Inspiring Greatness
INDEPENDENCE SCHOOL DISTRICT

Math Virtual Learning

Grade 8

Compare Linear Relationships

May 19, 2020

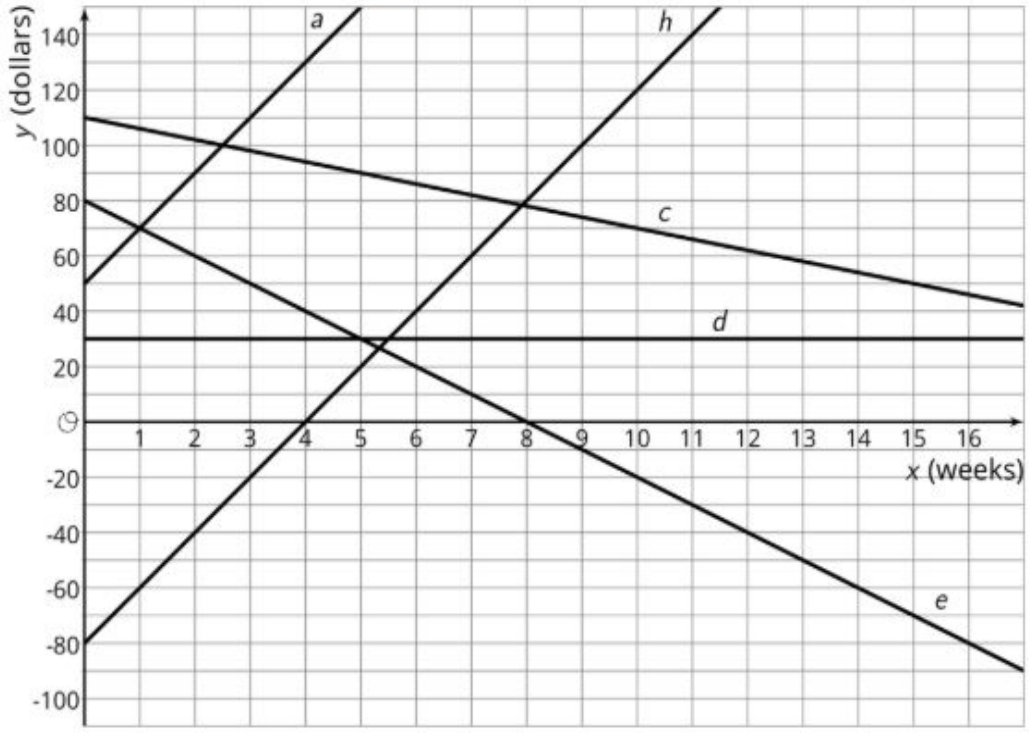
Math 8
Lesson: May 19, 2020

Objective/Learning Target:
I can compare and interpret linear relationships.

Warm-Up:

Answers on next slide

Each line represents one person's weekly savings account balance from the start of the year. **State whether each statement is true or false.**



1) **Lines a and h represent two people who save the same amount each month.**

2) **Line d represents someone who added the same amount each month.**

3) **The person in line c withdrew more money each month than the person in line e.**

Warm-Up: *Answer Key*

1) Lines a and h represent two people who save the same amount each month.
   True

2) Line d represent someone who added the same amount each month.
   False (it represents someone who did not add or withdraw money each month)

3) The person in line c withdrew more money each month than the person in line e.
   False (compare the slopes of the two lines - line e is steeper than line c)

Review: Equation in Slope-Intercept Form

$$y = mx + b$$

slope — y-intercept

Example:

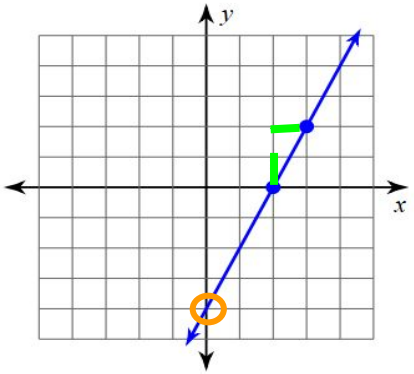
$$y = 2x + 3$$

slope — y-intercept

2/1 is the slope

(0,3) is the y-intercept

Review: How to Write an Equation Given a Graph or a Table



① Count the **slope**.

For this line, the slope is 2/1 or just 2

② Find the **y-intercept** (where the line crosses the y-axis).

For this line, the y-axis is at (0,–4).

③ Write the **equation** in **slope-intercept form**. $y = 2x - 4$

x	3	5	7	9
y	7	13	19	25

① Find the **slope** by finding the difference in y values and the difference in x values. ***Think: Slope Formula.***

*The **y values** have a difference of +6.*
*The **x values** have a difference of +2.*
Therefore the slope is 6/2 or 3

② Find the **y-intercept** in the table or plug the slope and a point into the slope-intercept equation.

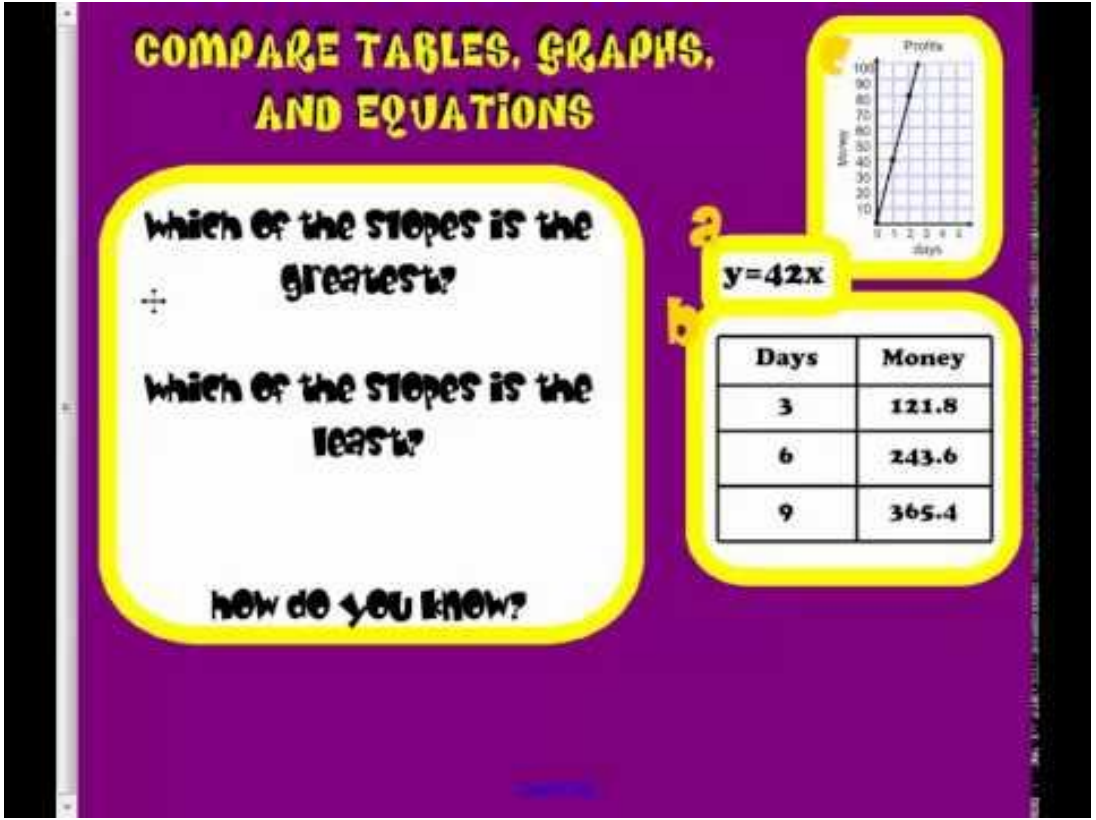
Set up: $y = 3x + b$
Use point (3, 7): $7 = 3(3) + b$
Solve: $7 = 9 + b$
$-9 \quad -9$
$-2 = b$

③ Write the **equation** in **slope-intercept form**.

$y = 3x - 2$

Video:

Take notes on a piece of paper as you watch this video.



Example 1: Two tables are shown below. Answer the questions:

– *Which table represents a faster rate of change?*

– *At which week will each table surpass 100 for the y value?*

x	–1	0	1	2
y	25	45	65	85

x	–2	–1	0	1
y	71	76	81	86

The difference in y is +20, and the difference in x is +1, so the slope is +20 / +1 or 20.

The difference in y is +5, and the difference in x is +1, so the slope is +5 / +1 or 5.

Answer: The blue table's rate of change (20) is faster than the green table's (5).

If we continue the table, Week 3 would be 105.

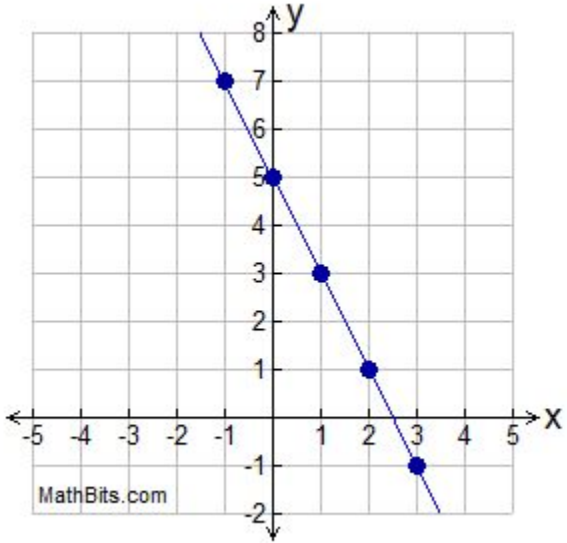
If we continue the table, Week 2 would be 91, Week 3 would be 96, and Week 4 would be 101.

Answer: The blue table's will surpass 100 at Week 3, and the green table at Week 4.

Example 2: A graph and table are shown below. Answer the questions:

– Which one represents a slower rate of change (slope)?

– Which one has a greater initial value (y-intercept)?



x	–2	0	2	4
y	6	5	4	3

For the graph, we can count the slope as "down 2, right 1", so the slope is –2 / 1, or –2.
For the table, the difference in y is –1, and the difference in x is +2, so the slope is –1 / 2 or –½.

Answer: The table's rate of change (–½) is slower than the graph's rate of change (–2).

The graph's line crosses the y-axis at 5, so its y-intercept is (0,5).
The table has a point at (0,5) and that is its y-intercept.

Answer: The initial value is the same for both relationships.

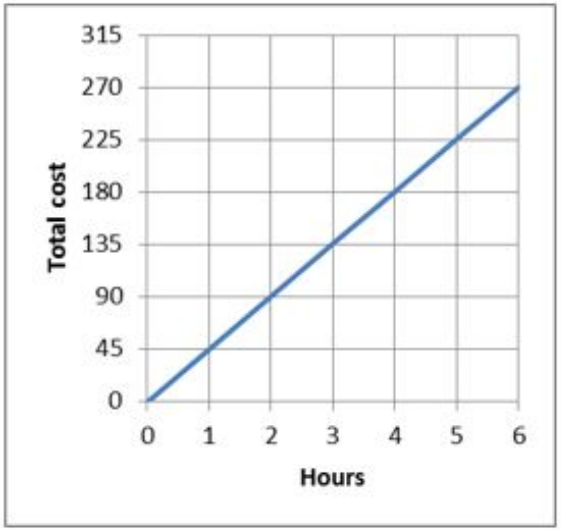
Example 3: Three DJ companies are listed below. Answer the questions:

– Which company has the greatest set-up fee?
– Which company has the lowest per-hour cost?
– Which company would be the most expensive for a 4-hour show?

Company A
Charges a flat rate of $45/hour and a set-up fee of $5

Company B
Can be modeled by the equation:
y = 40x + 10

Company C
Can be modeled by the graph:



Set-up fees (initial value / y-intercept) for Company A is $5, for Company B is $10, and for Company C is $0.
Answer: Company B has the greatest set-up fee ($10).

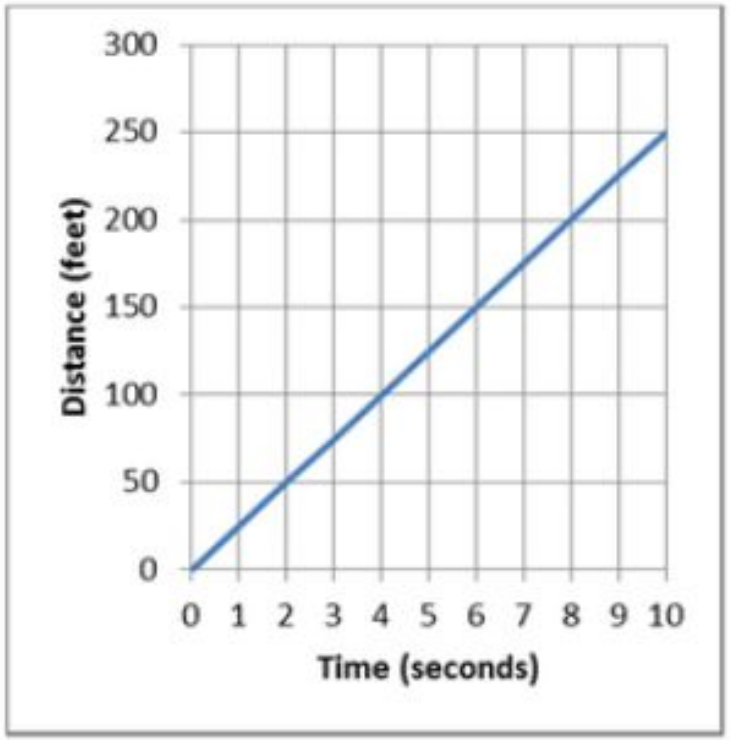
Hourly rate (rate of change / slope) for Company A is $45, for Company B is $40, and for Company C is $45.
Answer: Company B has the lowest hourly cost ($40).

For a 4-hour show, Company A is $185, for Company B is $170, and for Company C is $180.
Answer: Company A has the greatest 4-hour show cost ($185).

Practice 1:

Answers on next slide

The graph below shows how far Ricky's bike as a function of time.



If Ricky *runs* <u>more slowly</u> than he *bikes*, which of the following equations could represent how much distance (d) Ricky runs over time (t) ?

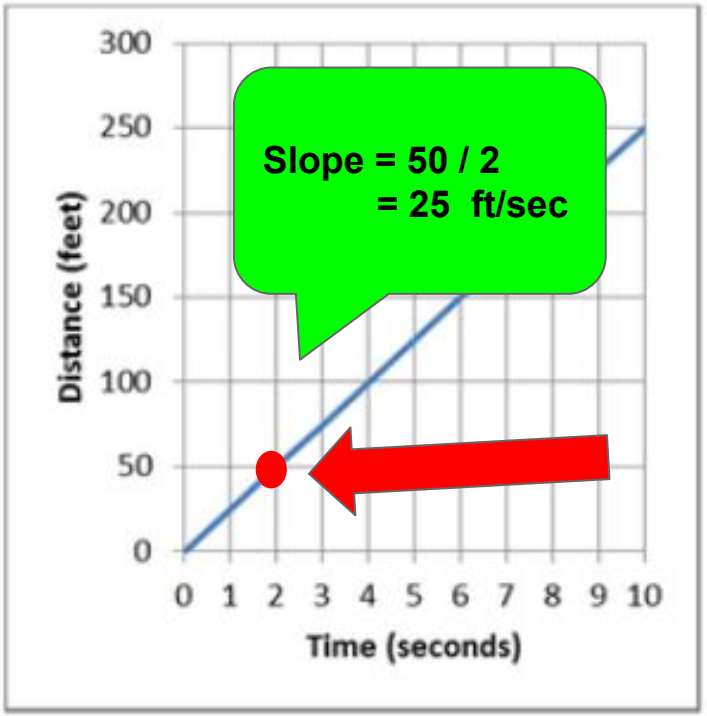
a. $d = 20t$

b. $d = 25t$

c. $d = 50t$

d. ***None of the above***

Practice 1: *Answer Key*



On the graph, the rate Ricky bikes (slope) is 50/2 or 25 feet per second. The equation for the line on the graph would be d = 25t.

The equation with a slope less than 25 is

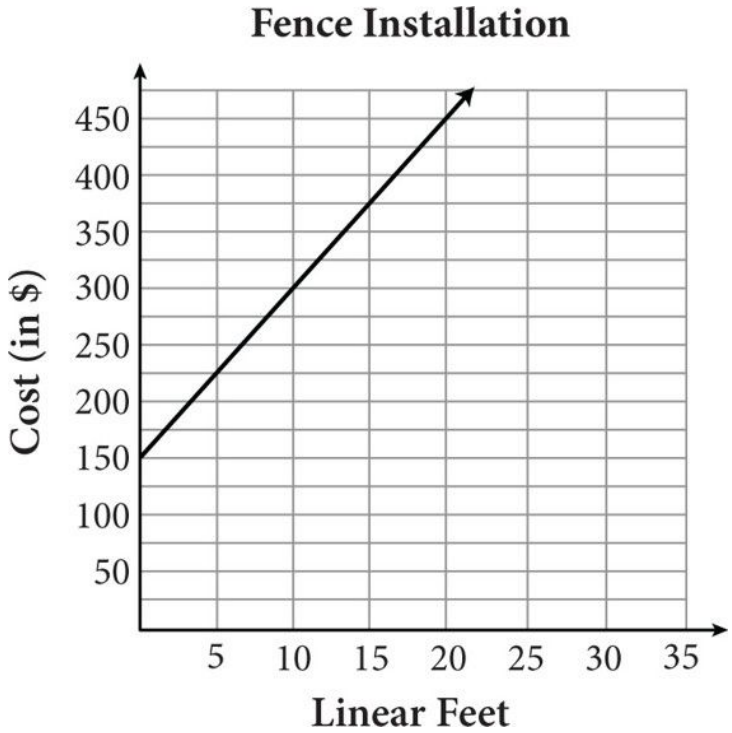
a) d = 20t

Practice 2:

Answers on next slide

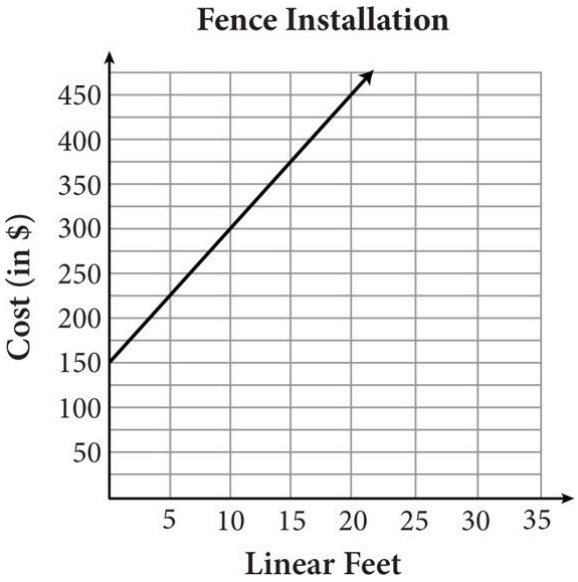
Adam wants to install a fence for his garden. Company A's prices are depicted in the graph. Company B's prices are depicted in the table. Answer the questions:

- ***Which company charges more per linear foot?***
- ***Which company should Adam choose for his garden that is 20 feet long?***



Length (lin ft)	Cost ($)
0	100
5	200
10	300
15	400
20	500

Practice 2: *Answer Key*



Length (lin ft)	Cost ($)
0	100
5	200
10	300
15	400
20	500

Answer 1: We are looking at the constant rate of change (slope). Company A charges $75 for every 5 feet, or $15 per foot. Company B charges $100 for every 5 feet, or $20 per foot. Therefore, Company B charges more per foot.

Answer 2: We are looking at when x = 20. Company A would cost $450. Company B would cost $500. Therefore, Company A would cost less for Adam to fence his garden. Adam should choose Company A.

Practice 3:

Answers on next slide

David and John buy MP3 files from different services. The monthly cost, y dollars, for x songs is linear. Answer the question:

–Which plan would be the cheapest for 30 songs?

The cost of David's plan is given by the equation: $y = 0.50x + 10$

The table shows the cost of John's plan:

Monthly Cost of MP3s at John's Music Service					
Songs, x	5	10	15	20	25
Cost ($), y	4.95	9.90	14.85	19.80	24.75

Practice 3: *Answer Key*

David's plan:

$Y = 0.50 (30) + 10$

$= 15 + 10$

$= 25$

$25 for 30 songs

John's plan:

Notice the table is going up by 4.95 for every 5 songs.

Monthly Cost of MP3s at John's Music Service					
Songs, x	5	10	15	20	25
Cost ($), y	4.95	9.90	14.85	19.80	24.75

$29.70 for 30 songs

David's plan is cheapest

Additional Resources:

Comparing Linear Relationships - Khan Academy

Comparing Linear Relationships - Online Practice

Comparing Linear Relationships - Worksheet & Answer Key