Code	Objective
I3.1	**Interpret and compare numbers in standard form A x 10^n 1 ≤ A < 10, where n is a positive or negative integer or zero.** Put the following numbers into ascending order $7.\ 2 \times 10^3 \qquad 6.3\ \times 10^4 \qquad 7.4\ \times 10^{-4} \qquad 6.7\ \times 10^0$ Step 1 – Convert the numbers from standard form back to ordinary numbers $7200 \qquad 63000 \qquad 0.00074 \qquad 6.7$ Step 2 – Order the numbers from largest to smallest $0.00074 \qquad 6.7 \qquad 7200 \qquad 63000$ Step 3 – Write the numbers out in the correct order in standard form. $Answer$: $7.4\ \times 10^{-4} \qquad 6.7\ \times 10^0 \qquad 7.\ 2 \times 10^3 \qquad 6.3\ \times 10^4$
I3.2	**Estimate powers and roots of any given positive number.** Estimate $\sqrt{45}$ Step 1 – Write down the two nearest square numbers to the number given in the question $\sqrt{36} = 6 \qquad \sqrt{49} = 7$ Step 2 – Draw a number line between the two numbers $\sqrt{36} \qquad \sqrt{49}$ $6 \qquad 7$ Step 3 – Estimate where the number in the question should be placed on the number line $\sqrt{36} \qquad \sqrt{45} \quad \sqrt{49}$ $6 \qquad 7$ Step 4 – Then estimate a value (to 1 d.p) for the square root of the number based upon it's position on the number line. $Answer\ \sqrt{45} \approx 6.7$
I3.3	**Simplify surd expressions involving squares** Simplify $\sqrt{24}$ Step 1 Write down all the factor pairs of the number given $\sqrt{1 \times 24} \quad \sqrt{2 \times 12} \quad \sqrt{3 \times 8} \quad \sqrt{4 \times 6}$ Step 2 Select the pairing which contains the largest square number $\sqrt{4 \times 6}$ Step 3 Separate the two number into individual square roots and square root the square number $\sqrt{4} \times \sqrt{6}$ $2 \times \sqrt{6}$ Step 4 – Simplify the expression $Answer:\ 2\sqrt{6}$
I3.4	**Simplify and manipulate algebraic expressions to maintain equivalence by taking out common factors, expanding products of two or more binomials and collecting like terms.** Expand $(x + 2)(x + 3)$ Step 1: Multiply the 2nd bracket by each term in the 1st bracket.

$$x(x+3)+2(x+3)$$

Step 2 Collect the like terms

$$x^2+3x+2x+6$$

$$Answer\ x^2+5x+6$$

I3.5

Simplify expressions involving the laws of indices

Simplify the following expressions

Add the powers together $y^3 \times y^5$

y x y x y x y y x y y x y x y

y^{3+5}

y^8

Subtract the powers $\frac{y^9}{y^4}$

$$\frac{y \times y \times y \times y \times y \times y \times y \times y \times y}{y \times y \times y \times y}$$

y^{9-4}

y^5

Multiple the powers together $(y^2)^3$

$y^2 \times y^2 \times y^2$

$y^{2\times 3}$

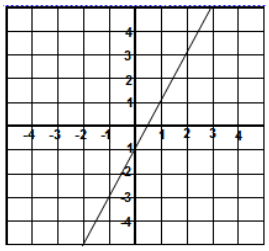
y^6

I3.6

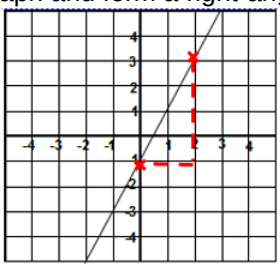
Reduce a given linear equation in two variables to the form y = mx + c: calculate and interpret gradients and intercepts of graphs of such linear equations numerically, graphically and algebraically.

$$y = mx + c \qquad m = \text{gradient} \qquad c = y\ \text{intercept}$$

Find the equation of the line given below:



Step 1 Select two coordinates from the graph and form a right-angled triangle.



Step 2 To calculate the gradient of the graph use the formula below.

$$m = \frac{change\ in\ y}{change\ in\ x}$$

$$m = \frac{4}{2}$$

$$m = 2$$

Step 3 To complete the equation of the line the y intercept is the number where the line crosses over the y axis. So for this graph $c = -1$.

Answer : $y = 2x - 1$

I3.7

Plot graphs of quadratic functions

Plot the graph $y = x^2 + 2x$ for the values $-3 \geq x \geq 2$

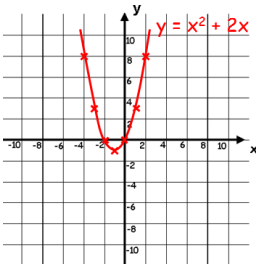
Step 1 – Draw a table of values

x	-3	-2	-1	0	1	2
y						

Step 2 – Substitute the values of x into the equation and calculate the y values.

x	-3	-2	-1	0	1	2
y	3	0	-1	0	3	8

Step 3 – Plot the x and y values as coordinates on a set of axis

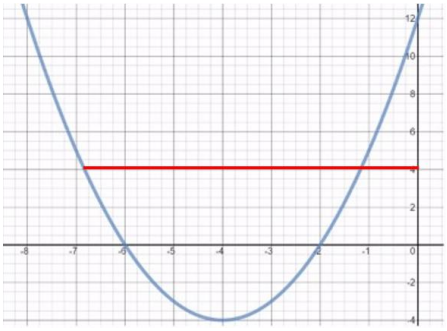


I3.8

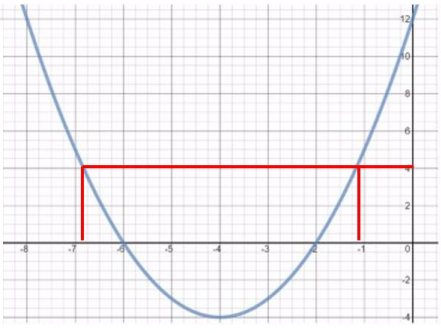
Use quadratic graphs to estimate values of y for given values of x and vice versa.
Below is the graph $y = x^2 + 8x + 1$

Using the graph solve the equation $4 = x^2 + 8x + 12$

Step 1 Go to 4 on the y axis and draw a line across to meet the graph at both points



Step 2 Draw a line down to the x axis at the two points were your line intersects the graph. Then read of the values of x.

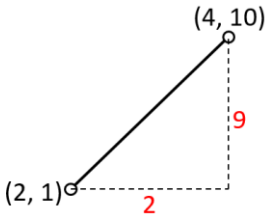


Answer : -1.1 and -6.9

I3.9

Use Pythagoras' Theorem to solve problems involving right-angled triangles.

What is the length of the line between the points (2, 1) and (4, 10)?



$c^2 = a^2 + b^2$

$c^2 = 2^2 + 9^2$

$c^2 = 4 + 81$

$c^2 = 85$

$c = \sqrt{85}$

$c = 9.22$

I3.10

Find the midpoint of a straight line given two coordinates.

Find the Midpoint of AB $A\,(2,6)$ $B\,(4,14)$

Step 1 To find the middle of the two x coordinates add them together and divide by 2

$\frac{x_1+x_2}{2} = \frac{2+4}{2} = \frac{6}{2} = 3$ $x\ coordinate\ equals\ 3$

Step 2 To find the middle of the two x coordinates add them together and divide by 2

$\frac{y_1+y_2}{2} = \frac{6+14}{2} = \frac{20}{2} = 10$ $y\ coordinate\ equals\ 10$

$Midpoint\ of\ AB \quad (3,10)$

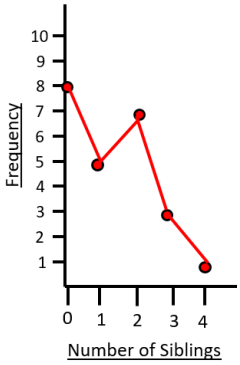
I3.11

Draw and analyse Frequency Polygons

Draw a frequency polygon for the table given below

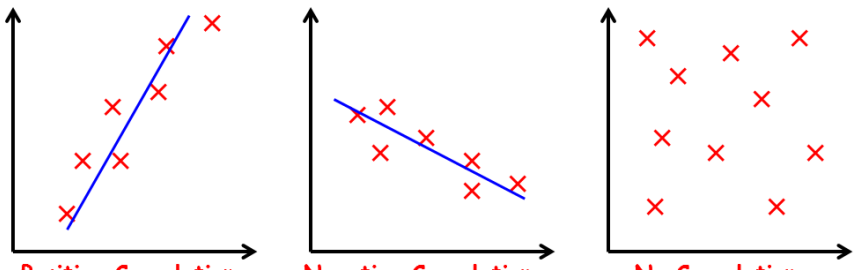
Number of Siblings	Frequency
0	8
1	5
2	7
3	3
4	1

Step 1 – Draw the appropriate x and y axis. Always plot the frequency on y axis
Step 2 - Plot the points on the graph
Step 3 – Join points together using a ruler



I3.12

Scatter Graphs, correlation and lines of best fit.



Positive Correlation
→ As one value increases, the other increases

Negative Correlation
→ As one value increases, the other decreases

No Correlation
→ There is no pattern in the data (and therefore no line of best fit…)