

Linear Graphs

All straight line graphs are in the form:
 $y = mx + c$

$$y = \underset{\text{Gradient}}{m}x + \underset{\text{y intercept}}{c}$$

The gradient is a measure of how steep the graph is

The y - intercept is which number on the y axis the graph goes through

Formula for finding the gradient

$$\frac{\text{Change in } y}{\text{Change in } x} = \frac{y - y_1}{x - x_1}$$

Finding the gradient

- Pick two points on the line
- Label your first point (x and y)
- Label your second point (x₂ and y₂)
- Substitute the points into the formula

Finding the equation of a line from two points

A line passes through the points (4,7) and (8,15). Find the equation of the line.

$$\text{Gradient} = \frac{y - y_1}{x - x_1}$$

$$\text{Gradient} = \frac{7 - 15}{4 - 8} = - \frac{8}{-4} = -2$$

$$y = mx + c$$

$$y = -2x + c$$

$$7 = -2(4) + c$$

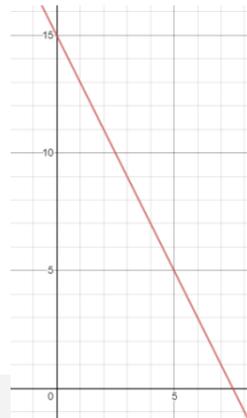
$$7 = -8 + c$$

$$15 = c \quad y = -2x + 15$$

Step 1: Find the gradient

Step 2: Pick a point

Step 3: Use gradient and point to find the equation

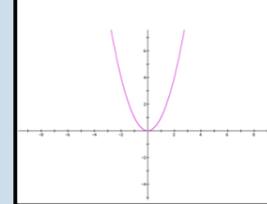


The coordinates of a midpoint of a line segment is

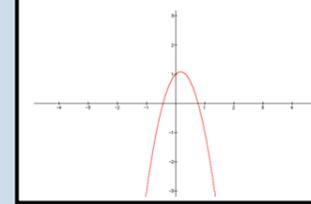
$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Quadratic Graphs

Positive Quadratic Graphs have a U shape

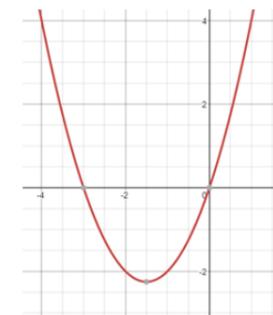


Negative Quadratic Graphs have a n shape



Plot the graph of $y = x^2 + 3x$

| x | -4 | -3 | -2 | -1 | 0 | 1 | 2 |
|----------------|----|----|----|----|---|---|----|
| $y = x^2 + 3x$ | 4 | 0 | -2 | -2 | 0 | 4 | 10 |



Finding the roots of quadratic graphs

You can find the roots of a quadratic graphs by factorising

Sketch the graph for this equation

$$y = x^2 + 4x$$

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

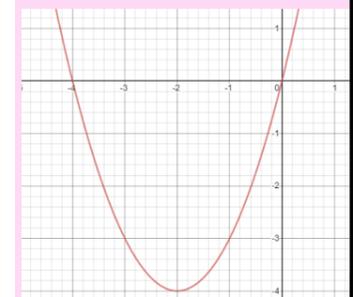
Step 1: Factorise

Step 2: Set each bracket to zero

Step 3: Solve to find your roots

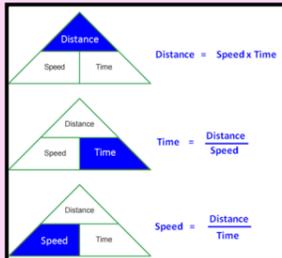
Step 4, set x equal to zero to find the y intercept

Step 5, n or U shape?



Unit 6: Graphs

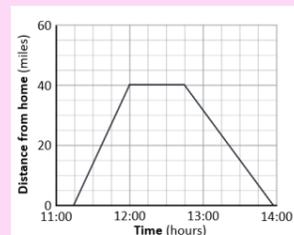
Speed Distance Time Graphs



A distance-time graph plots the distance an object travels against the time it takes it to travel.

This the gradient of the line and tells us the rate of change of distance with respect to time.

For a distance-time graph, the rate of change is the speed.

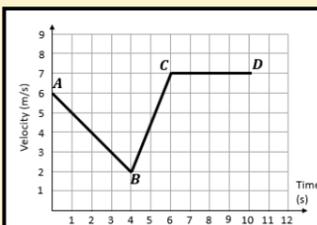
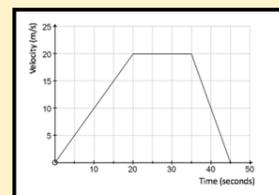


Velocity Time Graphs

Velocity is defined as the rate of travel of an object, along with its direction. **Velocity** tells you how fast an object is moving as well as in what direction it is moving.

The gradient of a velocity time graph represents acceleration

The area under a velocity time graph represents distance travelled



Determine the acceleration from:
a) A to B: $-4 \div 4 = -1 \text{ m/s}^2$
b) B to C: $5 \div 2 = 2.5 \text{ m/s}^2$
c) C to D: 0 m/s^2

Find the total distance travelled.

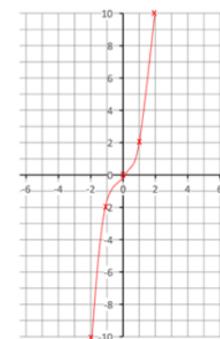
$$\text{Using whole trapezium: } \frac{15 + 45}{2} \times 20 = 600 \text{ m}$$

Cubic Graphs

Cubic equations are in this form
 $y = ax^3 + bx^2 + cx + d$

$$y = x^3 + x$$

| x | -2 | -1 | 0 | 1 | 2 |
|---|-----|----|---|---|----|
| y | -10 | -2 | 0 | 2 | 10 |

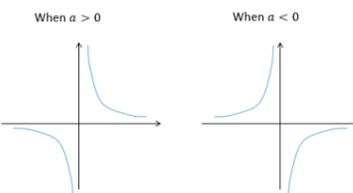


Reciprocal Graphs

A reciprocal equation will be in this form

$$y = \frac{a}{x}$$

a is a constant while x is a variable, so we might have $y = \frac{3}{x}$



The lines $x = 0$ and $y = 0$ are called asymptotes. An asymptote is a straight line which the curve approaches at infinity.

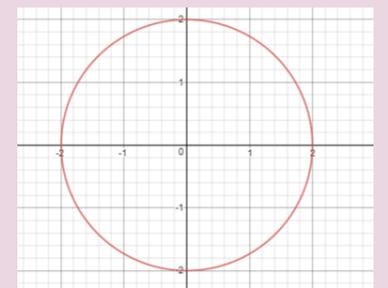
Equation of a Circle

The equation of a circle can be expressed in the form

$$x^2 + y^2 = r^2$$

Where r is the radius

$$x^2 + y^2 = 4$$



Travel Graphs

Cubic, Reciprocal and Circular Graphs