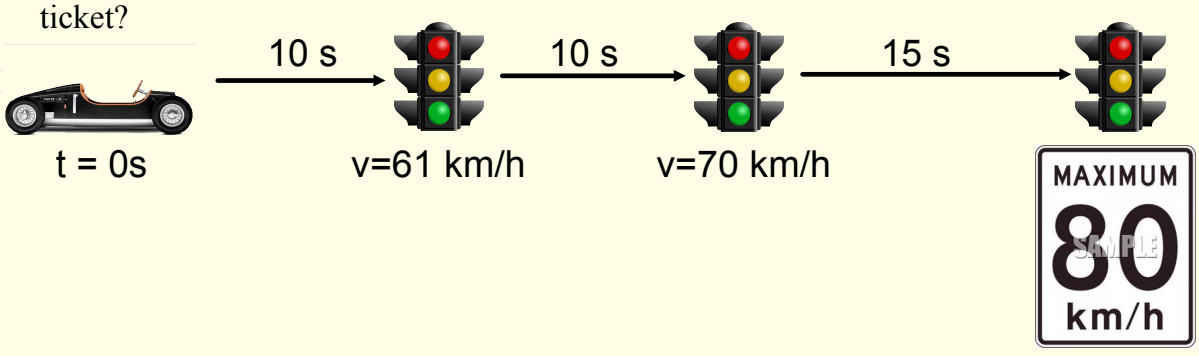
C1 - Linear Relations

- ✓ Know what a linear relation is and that slope is an important characteristic of linear relations.
- ✓ Identify whether a relation is linear when given a graph, table of values or the equation of a relation.
- ✓ Understand slope as a rate of change
- ✓ Calculate the slope of a linear relation
- ✓ Classify slopes as positive, negative, zero or undefined

Warm Up - Speeding? (Board Work)

A car is cruising down the road. At t = 0 seconds the car begins to accelerate at a constant rate. Ten seconds later the car passes through an intersection and the photo radar clocks his speed at 61 km/h. The car passes through the second intersection ten seconds later and his speed is 70 km/h. If the car passes through the third intersection fifteen seconds later and the speed limit is 80km/h, could the driver get a speeding ticket?



Also... What is the initial speed of the car? What is the car's acceleration? Sketch a graph.

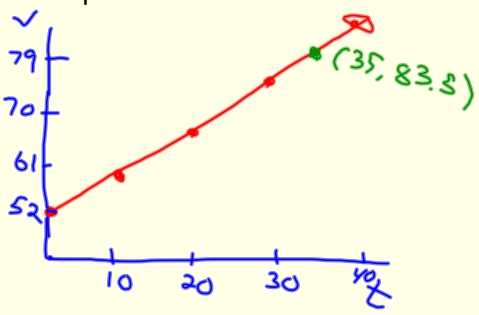
Debrief - Speeding?

Table of Values

t (s)	v (km/hr)
0	52
10	61
20	70
30	79
35	83.5

+10 (10 to 20) +9

Graph



Acceleration

$m = \frac{9\ km/hr}{10\ s}$

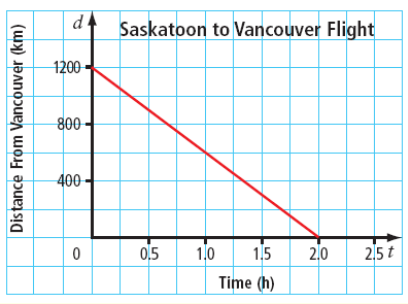
$= 0.9\ \frac{km/hr}{s}$

Discuss: Linear Relations / Constant Rate / Slope

Linear Relations

A linear relation forms a straight line when graphed.

Linear	Non-Linear



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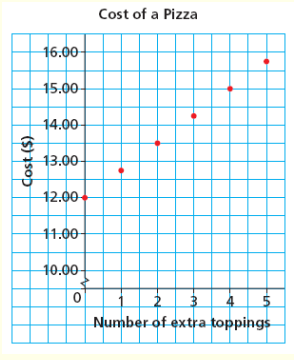
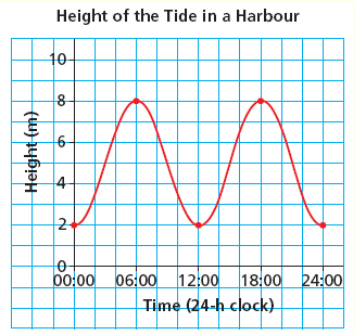


Pearson pg. 300



Pearson pg. 281

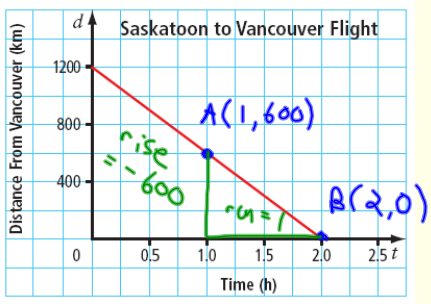
An important characteristic of a linear relation is that it has a constant slope.

Slope

Slope is a ratio of the vertical change to the horizontal change of a line or line segment.

$$Slope = \frac{rise}{run} = \frac{y_2 - y_1}{x_2 - x_1}$$ Where (x_1, y_1) and (x_2, y_2) are two points on the line.

Example:



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$A(1, 600)$ $B(2, 0)$

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

$= \frac{0 - 600}{2 - 1}$

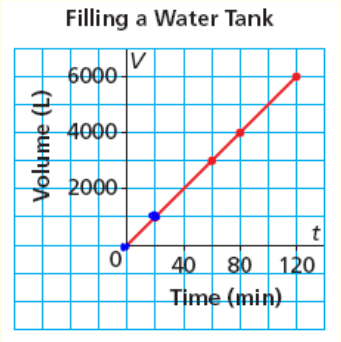
$= -600$

t	d
0	1200
1	600
2	0

Slope as a rate of change $\rightarrow -600 \frac{km}{hr}$

Slope

Example:



Pearson pg. 306

$(0, 0)$ $(20, 1000)$

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

$= \frac{1000 - 0}{20 - 0}$

$= \frac{1000}{20}$

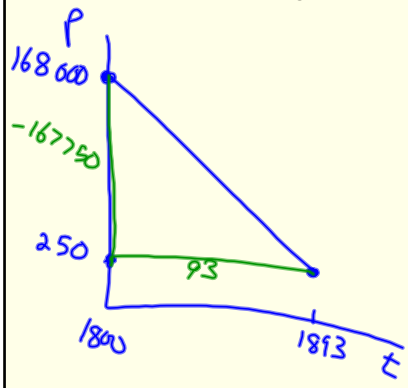
$= 50$

t	V
0	0
20	1000
40	2000
60	3000
80	4000

Slope as a rate of change $\rightarrow 50 \frac{L}{min}$

Slope

Example: In 1800, the wood bison population in North America was estimated at 168 000. The population declined to only about 250 animals in 1893. What was the average rate of change in the bison population from 1800 to 1893? MHR pg. 327



$(x_1, y_1) = (1800, 168\,000)$ $(x_2, y_2) = (1893, 250)$

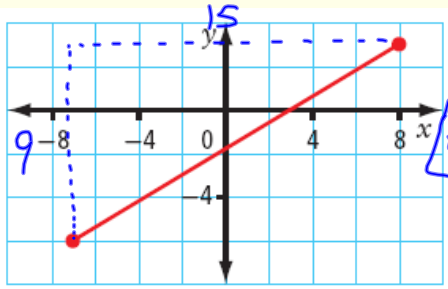
$$m = \frac{y_2 - y_1}{x_2 - x_1}$$
$$= \frac{250 - 168\,000}{1893 - 1800}$$
$$= \frac{-167\,750}{93}$$
$$= -1804 \text{ bison/yr}$$

Practice: CP pg. 153 (Groups of 3 - one column for each person)
Rate of Change Problems

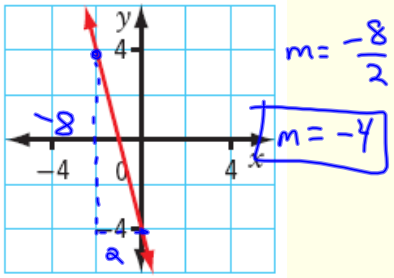
Classify Slope (Board Work)

Calculate the slope of each of the following:

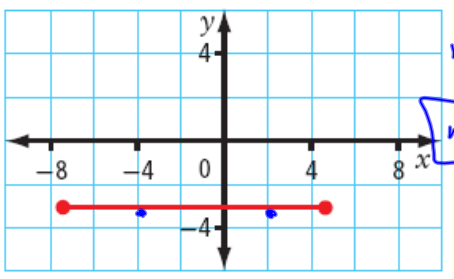
a)



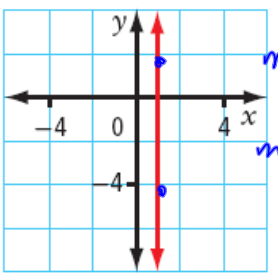
b)



c)



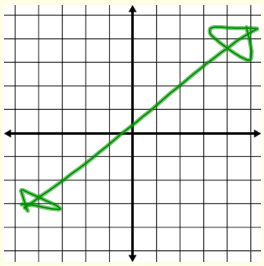
d)



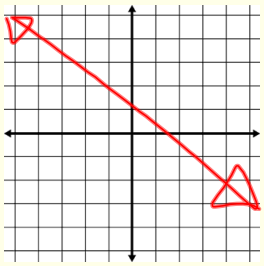
Explore Slope: Learn Alberta - Slope Activity B

Classify Slope

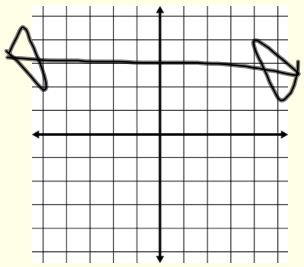
Positive Slope



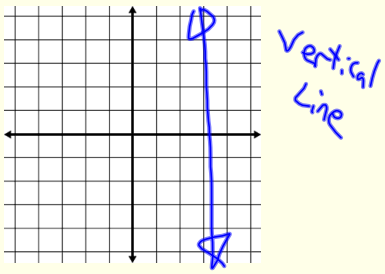
Negative Slope



Zero Slope



Undefined Slope

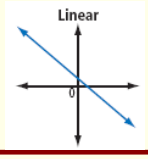
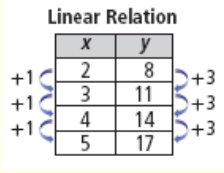
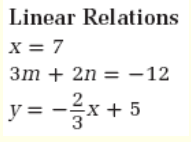


Practice

Lin Eqs & Grphs C1 - Linear or Non-Linear Investigation

Debrief Assignment: Lin Eqs & Grphs C1 - Linear or Non-Linear Investigation KEY

It is possible to identify if a relation is linear by looking at its graph, table of values or equation.

Graph	Forms a straight line	 MHR pg. 381
Table of Values	Independent and dependent data change by a constant amount.	 MHR pg. 381
Equation	Highest degree is one; one or two variables.	 MHR pg. 381

Practice: Linear or Non-Linear Assignment