Math 10
Section 6.2

Linear Relations

Focus:

1. To be able to determine if a relation is linear.
2. To be able to represent linear relations in a variety of ways.
3. To be able to explain why data points should or should not be connected
4. To be able to identify the dependent and independent variables in a relation.

Curricular Competencies:
A5: I can model mathematics in situational contexts.

What is a linear relationship?

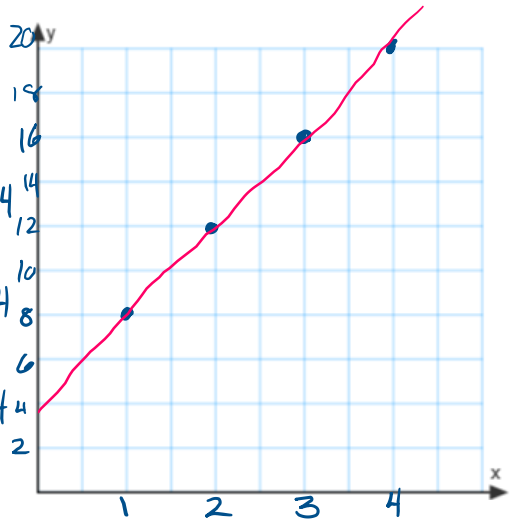
A relation is an association between 2 quantities. A linear relationship will have a graph that is a straight line. A non-linear relationship will have a graph that is a curved line.

To determine if a relation is linear from a table of values, check to see how the x & y values are related. If the values increase or decrease by a constant amount, then the relationship would be linear (except for horizontal or vertical lines). Non-linear relations would show values that increase or decrease by inconsistent amounts.

Examples:

Linear Relation

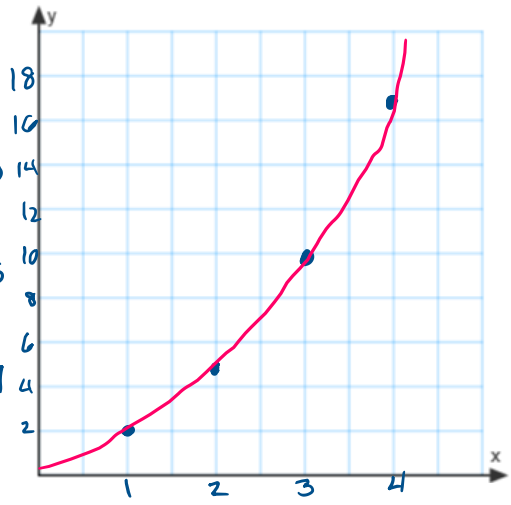
x	y
1	8
2	12
3	16
4	20



Equation: $y = 4x + 4$

Non-Linear Relation

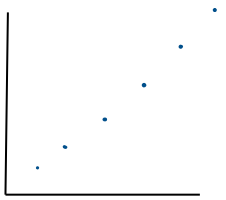
x	y
1	2
2	5
3	10
4	17



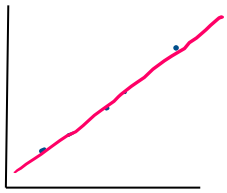
Equation: $y = x^2 + 1$

Types of Data

Discrete Data: data values on a graph that are separate



Continuous Data: data values on a graph can be connected



Independent and Dependent Variables

In relations that contain 2 variables, one variable is considered to be independent while the other is considered to be dependent. The independent variable is the variable for which values are selected. The dependent variable values rely on the values of the independent variable.

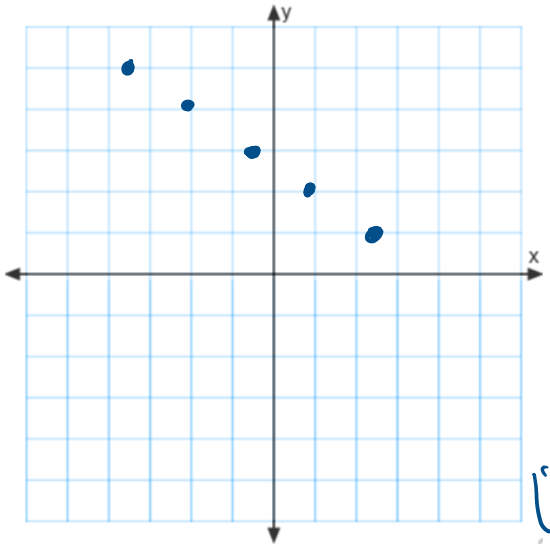
In graph form, the independent variables are on the x axis while the dependent variables are on the y axis.

In table form, the independent variables are on the left or top side while the dependent variables are on the right or bottom side.

Examples

For each of the following groups of data, determine whether or not they represent a linear relation.

a) The set of points: (-7,10), (-4,8), (-1,6), (2,4), (5,2)



x	y
-7	10
-4	8
-1	6
2	4
5	2

(3, -2, 3, -2, 3, -2)

Linear ✓

$y = \frac{-2}{3}x + \frac{16}{3}$

$\frac{-2}{3} \times -7$

$\frac{14}{3} = 10$

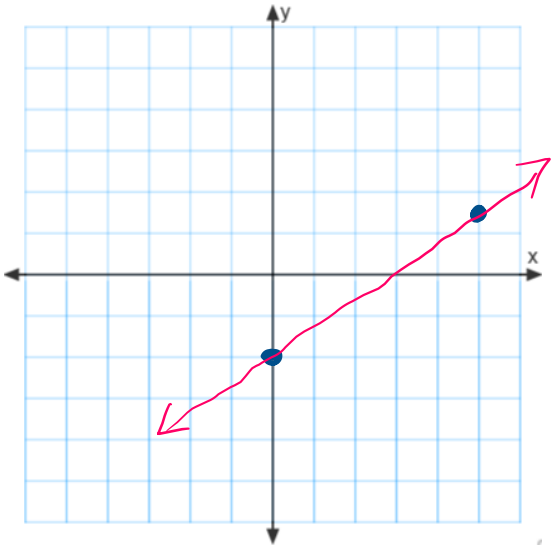
$\frac{14}{3} + \frac{16}{3} = \frac{30}{3}$

b) The graph below shows the radioactive decay of an isotope in a sample of rock.

Amount vs Time

not linear!

c) The relation described by the following equation: g + 4 = 0.7h



$-4 \quad -4$

$g = 0.7h - 4$ ← linear

h	g
0	-4
10	3

d) Allie has collected some data on students' height as they age. Which category would be the dependent variable? Which would be the independent variable?

height → age

not linear

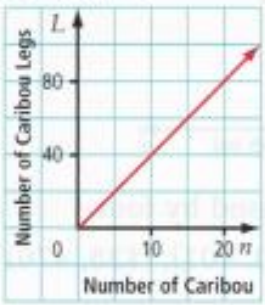
There is a linear relationship between the number of caribou, n, in a herd and the number of caribou legs, L. Which representations model this relation?

✓ A $L = 4n$

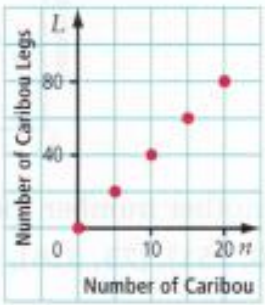
✓ B (0, 0), (3, 12), (8, 32), (15, 60), (50, 200)

C $L = n + 4$

D



✓ E



F

n	L
3	6
6	12
9	18
12	24

assignment: p 287 1-6, 8, 12