Math 9 Name: _____
Ch. 4 – Linear Relations Block: _____

4.2 – Linear Relations

Recall that we have a **linear relation** if a constant change in one variable produces a constant change in the other.

Ex. 1: Are the following relations linear?

x	y
1	4
2	13
3	22
4	31

+1, +1, +1 → +9, +9, +9

YES

x	y
1	2
2	4
3	8
4	14

+1, +1, +1 → +2, +4, +6

NO

x	y
9	-8
6	2
3	12
0	22

-3, -3, -3 → +10, +10, +10

YES

When graphing data, we always plot the **independent variable** on the horizontal (x) axis and the **dependent variable** on the vertical (y) axis. We can identify which is which by asking which variable depends on the other.

Eg. Distance driven and time

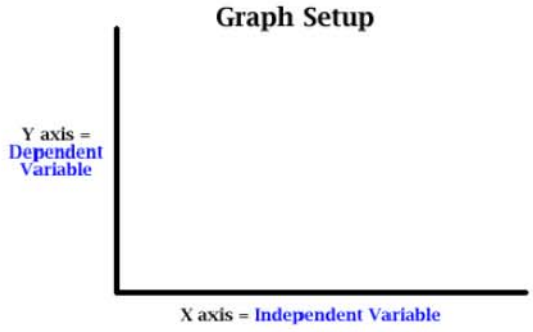
dep. indep.

since distance depends on time

Diver's depth and water pressure

indep. dep.

since pressure depends on depth.

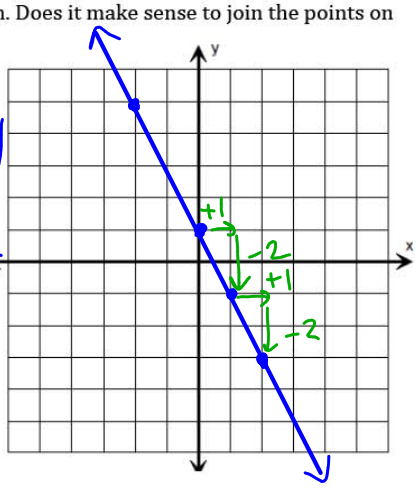


Before joining the data points on a graph, ask yourself whether it is possible to have decimal or fraction values for the variables. If yes, we say the data is **continuous**. If not, it is **discrete**. In a table of values, it is best to put the independent variable in the left column, and the dependent in the right.

Ex. 2: A relation has the equation $y = 1 - 2x$

(a) Create a table of values and graph the relation. Does it make sense to join the points on the graph?

x	y
1	$y = 1 - 2(1) = 1 - 2 = -1$
0	$y = 1 - 2(0) = 1 - 0 = 1$
-2	$y = 1 - 2(-2) = 1 + 4 = 5$
2	$y = 1 - 2(2) = 1 - 4 = -3$



Join the points since can have decimal x-values.

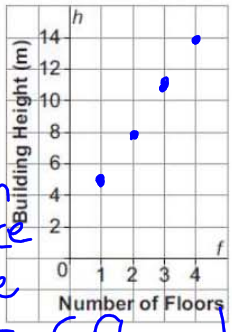
(b) What patterns are in the graph? Is the relation linear?

To get from one point to the next, go right 1 and down 2. Yes, it's linear.

Ex. 3: A one-story building is 5 m high. Each additional story adds another 3 m.

(a) Create a table of values and graph the relation. Does it make sense to join the points?

# of stories (s)	building height (h)
0	5
1	8
2	11
3	14
4	



Don't join points since can't have decimal # of floors!

(a) Write an equation to relate the height of the building, h, to the number of stories, s.

$h = 3s + 2$