

Lesson 9: Determining the slope and y-intercept of a Linear Function AND other Properties cont'd April 12, 2023

Recall : Definition:

slope  $\rightarrow$  rate of change ... of ... the function  $f / f(x) / y$   
(per  $x$  units)

visually : / graphically

slope = steepness of the line  $\rightarrow$  it tells us  
 $a / m$  2 things : (i) how  $\Delta x$  fast the function is changing  $\Delta y$

(ii) if that change is an increase or a decrease  
(+) (-)

slope 'm' or 'a'  
 $\downarrow$

$$a = \frac{\text{rise}}{\text{run}}$$

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

} units

$\$/hr$

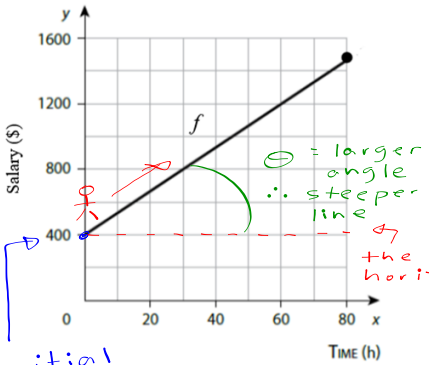
$\$/per hr$

hint

Notes: see handout 1, lesson 9

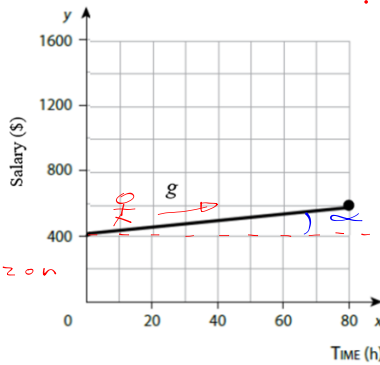
Slope and Reading the Graph

Electrician A's Salary as a Function of Weekly Hours Worked



initial value "flat fee"

Electrician B's Salary as a Function of Weekly Hours Worked



• handout 1  
• Lesson 9

• Think  
→ What's the "story" of graph.

• Pair

• Share

the horizon

a) Which line is steeper? That is, which function is changing (increasing) faster?

**f!**  
Definition: steep (adj) = making a large angle w the plane of the horizon.

b) Are the two slopes positive or negative?

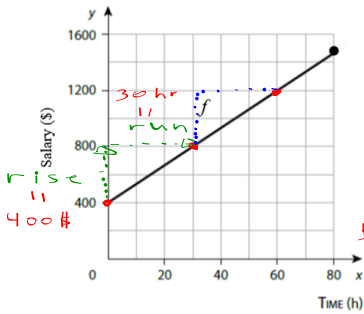
nota bene: if  $f$  is increasing, then  $a$  is (+)

if  $f$  is decreasing, then  $a$  is (-)

$\therefore a$  are positive

c) Verify your answers by calculating the slope of each line using the formula rise over run.

Electrician A's Salary as a Function of Weekly Hours Worked



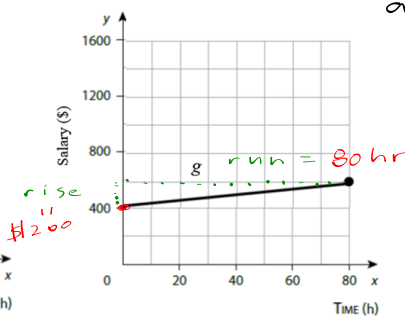
$$a = \frac{\text{rise}}{\text{run}}$$

$$a = \frac{400 \$}{30 \text{ hr}}$$

$$a = \frac{40 \$}{3 \text{ hr}}$$

$$a = 13.30 \text{ \$/hr}$$

Electrician B's Salary as a Function of Weekly Hours Worked



$$a = \frac{\text{rise}}{\text{run}}$$

$$a = \frac{200 \$}{80 \text{ hr}}$$

$$a = \frac{20 \$}{8 \text{ hr}}$$

$$a = 2.50 \text{ \$/hr}$$

$a = \frac{\text{rise}}{\text{run}}$   
count up or down  
count always from left to right

step i: find two points on grid lines.

step ii: count how many units (-) up or down for the rise.

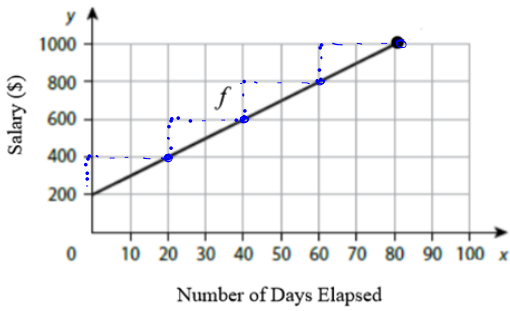
count how many units right for the run.

units to \$/hr

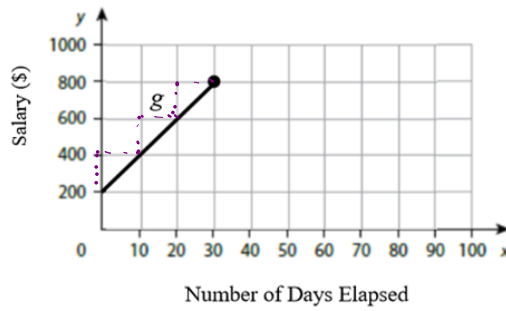
Let's read story of Q2  
→ you do part A.

We read together.  
You do Part A:

Isabelle's Salary Since the Start of the Year



Harry's Salary Since the Start of the Year



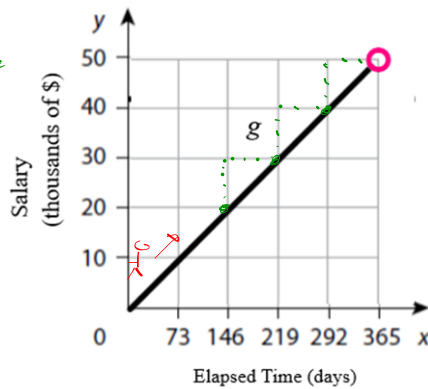
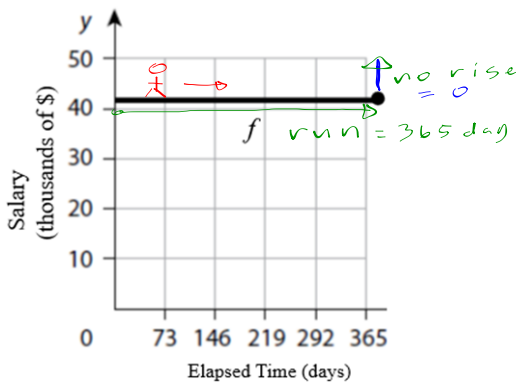
Special Case → The Constant Function

The Linear Function with slope = 0

Read the story of the Graph:

A Regular Teacher's Yearly Starting Salary

A Substitute Teacher's Yearly Salary



a) Which line is steeper? That is, which function is changing (increasing) faster?

$$a = \frac{\text{rise}}{\text{run}}$$

$$a = \frac{0}{365}$$

$$a = 0 \quad \text{variable}$$

$$y = a x + b$$

$$y = m x + b$$

· slope  
· aka, coefficient

y-int  
aka, constant

$$y = 0 \cdot x + b$$

$$y = b$$

← The Constant Function

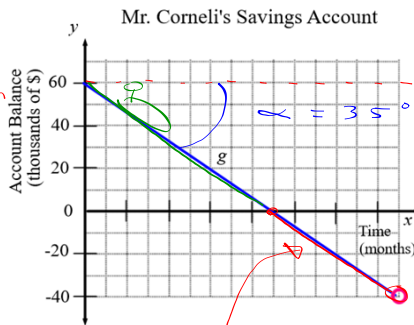
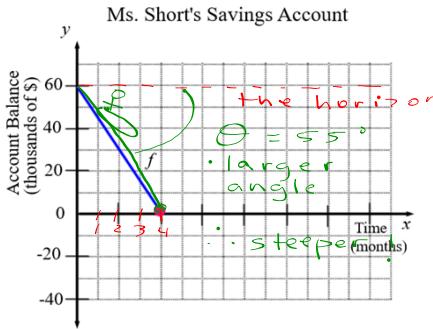
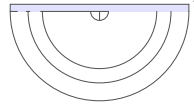
$$y = 42$$

· You finish Q3 Part A

· You start Q4 Part A.

Linear Functions w Negative Slopes (when f is decreasing)

Q4. SAD STORY - Catastrophe



Think: What's the story of graph

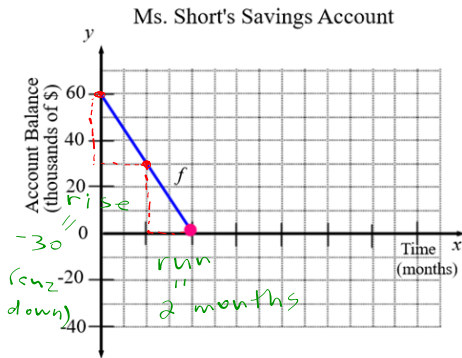
Pair  
Share

he's in debt

he owes the bank

- d) Which line is steeper? That is, which function is changing (decreasing) faster?
- e) Are the two slopes positive or negative? *negative since f is decreasing!*
- f) Verify your answers by calculating the slope of each line using the formula rise over run.

think of 'hit the slopes' (skiing) f!

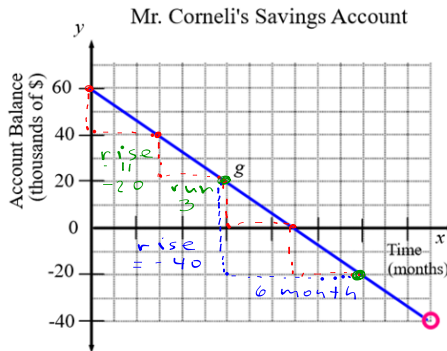


$$a = \frac{\text{rise}}{\text{run}}$$

$$a = \frac{-30 \text{ \$}}{2 \text{ months}}$$

$$a_1 = -15 \text{ \$/m}$$

units



$$a = \frac{\text{rise}}{\text{run}}$$

$$a = \frac{-40 \text{ \$}}{6 \text{ months}}$$

$$a_2 = -6.6 \text{ \$/m}$$

$$a = \frac{\text{rise}}{\text{run}}$$

$$a = \frac{-40 \text{ \$}}{6 \text{ mo}}$$

$$a = -6.6 \text{ \$/m}$$

$$-15 < -6.6$$

$$|-15| > |-6.6|$$

∴ a<sub>1</sub> is steeper slope

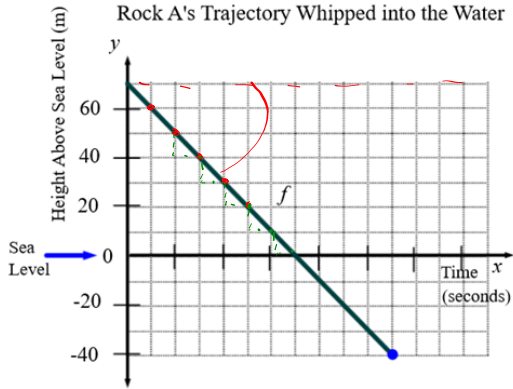
$$15 > 6.6$$

absolute value brackets | | (no negatives)

nota bene: enrichment the larger the slope's absolute value is, the faster the function (y) is changing

You do Q5 and Q6 part A

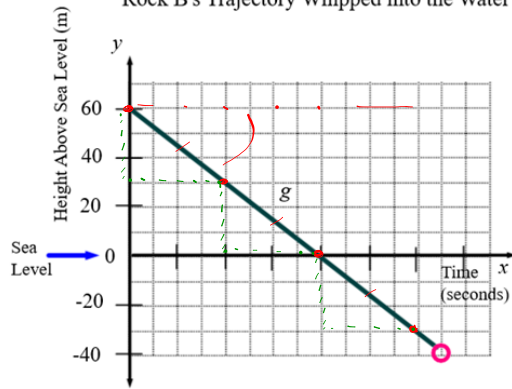
Rock A's Trajectory Whipped into the Water



$$a = \frac{-10 \text{ m}}{1 \text{ sec}}$$

$$a = -10 \text{ m/s}$$

Rock B's Trajectory Whipped into the Water

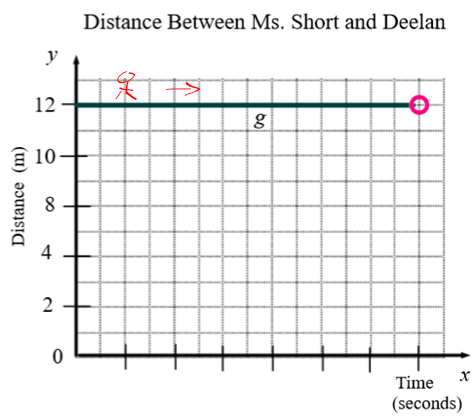
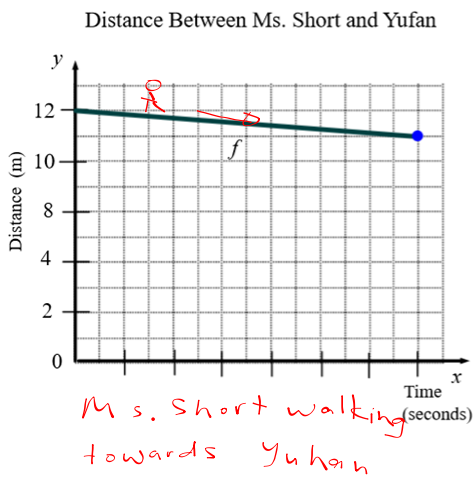


$$a = \frac{-30 \text{ m}}{4 \text{ sec}}$$

$$a = -7.5 \text{ m/sec}$$

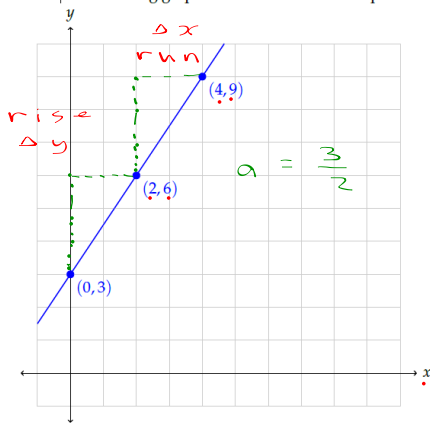
$$40 \text{ km/hr}$$

The Constant Function



handout 2 → lesson 9  
2nd formula for slope

Consider the following graph. Let's determine it's slope.



$$a = \frac{\text{rise}}{\text{run}}$$

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

$$a = \frac{y_2 - y_1}{x_2 - x_1}$$

→ how to use

Can we come up with a formula for calculating the slope of a line?

$$P_1 (2, 6)$$

$x_1$   $y_1$

$$P_2 (4, 9)$$

$x_2$   $y_2$

step i  
Label points

step ii  
sub values into equation

You do

Practice

1.1.1.  
and  
Ex 1.2

} check answers after each question

w

$$a = \frac{y_2 - y_1}{x_2 - x_1}$$

$$a = \frac{y_2 - y_1}{x_2 - x_1}$$

$$a = \frac{9 - 6}{4 - 2}$$

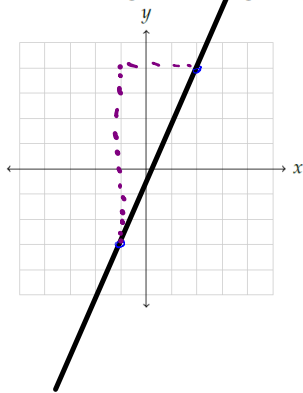
$$a = \frac{3}{2}$$

evaluate



## 1.2 Example

Determine the slope of the line passing through the following two points:  $(-1, -3)$  and  $(2, 4)$



$x_1, y_1, x_2, y_2$  . sketch points

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

. sub

$$m = \frac{4 - (-3)}{2 - (-1)}$$

. evaluate

$$m = \frac{4 + 3}{2 + 1}$$

$$m = \frac{7}{3}$$

Pg 3

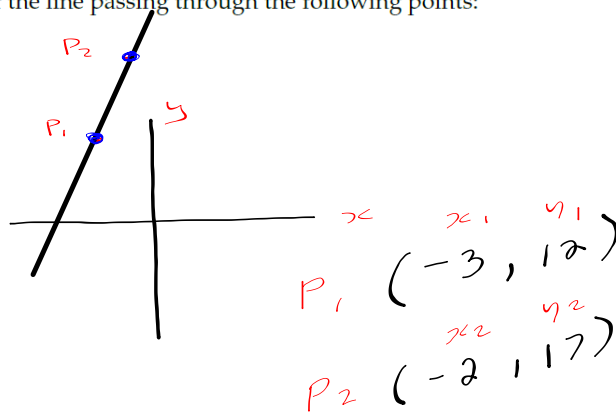
✓

TOU

1.3 Example: Finding the Slope of a Line Through Two Points Presented in a Table

Determine the slope of the line passing through the following points:

x	f(x)
-3	12
-2	17

. sketch  
(check)

$$a = \frac{y_2 - y_1}{x_2 - x_1}$$

$$a = \frac{(17 - 12)}{(-2 - (-3))}$$

$$a = \frac{5}{1}$$

$$a = 5$$

Pg 4

you do ② + ③

## 1.3.1 Practice

Determine the slope of the line passing through the following points:

①

<del>x</del>	<del>f(x)</del>
<del>2</del>	<del>40</del>
<del>4</del>	<del>20</del>

②

x	y
10	-120
18	-130

③

x	f(x)
-3	5
6	-3

do for  
homework

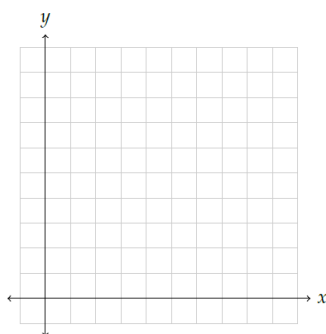
**1.4 Example: Determining the Slope from a Situation**

Jimmy is travelling from *LalaLand* to *Imaginary Place* at a constant speed. When he began, he was 600km from *Imaginary Place*. After 3 hours, he was 370km from his destination. How fast is Jimmy travelling?

Dependent Variable:

Independent Variable:

$x$	$f(x)$



P9 8 Determining the Equation of a Linear Function (Rule)

2.3 Example

Find the rule of the following linear functions: *(that is, find value of a and b)*

①

x	2	4	6	8
f(x)	40	20	0	-20

constant rate of change (m)  
∴ linear

$P_1 (2, 40)$   
 $P_2 (4, 20)$

$$a = \frac{y_2 - y_1}{x_2 - x_1}$$

$$a = \frac{20 - 40}{4 - 2}$$

$$a = \frac{-20}{2}$$

$$a = -10$$

$(2, 40)$

$$y = ax + b$$

$$40 = -10(2) + b$$

$$40 = -20 + b$$

$$60 = b$$

$$a = -10$$

$$b = 60$$

$$y = ax + b$$

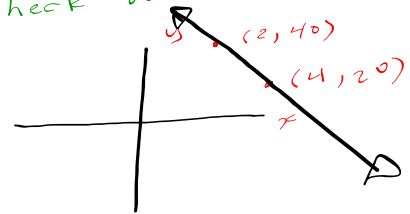
$$y = -10x + 60$$

step i. Pick starting equation (either linear or rational) looking @ TOV

$$y = ax + b$$

step ii. find slope using formula.

(check  $\bar{w}$  sketch)



step iii: find b by subbing in value of a point  $(x, y)$  and slope into

• sub evaluate  $y = ax + b$   
AND solve for b by isolating  $\bar{w}$  0.0.

Step iv sub value of a and b into equation to state the rule  $y = ax + b$

\* Leave variables as x/y.

You do table ② and ③  
- HWK: Finish the handout (Q's thru out)  
TEXTBOOK: P 129 #3.7

Pg 138 #3.11 Pg 130  
Pg 139 #3.13 #3.8

### 2.5 Example

Find the rule of the linear function with a slope of 2 and  $x$ -intercept of 38