Foundations & Pre-Calculus 10

# 6.2 Linear Relations

Recall that a relation is an association between two quantities. A ***linear relation*** will have a graph that is a line. A ***non-linear relation*** will have a graph that is some type of curve. To determine if a relation is linear from a table of values, check to see how the x and y values are related. If the x and y values increase or decrease by a constant amount, then the data would be for a linear relation (except for horizontal or vertical lines). Non-linear relations would have x and y values that increase or decrease by different amounts.

Example: linear relations have a constant rate

***Linear Relation***

| x | y |
|---|---|
| 1 | 8 |
| 2 | 12 |
| 3 | 16 |
| 4 | 20 |
| 5 | 24 |

+1, +1 → +4, +4

rate = $\frac{4}{1}$

rate = $\frac{4}{1}$

constant rate = $\frac{4}{1}$

Equation: $y = 4 \cdot x + 4$

***Non-Linear Relation***

| x | y |
|---|---|
| 1 | 2 |
| 2 | 8 |
| 3 | 18 |
| 4 | 32 |
| 5 | 50 |

rate = $\frac{6}{1}$

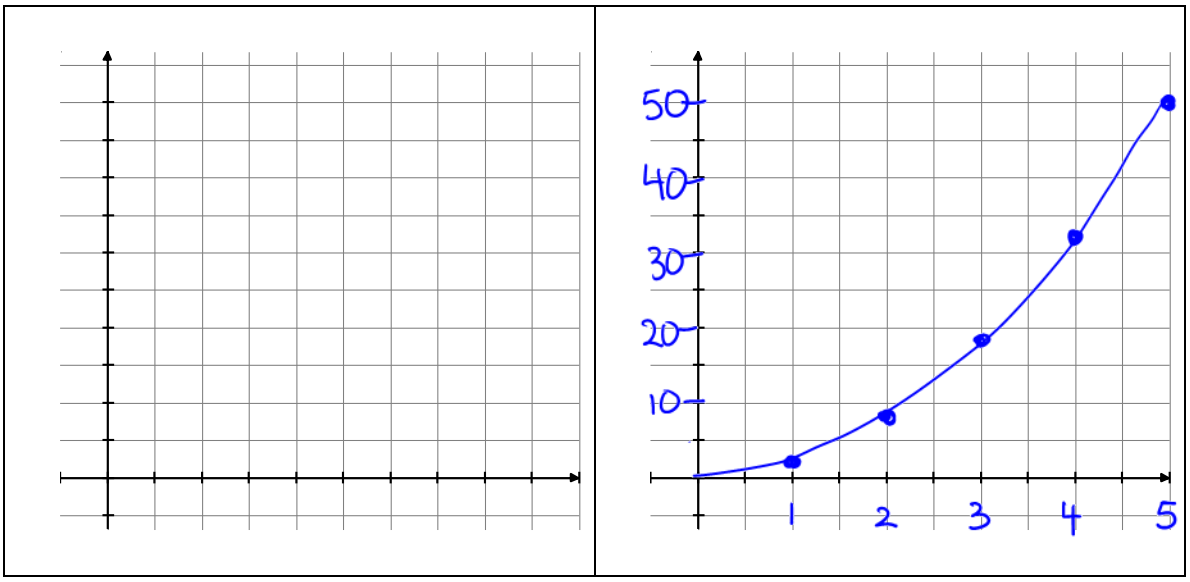
rate = $\frac{10}{1}$

Equation: $y = 2x^2$

non linear

$y = x^2$

$y = \sqrt{x}$



Graphs of linear relations may contain one of two different types of data:

Discrete Data: disconnected data, certain numbers cannot be placed on graph
eg amounts of donuts

Continuous Data:
connected data: you can have amounts between coordinates

For what type of situation would you see each type of data?

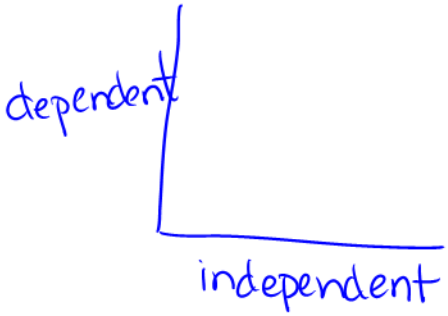
discrete - you only have whole number amounts

continuous - weights/heights may have decimals

In relations that contain two variables, one variable is considered to be ***independent*** while the other is considered to be ***dependent***. As would be expected, the dependent variable's values depend on the values of the independent variable.

- When data is presented in tabular form, the independent values are found in the first column and the dependent values are found in the second column.

- When data is presented in graph form, the independent values are on the x-axis (horizontal) and the dependent values are on the y-axis (vertical).

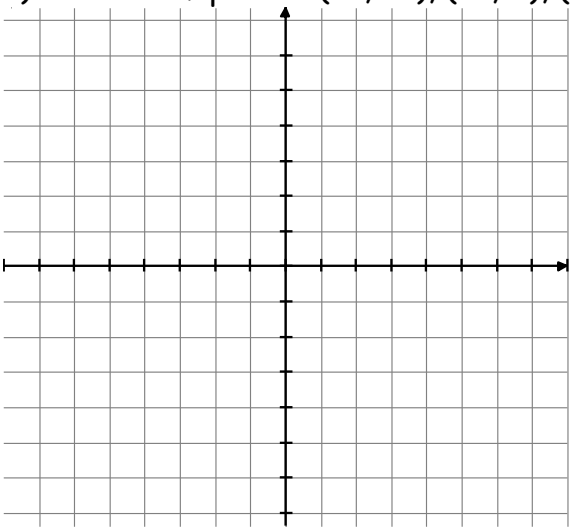



in rates, the rate is always
# dependent per # independent.

**Examples:**

1) 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)…

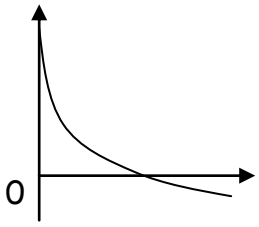


can determine if linear by

a) determining if constant rate

b) plotting

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

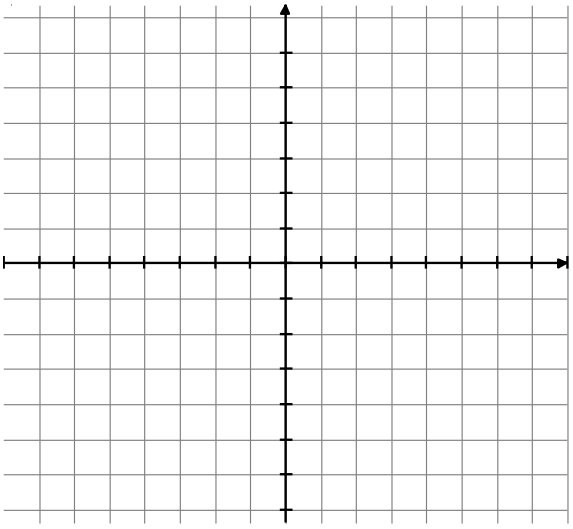



Amount vs. Time

↗ dependent ↑ independent.

p 287 # 1-10 *11, *12

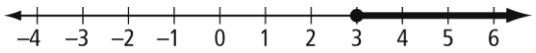
c) The relation described by the following equation: $g + 4 = 0.7h$



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

***6.3 Warm-Up***

**1.** Describe in words the values represented by the number line.




**2.** Draw a number line to represent all numbers that are less than –2.

**3.** Describe in words the values represented by the number line.


**4.** Draw a number line that represents all numbers that are greater than 4 and less than or equal to 7.

**5.** A car travels at 60 km/h for 5 h. Suppose you were to create a graph of this scenario.

**a)** What scale would you use along the time axis? What value would you start at? What value would you end at?

**b)** What scale would you use along the distance axis? What value would you start at? What value would you end at?