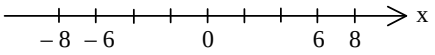
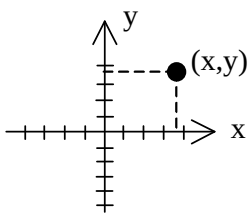
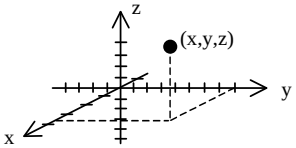


Coordinates: The location of a point on a line is done by stating a single number (x), positive or negative, representing the distance to the right or left, respectively, from a given point (the **origin**) having coordinate 0 as shown.



The location of a point on a plane is done by stating a pair of numbers (x,y) representing the values along two perpendicular lines (the **axes**) as shown.

The location of a point in space is done by stating a triple of numbers (x,y,z) representing the values along three mutually perpendicular line

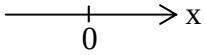


Ordinate: The **vertical** axis of a plane coordinate plot (the **x-axis**).

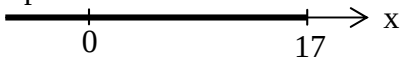
Abscissa: The **horizontal** axis of a plane coordinate plot (the **y-axis**).

Graphs: A pictorial representation of a function is called a graph.

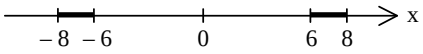
The simplest form of a graph uses the number line:



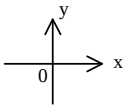
Ex: $x < 17$:



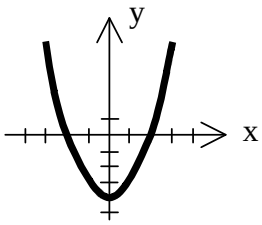
Ex: $36 < x^2 < 64$:



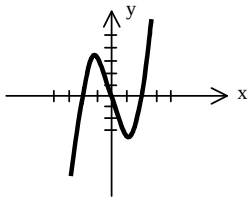
A graph of a function uses two perpendicular number lines:



Ex: $y = x^2 - 4$



Ex: $y = x^3 - 4x$



x-intercept: Where a graph crosses the x-axis is called x-intercept $(y = 0)$.

y-intercept: Where a graph crosses the y-axis is called y-intercept $(x = 0)$.

Ex: Find the x- and y- intercepts of $y = x^2 - 4$.

Setting $y = 0$ gives $x^2 = 4$ so the x-intercepts are at $x = \pm 2$.

Setting $x = 0$ gives $y = -4$ so the y-intercept is at $y = -4$ (see graph above).

Distance: The distance between two points having coordinates (x_1, y_1, z_1) and (x_2, y_2, z_2) is

$\boxed{d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}}$. This formula results from Pythagorus' Theorem.

Straight Line: The equation for a straight line in a plane is $\boxed{y = s \bullet x + b}$. This equation is a **linear** relation between x and y (y varies as the first power of x). **s** is the **slope** of the line.
b is the **y-intercept** of the line (the y-value when x = 0).
– b / s is the **x-intercept** of the line (the x-value when y = 0).

Slope: The slope of the straight line between any two points (x_1, y_1) and (x_2, y_2) is

$$\boxed{s = \frac{(y_2 - y_1)}{(x_2 - x_1)}}$$ (the y's are on top).

A **positive slope** slants **from lower left to upper right** when plotted on a standard xy-plot.
A **negative slope** slants **from upper left to lower right** when plotted on a standard xy-plot.

Straight Line: If you are given (or can find) the **slope s** of a line and a **point (x_1,y_1)** on the line, then the equation of the line is given by $\boxed{y - y_1 = s(x - x_1)}$.

Midpoint: The **midpoint** of the straight line between two points (x_1, y_1, z_1) and (x_2, y_2, z_2) is the point

$$\boxed{\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}, \frac{z_1 + z_2}{2}\right)}.$$

Perpendicular Lines: Two lines are **perpendicular** if they intersect at **right angles**.

If the slope of a line is s, then the **slope of the perpendicular line** is $\boxed{-\frac{1}{s}}$.

Ex: What is the equation of the line perpendicular to the line $2y = 4x + 3$ and passing through the point (1,2) ?

Soln: First, write the equation in standard form: $y = 2x + \frac{3}{2}$. The slope of this line is 2. Therefore the slope of the perpendicular line is $-\frac{1}{2}$. Now we have the slope of the unknown line and a point through which it passes. Therefore its equation is $y - 2 = \left(-\frac{1}{2}\right)(x - 1) = -\frac{x}{2} + \frac{1}{2}$, so $y = 2 - \frac{x}{2} + \frac{1}{2} = \frac{5 - x}{2} = y$.

Circles: The equation of a circle having radius **r** and center at (x_1, y_1) is $\boxed{(x - x_1)^2 + (y - y_1)^2 = r^2}$.

Analytics 1 Homework Problems
(No Calculators)

a) $f(x) = x^{1/2} + x^{3/2}$. What is $f(9)$? What are the x- and y-intercepts?

b) $f(x) = 17|2x + 4($. What is $f(-4)$? What are the x- and y-intercepts?

c) $f(x) = x^2$ and $g(x) = x^{1/3} + 4$. What are $g(f(8))$ and $f(g(8))$?

d) Express the area *A*, perimeter *P*, and diagonal *D* of a rectangle as a function of its sides *x* and *y*.

e) $h(x, y) = x^3 - 3xy + y^2$. What is $h(2,3)$? What is $h(x, y + k) - h(x, y)$?

f) $(x-4)^3 = \left(\frac{1}{8}\right)^{-1}$. What is x ?

g) $x\left(\frac{1}{\sqrt{2}-1}+\frac{2}{\sqrt{3}+1}\right) = \sqrt{3}+\sqrt{2}$. What is x ?

h) For what value of *x* less than zero will $|x-1| = 23$?

What are the slopes, the x-intercepts, and the y-intercepts of the following:

i) $y = 11x + 1$ j) $y = 11x$ k) $y = -x + 5$

l) $3y + 6x = 3$ m) $14x = 2y - 10$ n) $10^6 x = y + 1$

Determine the equations of the straight lines passing through the following pairs of points.
Find the midpoints in each case.
Find the distance from one point to the midpoint in each case.

o) $(1,6)\ (15,14)$ p) $(0,0)\ (3,5)$ q) $(8,9)\ (-1,-7)$

r) $(25,24)\ (24,25)$ s) $(10,12)\ (-12,-10)$ t) $(-1,-5)\ (-7,-3)$

In each of the last six questions, what is the equation of the perpendicular bisector of the line joining the two points? (Questions u, v, w, x, y, z.)

Determine the equations of the circles having centers and radii as given.

aa) $(0,0)$ and 7 ab) $(1,3)$ and 4 ac) $(-3,2)$ and 5 ad) $(-7,-6)$ and 15

ae) A circle has radius 5 and center at $(-1,3)$. What is the sum of its x-intercepts and y-intercepts?