LEARNING OBJECTIVE: We will solidify our knowledge of functions and compare different functions. (Lesson 58)

CONCEPT DEVELOPMENT:

Functions: A function is a rule that assigns each input exactly one output.
Stated another way: no *x*-values are repeated.

Functions can be viewed represented four ways

Verbally/Written Description	Equation
I have $500 in my bank account now, and deposit $75 per week.	$y = 75x + 500$ **or** $f(x) = 75x + 500$

(handwritten) Linear — raised to 1st power

Table	Graph

Weeks (x)	Money (y)
0	500
1	575
2	650
3	725
5	875

(handwritten) rate of change is slope

$$\frac{\Delta y}{\Delta x}$$

(handwritten) Straight line.

Function Notation: We write functions using the notation $f(x)$. We say "f of x."
So, instead of writing $y = \frac{3}{2}x^2$, we would write $f(x) = \frac{3}{2}x^2$.

We also say that "y is a function of x."

Example: The amount of money I have is a function of how long I've been saving.

(handwritten) y   x

FoCUS ✱

SPECIAL KINDS OF FUNCTIONS

Linear Functions: A function where the rule is specifically a linear equation in the form $y = mx + b$.

Example: I have $30 loaded on my Starbucks card, and each day I get a medium coffee for $2.00. $-2 \text{ Pay } \$2$

This can be represented by the function: $f(x) = -2x + 30$, where the amount of money I have remaining on my Starbucks card is a function of how many days I've bought a medium coffee.

Why is this relationship linear? Why is this a discrete linear function?

If the rate of change of a function is constant, the function is linear!!

Other Special Functions:

Quadratic Function $f(x) = x^2 - 1$	Cubic Function $f(x) = x^3 + 1$	1/x Function $f(x) = \dfrac{1}{x}$	Absolute Value Function $f(x) = |x - 3|$

Are any of these special functions linear? *No. Not straight line.*

Guided Practice:

Steps to Comparing Linear Functions
1. Read the scenario carefully, study any tables/graphs, and highlight the important information.
2. Identify the rate for each function.
3. Re-read the scenario and answer the question asked.

Mason and Julia drive separate cars at a constant speed. They both drive the same route from San Jose to San Luis Obispo, a distance of 147 miles. Mason begins at 1:40PM and arrives in San Luis Obispo at 4:15PM. Julia's trip can be described by the equation f(x)=64x, where the distance she travels is a function of how many hours she drives for. Who gets to San Luis Obispo faster?

Linear

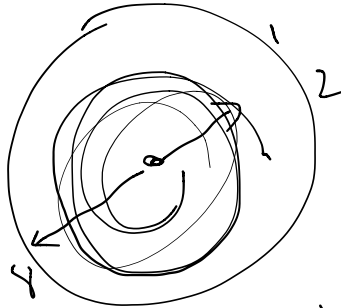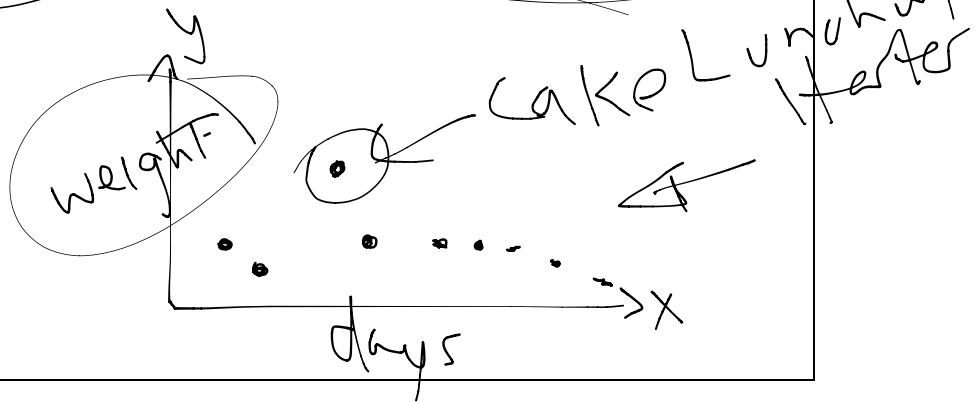Mason

$$f(x) = \frac{147mi}{155min} \times 60$$

Julia
$$f(x) = 64x$$
→ 64 MPH
60

x — time — input
y — miles — output

Julia goes faster

Cake Lunch w/ ltaler

weight

days

Rayan is researching cell phone plans. Sprint charges a flat rate of $75 each month. This means that he would pay $75 with no additional costs. The charges for T-Mobile is a function of the number of texts you send that month—the amount he pays will change each month based on how many texts he sends that month. The table below represents the inputs and corresponding output that the function assigns .

$$y = .1x + b$$

$$50 = .1(50) + b$$

$$50 = 5 + b$$

$$45 = b$$

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

$$\frac{60 - 50}{150 - 50}$$

$$\frac{10}{100} = \frac{1}{10}$$

each text $.10

$$\text{Sprint} \to f(x) = 75$$

$$\text{T-Mobile } f(x) = 0.1x + 45$$
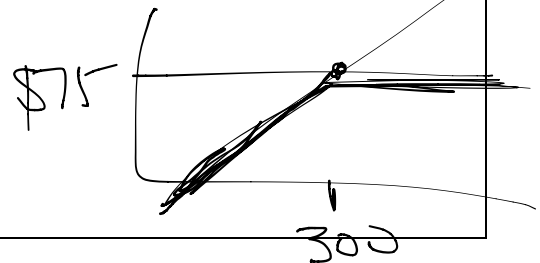
When does it become cheaper for Rayan to go with Sprint v. T-Mobile?

More than 300 → use Sprint!

Less than 300 → use T-Mobile

$$75 = 0.1x + 45$$

$$x = 300$$

$75

300

A function describes the volume of water in gallons, y, that flows from faucet A for x minutes. The graph below is the graph of this function. 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 in x minutes. Assume the water flow is constant.
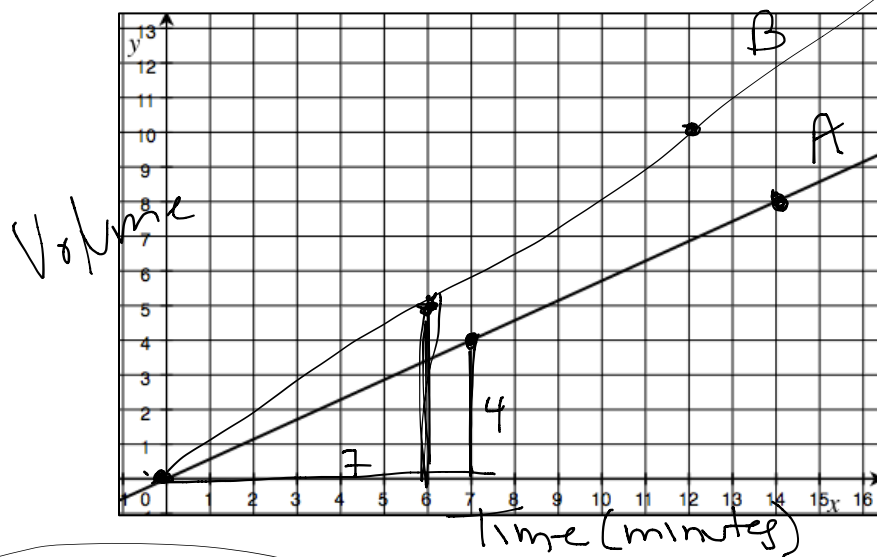
Which faucet has a faster flow?

faucet A

$Rate \rightarrow \frac{4}{7}$ $f(x) = \frac{4}{7}x$

$\checkmark$ Faucet B

$Rate \frac{5}{6}$ $f(x) = \frac{5}{6}x$

Each faucet is being used to fill 50 gallon tubs. How long will it take each faucet to fill the tub? How do you know?

3 min

A

$f(x) = \frac{4}{7}x$

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

87.5 minutes.

Faucet B

60 minutes

Suppose the tub that is being filled by faucet A already has 15 gallons in it. If both faucets are turned on at the same time, which tub will be full first?

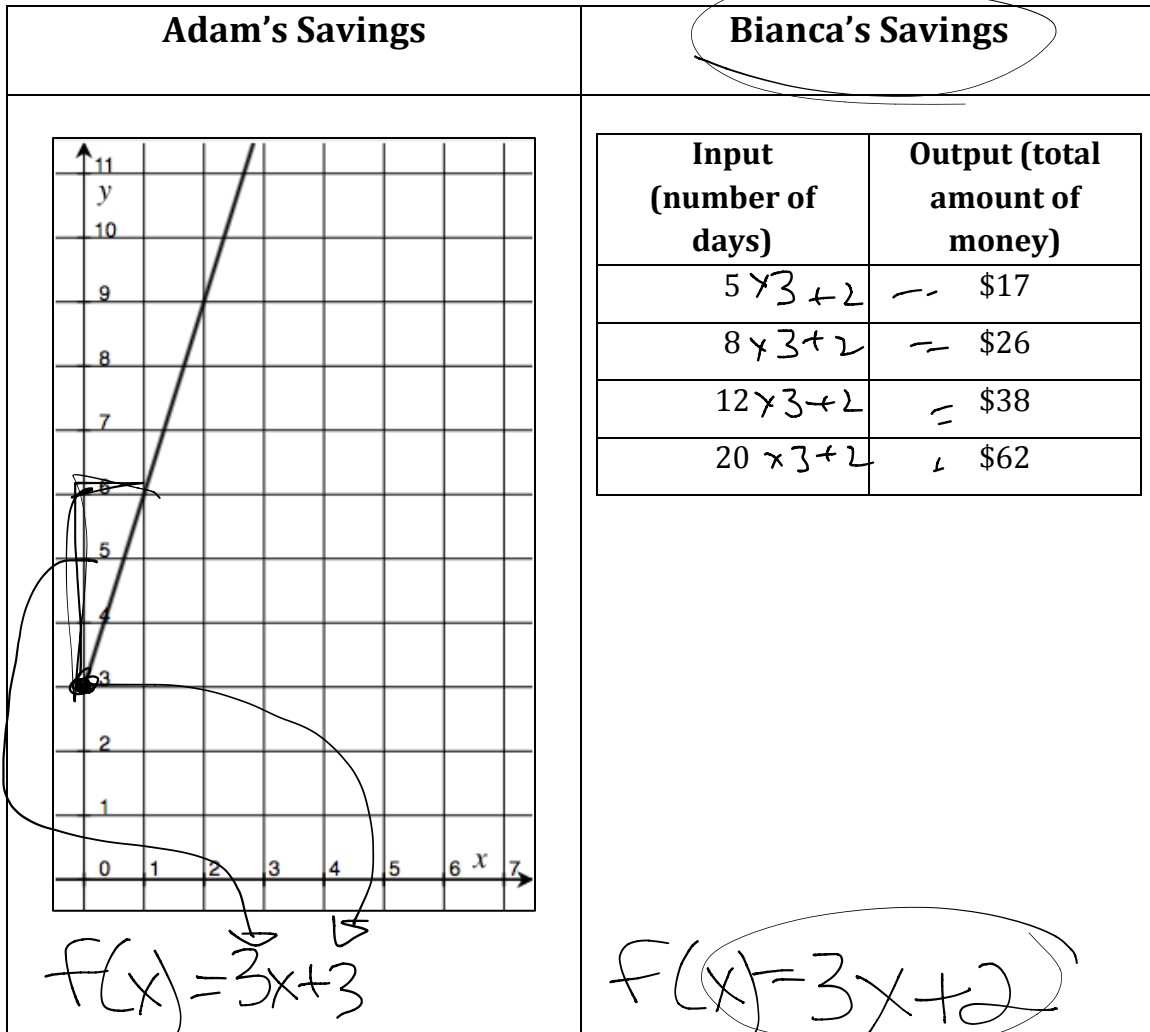$f(x) = \frac{4}{7}x + 15$

$50 = \frac{4}{7}x + 15$

61 min 15 sec.

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 more money at the end of the month. *Constant rate.*

Adam's Savings	Bianca's Savings

Bianca's Savings table:

Input (number of days)	Output (total amount of money)
5 × 3 + 2	$17
8 × 3 + 2	$26
12 × 3 + 2	$38
20 × 3 + 2	$62

Adam: $f(x) = 3x + 3$

Bianca: $f(x) = 3x + 2$

State how much money each person had at the start of the competition.

$3 , $2

Who had more money at the end of the month?

Adam !!

Independent Practice:

Give problem set for Lesson 7 as independent practice.

Activating Prior Knowledge:

$2(x + 5) = 3(x + 6)$	$-(4x + 1) = 3(2x - 1)$	$15x - 12 = 9x - 6$
$3(x + 5) = 4(x + 6)$	$3(4x + 1) = -(2x - 1)$	$\frac{1}{3}(15x - 12) = 9x - 6$
$4(x + 5) = 5(x + 6)$	$-3(4x + 1) = 2x - 1$	$\frac{2}{3}(15x - 12) = 9x - 6$

Closure:

Teacher Notes:
Map to Lesson 7, Mod 5.