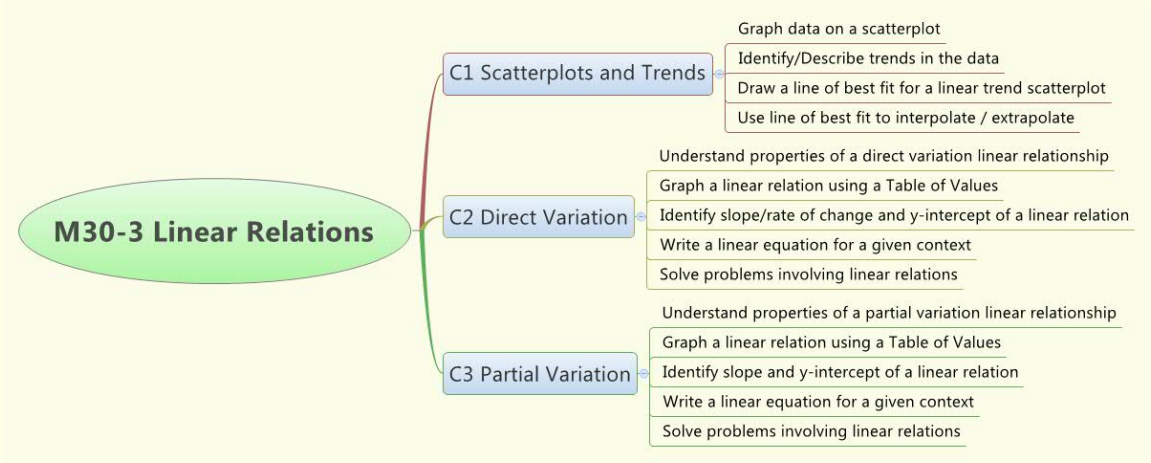
Linear Relations Notes



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C1 SCATTERPLOTS & TRENDS

- graph data on a scatterplot.

- draw a line of best fit for a scatterplot.

- describe trends in the data.

- use line of best fit to interpolate and extrapolate.

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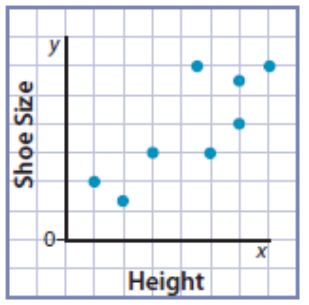
Graph a Scatterplot

Scatterplot: a graph of plotted points that shows the relationship between two data sets.

Example: Each dot represents one person's shoe size versus height.



MathAtWork 12 pg. 94

A scatterplot may be graphed by hand or by using technology (Microsoft Excel).

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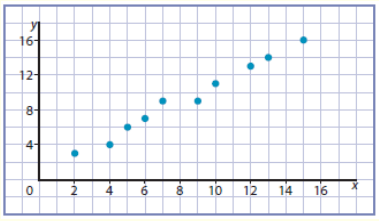
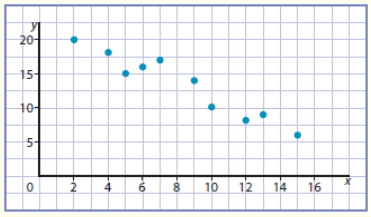
Describe Trends in Data

Trend: the general direction in which values in a data set tend to move.

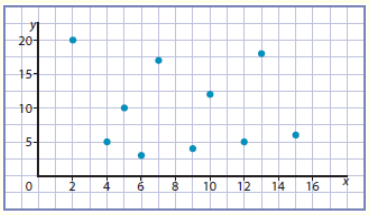
Positive Linear Trend



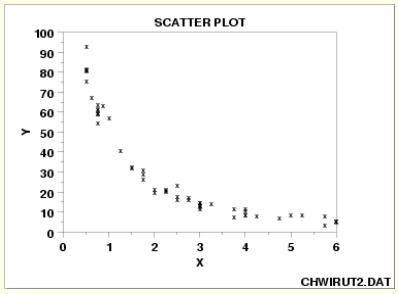
Negative Linear Trend



No Trend



Non-Linear Trend



MathAtWork 12 pg. 98,123

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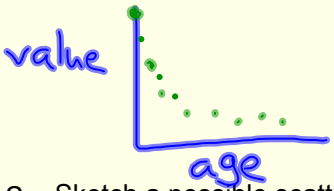
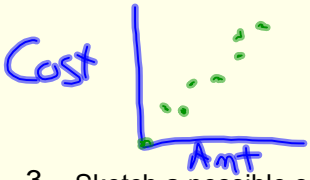
Describe a Trend (Board Work)

1. Sketch a possible scatterplot that represents the value of a car vs. the age of a car and describe the trend.



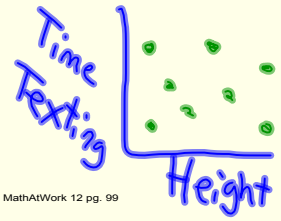
Non-linear Trend

2. Sketch a possible scatterplot that represents the cost of fencing vs. the amount of fencing purchased and describe the trend.



Positive Linear Trend

3. Sketch a possible scatterplot that represents the number of minutes per day a student spends texting vs. the height of the student and describe the trend.



MathAtWork 12 pg. 99

Practice: Text pg. 99: 5,6

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Interpolate and Extrapolate

A line of best fit may be drawn on a scatterplot to show a trend and then the line of best fit may be used to estimate values.

Interpolate: estimate between numbers.

Extrapolate: estimate beyond numbers.

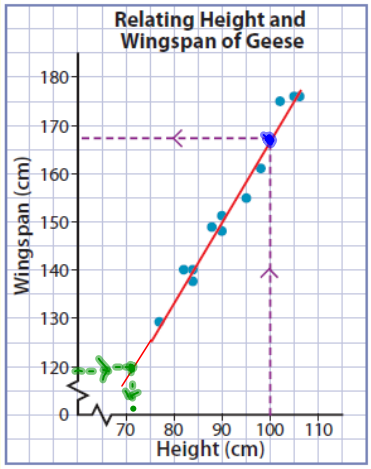
Example:

Estimate the wingspan of a goose that is 100 cm tall.

Wingspan = 168 cm Interpolate

Estimate the height of a goose that has a wingspan of 120cm.

Height = 72 cm Extrapolate



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Practice

Text pg. 116: Your Turn Problem

Text pg. 117-119: 1, Choose two of 3-5 (Do at least one with Excel)

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C2 DIRECT VARIATION

- Understand properties of a direct variation linear relationship.
- Graph a linear relation using a table of values.
- Identify slope/rate of change and y-intercept of a linear relation.
- Write a linear equation for a given context.
- Solve problems involving linear relations.

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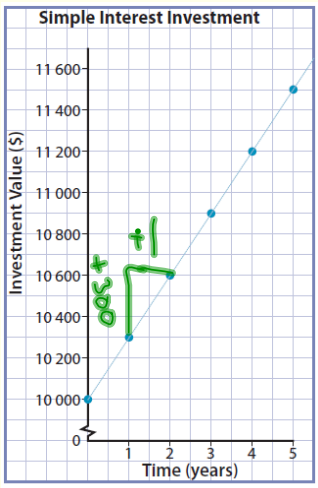
Linear vs. Non-Linear Relations

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.



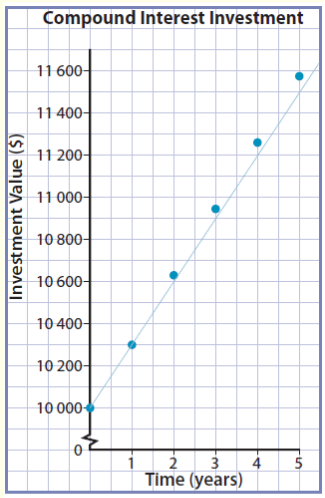
A straight line goes through every point.

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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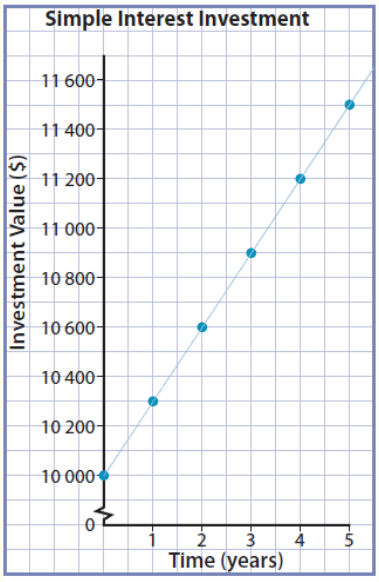
Slope / Rate of Change

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



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

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

$$slope = \frac{300}{1}$$

Rate of Change is the slope with units included.

$$= \frac{\$300}{1\ year}$$

Practice: Text pg. 122: Your Turn
Text pg. 123: 1, 4

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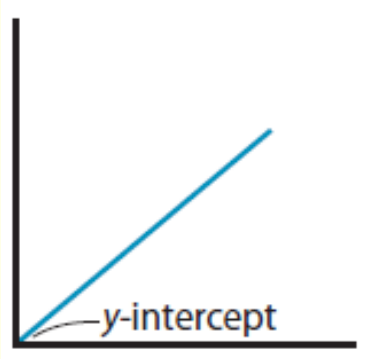
Direct Variation

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



Examples: On the Job #1 pg. 129-130
On the Job #2 pg. 133-134

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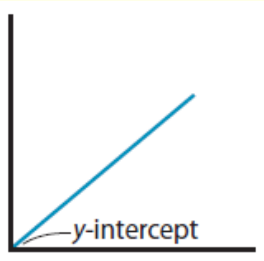
Determine Linear Equations

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.

$$S = 3t$$

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Determine Linear Equations Example

Sally charges $75 every hour for providing physiotherapy to patients.

a) Write an equation to represent the relationship between the amount Sally earns, *E*, and the number of hours she works, *h*.

$E = 75h$

b) In one day Sally treats four patients for the following lengths of time: 1 hour, 0.5 hour, 0.75 hours and 1.5 hours.
Use the equation to calculate Sally's total earnings for the day.

Total hours $= 0.5 + 0.75 + 1.5 + 1$
$= 3.75$

$E = 75(3.75)$
$= \$281.25$

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Direct Variation Practice

Text pg. 135: 1-3, 6
Text pg. 140: 6,8
Text pg. 141: 1

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C3 PARTIAL VARIATION

- Understand properties of a partial variation linear relationship.

- Graph a linear relation using a table of values.

- Identify slope/rate of change and y-intercept of a linear relation.

- Write a linear equation for a given context.

- Solve problems involving linear relations.

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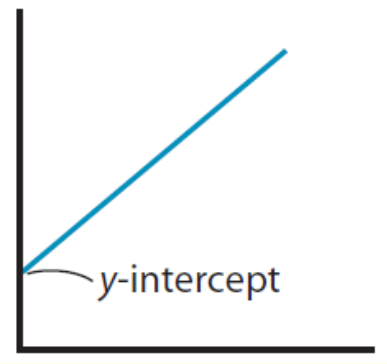
Partial Variation

Partial Variation: a linear relation where the y-intercept is **not** zero.



Partial Variation relationships involve a fixed amount (y-intercept) and a rate of change.

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Partial Variation Practice

Example: On the Job #1 pg. 145-146
On the Job #2 pg. 149-151

Practice: pg. 151: Your Turn
pg. 153: 5
pg. 148: 4, 7

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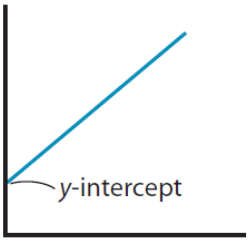
Determine Linear Equations

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



$$y = mx + b$$

y = vertical axis variable (dependent)
x = horizontal axis variable (independent)
m = slope
b = constant / fixed amount (y-intercept)

Example: The cost for a banquet is \$30 per person plus a fixed rental fee of \$200.

$$C = 30n + 200$$

A ski resort has a 30 cm base of snow. They are making new snow at a rate of 4 cm per hour.

$$S = 4t + 30$$

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Partial Variation Practice

Example: On the Job #3 pg. 154-155

Practice: pg. 155: Your Turn
pg. 157: 7
pg. 158: 1, 2

Unit Review: pg. 160-161: 1,3,4
pg. 162-163: 1,3,5,8,9

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