C2 Direct Variation

- Graph a linear relation using a table of values.
- Identify slope and y-intercept of a linear relation.
- Determine the equation of a linear relation.

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Warm Up

Complete: *Investigating Lines (Direct Variation)* Handout

Debrief Investigation:

The following slides will review important concepts from the investigation such as:

- Linear / Non-linear Relations
- Slope and Rate of Change
- Direct Variation
- Determine Linear Equations

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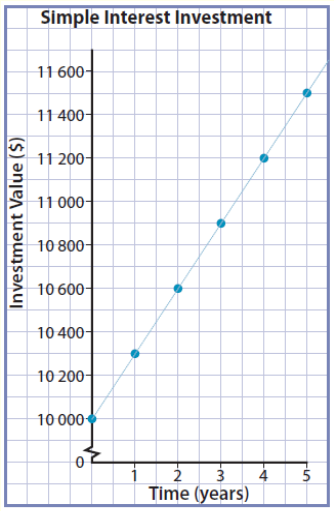
Linear vs. Non-Linear Relations

Linear Relation: a relation where the points form a straight line.

Non-Linear Relation: a relation where the points do not form a straight line.



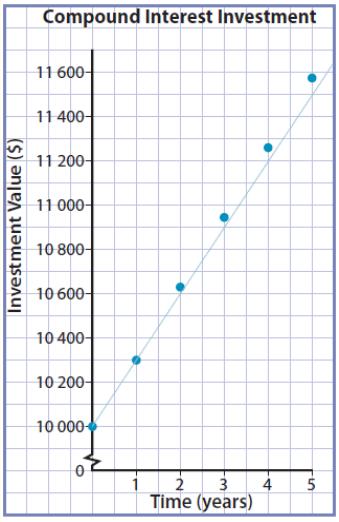
A straight line goes through every point.

Simple Interest

Time (years)	Value of Investment ($)	
0	10 000	
1	10 300	+300
2	10 600	+300
3	10 900	+300
4	11 200	+300
5	11 500	+300

Compound Interest

Time (years)	Value of Investment ($)	
0	10 000	
1	10 300	+300
2	10 609	+309
3	10 927	+318
4	11 255	+328
5	11 593	+338



A straight line does not go through every point.

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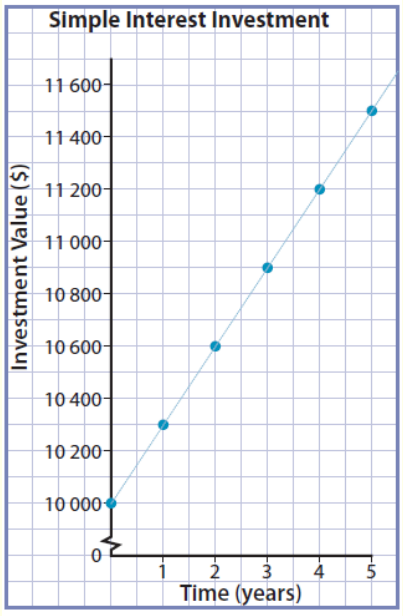
Slope / Rate of Change

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

$$slope = \frac{rise}{run}$$



Simple Interest

Time (years)	Value of Investment ($)	
0	10 000	
1	10 300	+300
2	10 600	+300
3	10 900	+300
4	11 200	+300
5	11 500	+300

Rate of Change is the slope with units included.

How does this connect with the Investigation you did?

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Practice

Text pg. 122: Your Turn

Text pg. 123: 1, 4

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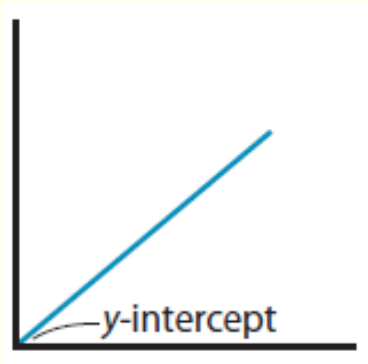
Direct Variation

Direct Variation: a linear relation where the y-intercept is zero.



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Example (Board Work)

Model a Direct Variation Relationship With a Table of Values

The dispatcher of a school bus company is monitoring the local weather forecast to decide whether to cancel school buses for the next day. At 9:00 p.m., there is no snow on the ground but it has started snowing. It is predicted that 2 cm of snow will fall each hour through the night and into the next morning.

a) What is the **initial value**, that is, the amount of snow on the ground at 9:00 p.m. (0 h)?

b) What is the expected **rate of change** in the depth of snow each hour?

c) Create a table of values for 0 h to 10 h of snowfall. How does your table show the initial value and rate of change for the relationship?

d) How does it show that the relationship has direct variation?

e) Predict what a graph of the table of values would look like.

f) What time will it be when there are 12 cm of snow on the ground?

g) The decision to cancel buses must be made by 6:00 a.m. How much snow will be on the ground at that time?

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Practice (Mini-boards)

Model a Direct Variation Relationship With a Graph

Kelly works part-time at an ice cream shop. She writes down her hours and her earnings for each of her first four weeks on the job.

	Number of Hours	Money Earned
Week 1	12	$132
Week 2	8	$88
Week 3	17	$187
Week 4	15	$165

a) What is Kelly's hourly rate of pay?

b) Create a scatter plot of the data. Describe the pattern of the points.

c) Do you think it is reasonable to draw a straight line through the points to connect them and to represent the relationship? Why? If it is reasonable, draw the line.

d) What are the slope and y-intercept of the graph?

e) Use the graph to estimate how many hours Kelly would have to work to earn $200.

f) Explain how the graph shows that the relationship between number of hours worked and earnings is a direct variation.

Practice: Text pg. 135: 1-3, 6

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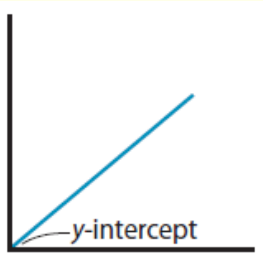
Determine Linear Equations

For a direct variation linear relation the following equation may be used.



$$y = mx$$

y = vertical axis variable (dependent)
x = horizontal axis variable (independent)
m = slope

Example: The cost for a banquet is $30 per person.

$$C = 30n$$

Snow started to fall at a rate of 3cm per hour.

$$S = 3t$$

How does this connect with the Investigation you did?

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Example

Model a Direct Variation Relationship With an Equation

Brian owns a repair garage. He has four cars scheduled for service today. Brian charges $72 an hour for labour. He estimates how long each job will take using an online automotive database. He estimates that the four jobs will take 1.3 h, 2.0 h, 1.8 h, and 2.5 h.

a) Write an equation to model the relationship between Brian's labour charge and the number of hours the job takes.

b) Use the equation to determine

i) the labour cost for each of the four jobs

ii) the total labour charged for the day

c) Predict what a graph of the relationship would look like.

d) How does the graph relate to the equation?

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Practice

Text pg. 140: 6,8
Text pg. 141: 1

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