5.2 Interpreting Graphs

November 20, 2018 2:59 PM

5.2 INTERPRETING GRAPHS

Name:_____ Block_____

A) Reading Graphs

Investigation:
Kelowna has grown in population over the past few years. This table and graph show how the volume of water used each month is related to the population.

Table of Values

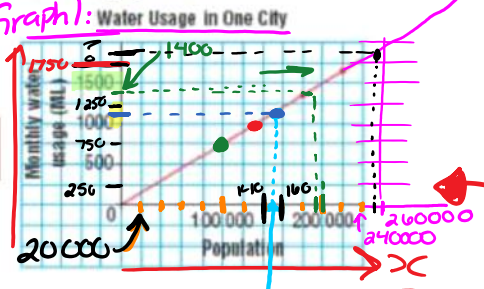
Population	Monthly Water Usage (ML)
100 000	750
130 000	975
180 000	1350
220 000	1650

150000?

1 ML = 1 000 000 L
(ML → Megalitre)

Numbered title

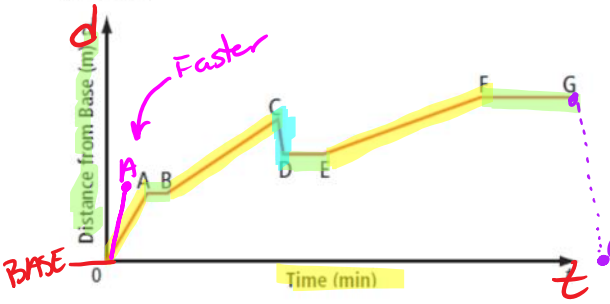
Graph1: Water Usage in One City



1. Estimate the monthly water usage for a population of 150 000 people.
   1250 − 1000 = 250 ÷ 2 = 125
   ~150000 → ~1125 ML of water
2. Estimate the population when the monthly water usage is 1400 ML. ← y-axis
   ~ 180 000 - 190 000
3. Predict the water usage for 250 000 people.
   beyond the graph ~1875 ML

estimates ALWAYS show work ON THE Graph!

Example 1:
The graph below shows the distance a rock climber is from the base of the cliff as time passes.



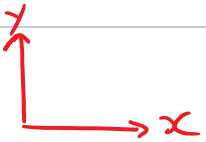
a) Describe one property a line segment has if the climber is climbing.
distance (y) increases as time (x) increases

b) Describe one property a line segment has if the climber is resting.
no change in distance (y) but time (x) ALWAYS increases

c) Describe one property a line segment has if the climber is descending.
distance (y) decreasing but time (x) is increasing.

d) How would the graph of the line segment be different if he increased his speed for the first time he climbed?
O → A faster
steeper line (faster rate of change) distance increasing in a shorter time

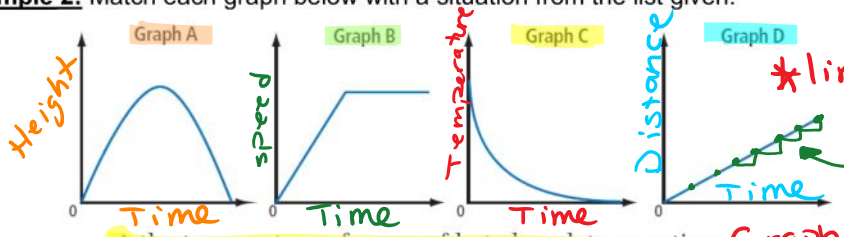
f) What would you add to the graph to show the climbers return to the bottom of the cliff?
G → O distance decrease back! to 0 m (start)



Example 2: Match each graph below with a situation from the list given. + label axis

Graph A Graph B Graph C Graph D

Example 2: Match each graph below with a situation from the list given. + label axis



* linear relationship = constant/same rate of change (pattern)

a) the temperature of a cup of hot chocolate over time — Graph C

b) a car accelerating to a constant speed — Graph B — flat = constant speed

c) the distance a person walks during a hike — Graph D

d) the height of a soccer ball kicked across a field — Graph A

B) Interpolation & Extrapolation

"Inter" - estimate - IN the graph

Interpolation: Estimate a value between two known values.
- i.e. If x=2.5 then y should equal 4 since x=2→y=3 and x=3→y=5
- (x=2.5 is between 2 and 3, as y=4 is between 3 and 5)

"EXTRA" - draw extra graph to estimate

Extrapolation: Predict a value by extending a pattern beyond known values.
- If x=5 then y should equal 9 if the pattern continues.
- (The graph goes right one and up two units.)

The process of predicting values that lie between given data points on the graph is called INterpolation ("to interpolate")

PRACTICE

→ always follow to a point ON THE LINE!

Determine the values by interpolation.

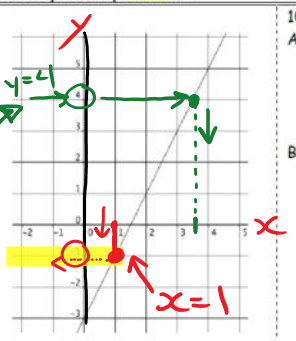
105.

A. Find y if x=1.

y = -1

B. Find x if y=4.

x = 3.5



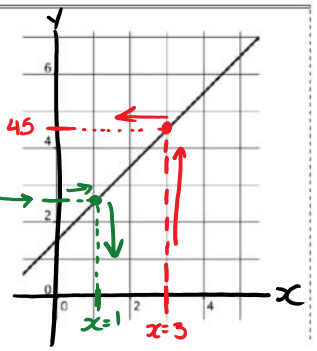
106.

A. Find y if x=3.

y = 4.5

B. Find x if y=2.5

x = 1



2

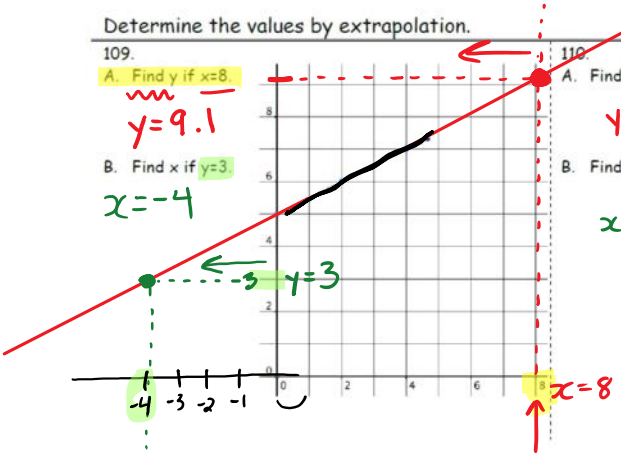
The process of predicting values that lie outside given data points on the graph is called EXRApolation ("to extrapolate")

** This procedure will require you to extend beyond the given graph **

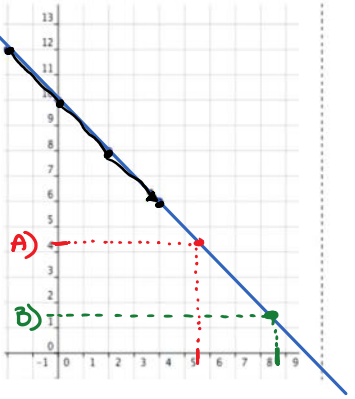
↳ NEED A RULER!

Determine the values by extrapolation.

109.
A. Find y if x=8. y=9.1
B. Find x if y=3. x=-4



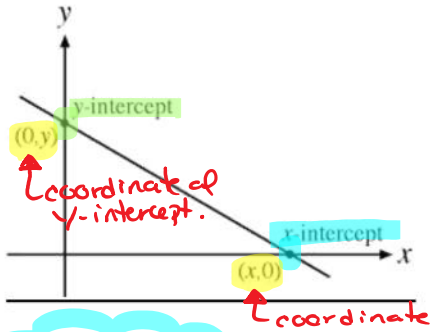
110.
A. Find y if x=5.5. y=4.5
B. Find x if y=1.5. x=8.5



C) Intercepts & Linear Relations

Linear relation

Intercept the point where the line crosses an axis.



y-intercept
- where the line crosses the y-axis
- where x will ALWAYS = 0
- y will = some #

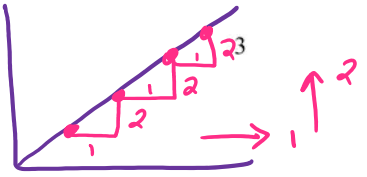
x-intercept
- where the line crosses the x-axis
- where y will always = 0
- x will = some #

Linear Relation
- A linear relation when graphed forms a straight line.
- Or a straight line can be drawn through every point of the graph. (connect dots)
- A linear relation has a constant rate of change. (pattern is same)

↳ slope of the line.

What is a non-linear relationship?

relationship between variables that does NOT have a constant rate of change. One quantity changes faster/slower than the other. (curved line)

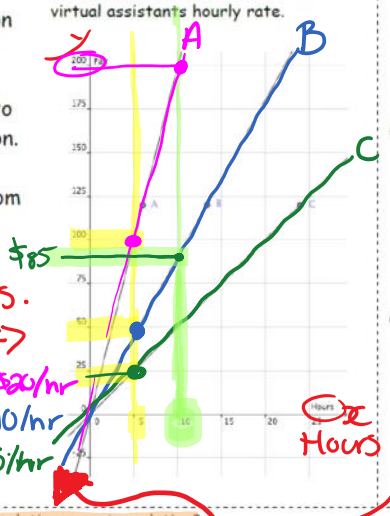


PRACTICE

rate of change = variable y ÷ variable x

111. Business people are now hiring virtual assistants on the internet to do office tasks for them. Silvia needs a report turned into a power point presentation. She goes on line and receives three offers from 3 different virtual assistants.

The graph below represents three virtual assistants hourly rate.



A. Which letter represents the most expensive rate?

A is the most expensive because after 5hr it costs $100 (more than B, C)

B. She thinks the job will take about ten hours. How much will she save by choosing company B over company A?

@ 10hrs company B - $85
company A - $200
$200 - $85 = $115.00

C. Write an equation to represent the approximate hourly rate for each company

= rate of change

$C_A = 20x$ (x = hours)

$C_B = 10x$

$C_C = 5x$

A. Let's look @ 5hrs. to answer A ⟹

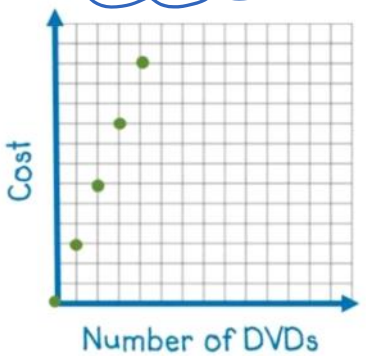
company A = $100/5hrs = $20/hr
company B = $50/5hr = $10/hr
company C = $25/5hr = $5/hr

112. Did this challenge require interpolation or extrapolation?

Interpolation ... because we estimated with the data points (did NOT extend the line)

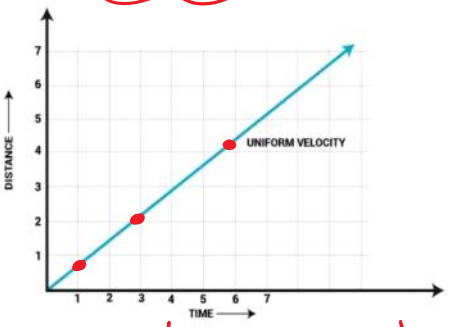
D) Discrete & Continuous Relationships

Discrete



- the values are separate
- no line

Continuous



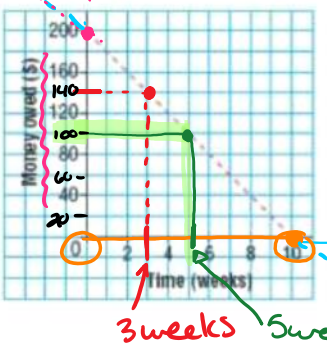
- includes all numbers (decimals + fractions)
- draw a line to show numbers between point are included

Why would you not want to join the points on a graph of a discrete relationship?

Because the relationship does NOT include partial (fractions) values.
eg. you can't have 2.3 DVD's, only 2 or 3.

4

Example #3: Vincent borrows money from his parents for a school trip to Science World. He repays the loan by making regular weekly payments. The graph shows how the money is repaid over time.



extrapolate
y-axis
extrapolation
3 weeks
5 weeks

a) i.) How much did Vincent borrow initially?

$200 (initial - at time = 0 amount owed)

ii.) What is another name for this point on a graph?

y-intercept

b) How much money does he owe after three weeks? (Time = 3)

$140 (interpolation)

c) How many weeks will it take him to repay half of the money borrowed?

5 weeks $\frac{\$200}{2} = \$100$ how long to pay back $100

d) i.) How long does it take Vincent to repay the entire amount of the loan? how long until he owes $0?

10 weeks

ii.) What is another name for this point on a graph?

x-intercept.

e) Do questions a, b, and c use interpolation or extrapolation?

interpolation ... using points within the data

f) Why is extrapolation not relevant in this example?

if we extended the graph we would be talking about (-) weeks ... or paying back MORE $ than needed.

g) ~~Why is the line dotted rather than solid?~~ does not depend on anything. it changes all on its own.

h) The independent variable is weeks (time) => x-axis

The dependent variable is Money owed ($) => y-axis

the variable that depends on the other variable. it is changing because of the other variable.

Example #4: Julia is jogging along the Galloping Goose Trail. Her trainer has made a chart of her progress below.

a) Using the table of values provided, graph the data below.

Numbered Title + Description

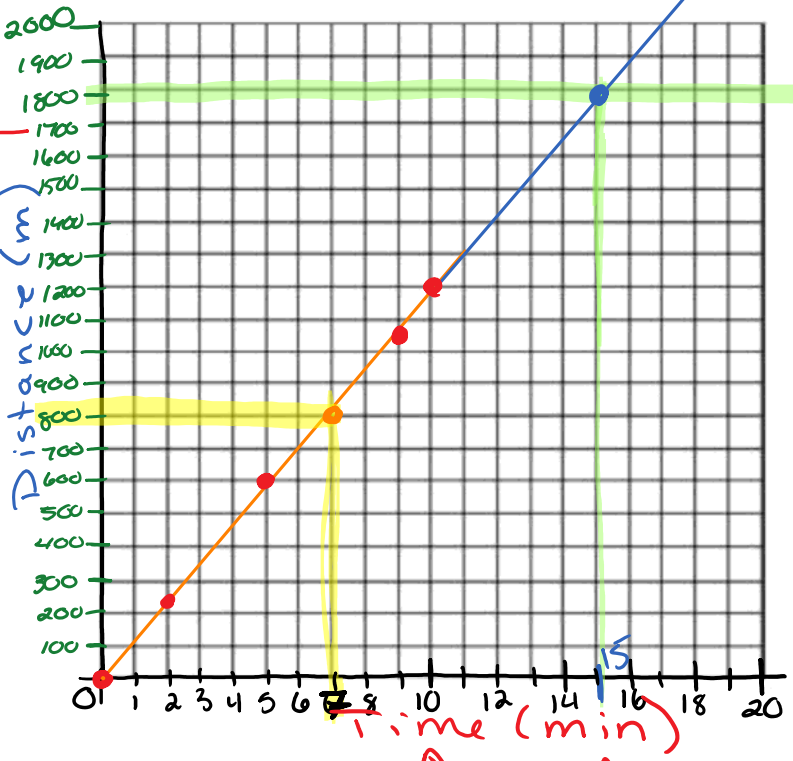
Before you graph, consider the following: title, independent variable, dependent variable, horizontal and vertical axes, scales of axes (includes all given data points and any point to be determined later through extrapolation), and discrete/continuous graph.

Graph 4: Julia's Jog

indep. var. x | dep. var y

Time (min)	Distance (m)
0	0
2	240
5	600
9	1080
10	1200

15 | 1800



Title | units.

b) Determine how far Julia can jog in 7 minutes.

800 m

c) Predict how long it will take Julia to jog 1800 m.

15 min

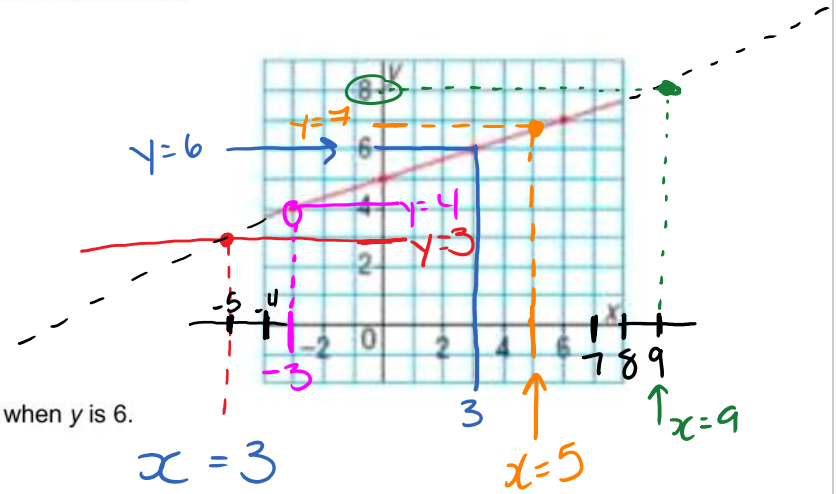
d) Predict how far she can jog in 15 minutes.

1800m

e) What assumption did you make when answering the above questions?

- that she didn't stop
- that she ran at the exact same speed (constant rate) the whole time.

Example #5: Use this graph of a linear relation.



a) Determine the value of x when y is 6.

$x = 3$

b) Determine the value of y when x is -3.

$y = 4$

c) Determine the value of x when y is 3.

$x \approx -5$

d) Determine the value of y when x is 9.

$y = 8$

e) Determine the value of y when x is 5.

$y \approx 7$

Homework	Required	Extra Practice	Extension
Assignment #5.2 pg 173-177	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13	12, 14, 15, 16	17, 18, 19

Is it a linear relationship?

straight line?