# Linear Graphs

## Note 1 Table of values

Given an equation, we can fill out a table of values.

**Example:** The number of times a cricket chirps a minute is related to temperature by

$$C = 7{\cdot}2\,t + 88$$

Find $C$ when $t = 0°, 10°, 15°$ and $20°$

when $t = 0$

$$C = 7{\cdot}2 \times 0 + 88$$
$$= 88$$

when $t = 10°$

$$C = 7{\cdot}2 \times 10 + 88$$
$$= 160$$

etc.

| $t$ (°C) | 0° | 10° | 15° | 20° |
|---|---|---|---|---|
| $C$ chirps/min | 88 | 160 | 196 | 232 |

## Note 2 Ordered pairs and graphs

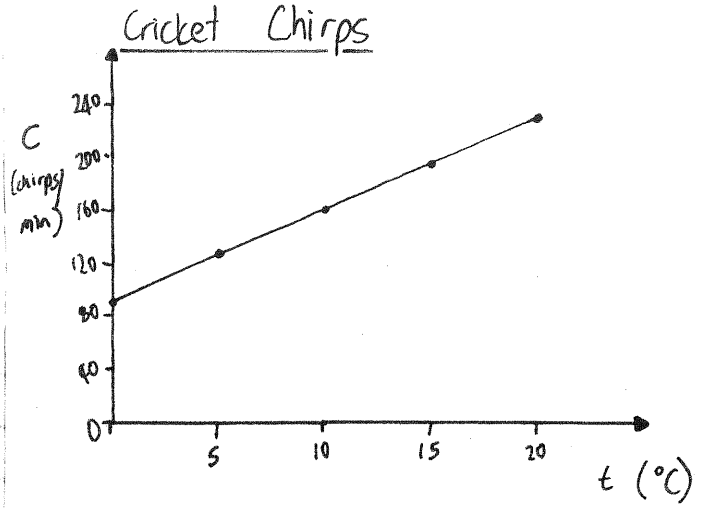
The results shown in a table of values can be listed as ordered pairs and graphed.

**Example:** In the example above pairs are

$$(0, 88), (10, 160), (15, 196), (20, 232)$$

'x' like coordinate

'y' like coordinate




## Dependent & Independent Variables

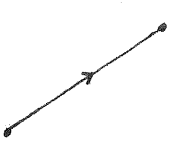
The independent (or explanatory) variable is plotted on the x-axis. We can choose its value. The dependent (or response) variable is plotted on the y-axis. Its value will depend on x.
In the example on cricket chirps,
temperature is the independent variable and the number of chirps per minute is the dependent variable. (i.e. the number of chirps per minute <u>depends</u> or is <u>explained</u> by the temperature)

## Gradient

This is a measure of a lines 'steepness'

$$\text{Gradient} = \frac{\text{vertical distance}}{\text{horizontal distance}}$$

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

Examples: 1)  gradient $= \frac{2}{3}$

2)  gradient $= \frac{-2}{1}$

$= -2$

Point: Gradient is often given the symbol m. In above examples $m = \frac{2}{3}$ and $m = -2$

# General equation of a straight line

This is

$$y = mx + c$$

$m$: gradient; $c$: y intercept

We can now sketch the graph.

Steps:

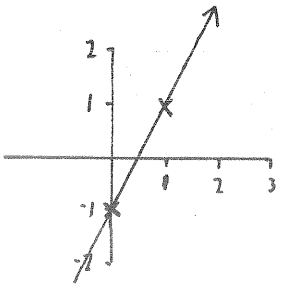
(i) Plot y intercept

(ii) Use gradient to plot a second point.

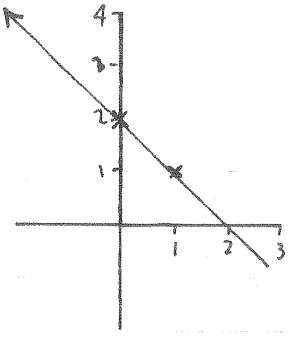
(iii) Join points and extend

Examples: Sketch graphs of

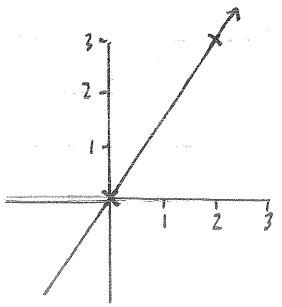
(1) $y = 2x - 1$




(2) $y = -x + 2$




(3) $y = \frac{3}{2}x$

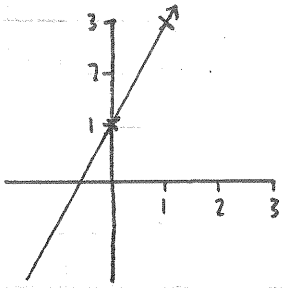



(4) $2y = 4x + 2$

Must first put in form $y = \ldots\ldots$

Divide by 2

$y = 2x + 1$



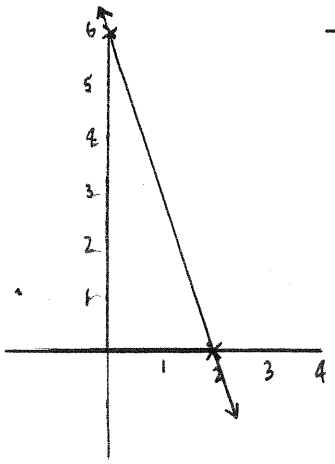
# Graphing x and y intercepts

The intercept on each axis is plotted. The two points are then joined

## Examples Graph

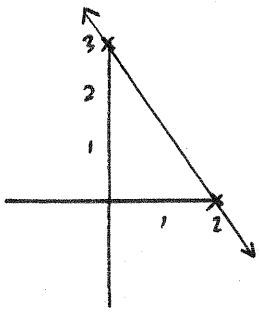
1) $y + 3x = 6$

| x | y |
|---|---|
| 0 | 6 |
| 2 | 0 |



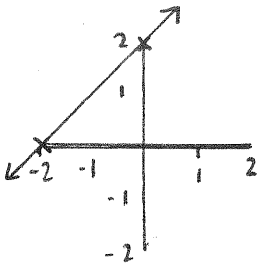

2) $2y + 3x = 6$

| x | y |
|---|---|
| 0 | 3 |
| 2 | 0 |




3) $y - x = 2$

| x | y |
|---|---|
| 0 | 2 |
| -2 | 0 |



# Cubics

The basic cubic has equation, $y = x^3$

## Table of values

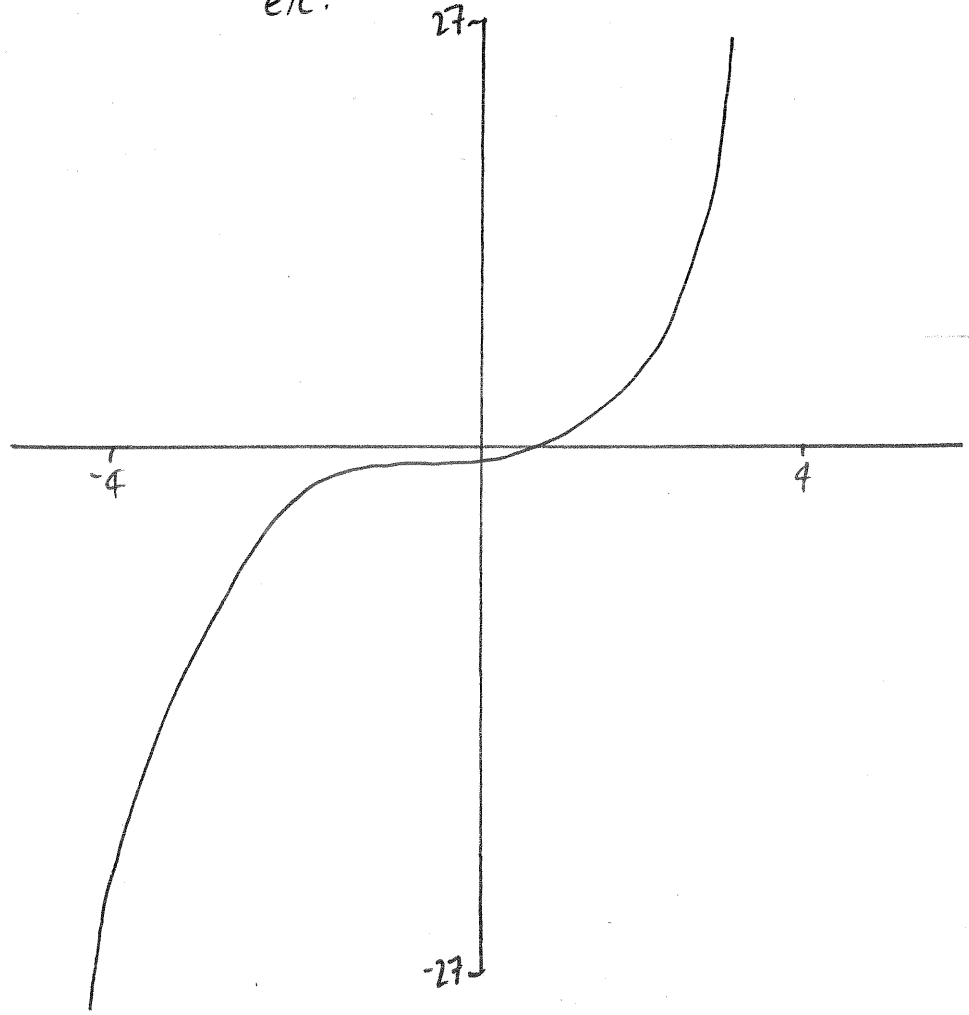
| $x$ | -3 | -2 | -1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|
| $y = x^3$ | -27 | -8 | -1 | 0 | 1 | 8 | 27 |

Point When $x = -3$

$y = (-3) \times (-3) \times (-3)$

$y = -27$

etc.



# Circles

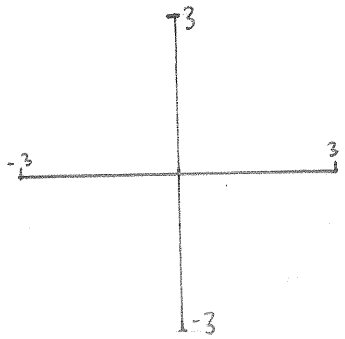
Simple circles, with their centre at the origin (0,0), have an equation in the form:

$$x^2 + y^2 = \text{number}$$

Examples include: $x^2 + y^2 = 4$ $x^2 + y^2 = 25$ etc.

The radius of the circle $x^2 + y^2 = \text{number}$ is $\sqrt{\text{number}}$

Draw the circle $x^2 + y^2 = 9$




What is the equation of a circ which has its centre at (0,0) a radius of 4.

$x^2 + y^2 = 16$

# Hyperbolas

These graphs have an equation in the form

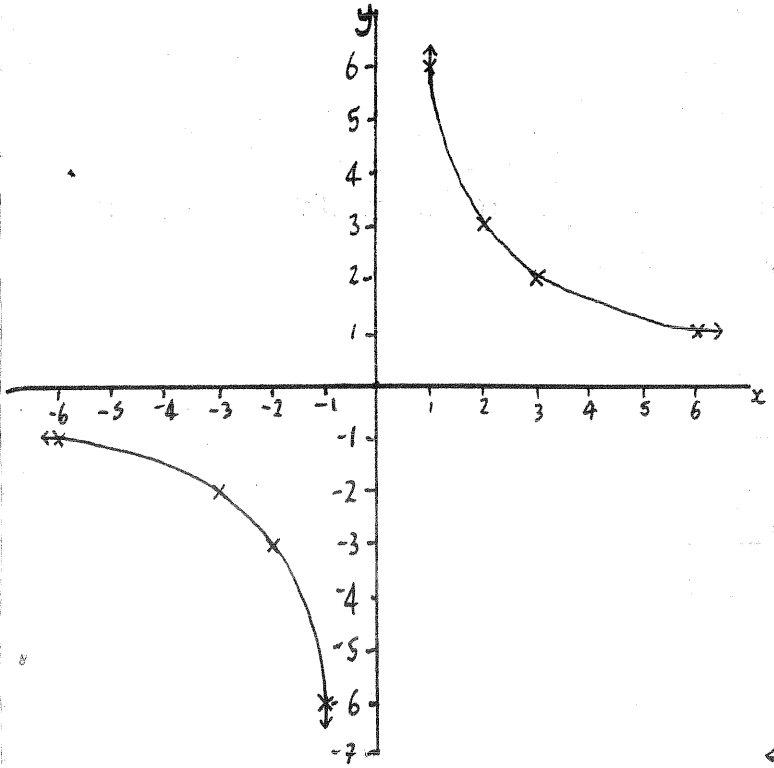
$xy = c$ (number)

or $y = \frac{c}{x}$

## Examples Plot

(1) $xy = 6$ or $y = \frac{6}{x}$

| x | -6 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 6 |
|---|---|---|---|---|---|---|---|---|---|
| y | -1 | -2 | -3 | -6 | / | 6 | 3 | 2 | 1 |




(2) $xy = -4$ or $y = \frac{-4}{x}$

| x | -4 | -2 | -1 | 0 | 1 | 2 | 4 |
|---|---|---|---|---|---|---|---|
| y | 1 | 2 | 4 | / | -4 | -2 | -1 |