiving cash gifts from relatives at graduation. If each relative gives an average of $50, show her total savings (s) with (r) relatives giving her cash.
   Rate of change (slope): $50 Y-intercept: $1000 Equation: S = 50r + 1000
2. Tyriq is considering renting an apartment after high school graduation. He found one apartment that charges $475 per month. There is also a security deposit of $1000 required for move in. What is the total amount (y) he will pay for renting this apartment for (x) months?
   Rate of change (slope): $475 Y-intercept: $1000 Equation: y = 475x + 1000
3. An electrician charges $45 per hour for a service call. For after hours and weekends, there is an additional charge of $70. What is the total amount (c) charged for a Saturday repair requiring (h) hours of work?
   Rate of change (slope): $45 Y-intercept: $70 Equation: C = 45h + 70
4. A caterer charges $120 to cater a party for 15 people and $200 for 25 people. What is the total charge (c) of catering a party for (p) people?
   Rate of change (slope): $8 Y-intercept: 0 Equation: C = 8p

x	y
15	120
25	200

+10 +80

I can compare proportional relationships.

The tables below show the rates at which two pools are being filled. Use the tables to answer the questions that follow.

Pool A	
Minutes	Gallons
5	20
10	40
15	60
20	80

+5 +5 +5 → +120 +120 +120

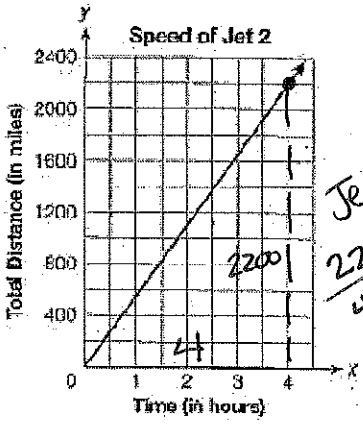
Pool B	
Minutes	Gallons
5	22
10	37
15	52
20	67

+5 → +15

1. Write the filling rate for each pool in gallons per minute. Pool A: 4 gal./1min. Pool B: 3gal/1min.
2. One of the pools was not empty when it started to be filled. From the data in the tables, which pool was not empty? How do you know? pool B. It had 7 gallons when it started.
3. Write a linear equation in slope intercept form (y=mx+b) for each pool.

   Pool A: y = 4x Pool B: y = 3x + 7

Two jets, Jet 1 and Jet 2, are cruising at a constant rate of speed. The equation $y = 575x$ shows the total distance, y, in miles, traveled by Jet 1 over x hours. The graph below shows the relationship between the traveling time and the distance for Jet 2.



Jet 1: $y = 575x$

Jet 2: $\frac{2200 \text{ miles}}{4 \text{ hrs}} = \frac{550 \text{ mi}}{1 \text{ hr.}}$

Which of the following is true?

(A.) Jet 1 is traveling at a faster speed than Jet 2. ✓

B. Jet 2 is traveling at a faster speed than Jet 1. ✗

C. Jet 1 and Jet 2 are traveling at the same speed. ✗

D. Jet 1 is sometimes traveling at a faster speed than ✗

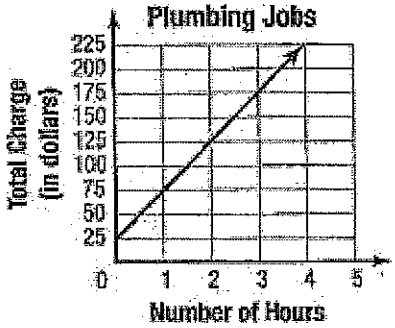
Jet 2 and sometimes at a slower speed than Jet 2. ✗

Which has a greater initial value?

(a.) $y = 500+4x$ b. $y = 200+400x$ c. $y = 600x+200$ d. $y = 4x+450$

I can identify and interpret the rate of change given various representations.

A plumber charges a set fee for each house call plus an hourly rate, as shown in the graph below.



What does the slope of the graph represent? $\frac{\text{Change in } y \text{ (\$)}}{\text{Change in } x \text{ (hrs)}}$

a. The cost of materials for each plumbing job.

b. The total charge for any plumbing job.

c. The set fee for any plumbing job.

(d.) The hourly rate charged by the plumber

What is the rate of change in the situation below:

Robert is making wooden bird houses to sell at the craft fair at school. He has already made 20 houses. He can make 2 houses per day. The equation below represents the total houses he builds as a function of x, the number of days.

houses: $f(x)=20+2x$ days

What is the rate of change in the function? $\frac{2 \text{ houses}}{1 \text{ day}}$

If the fair is 12 days away, how many houses can Robert expect to have for sale? 44 houses

Bella's pizza shop charges $4.50 for a small pizza and $9.00 for a large pizza. Toppings cost extra. Bruce ordered a large pizza with three toppings that cost a total of $12.60. What is the unit rate per topping for a large pizza? $1.20

Small: 4.50

Large: 9.00

$12.60 = \_\_(3)+9.00$

-9.00

$3.60 = \_3$ -9.00

If Anthony pays $6.90 for a three topping small pizza, is the unit rate for toppings the same as for a large pizza? $6.90 - 4.50 = 2.40$ $\frac{2.40}{3} = .80$

I can determine unit rate

A 16-oz box of Wheaty Puffs costs $3.52. A 64-oz box of Wheaty Puffs is sold at the same unit price. What is the cost of the 64-oz box? $\frac{16 \text{ oz}}{3.52}$ $\frac{3.52}{16}$ $\frac{.22}{\text{oz.}}$ 64oz = $14.08

Mechanical pencils are sold at the school store at a price of $3.00 for two pencils. What is the unit rate for pencils? $\frac{\$1.50}{1 \text{ pencil}}$