YEAR 11 SPRING 1 FOUNDATION

1) Similarity and Congruence
Similar shapes (144)
Similar shapes – scale factors (R10)
Similarity – Area and volume (201)
Congruent shapes (12b)
Congruent triangles (G31, 166)

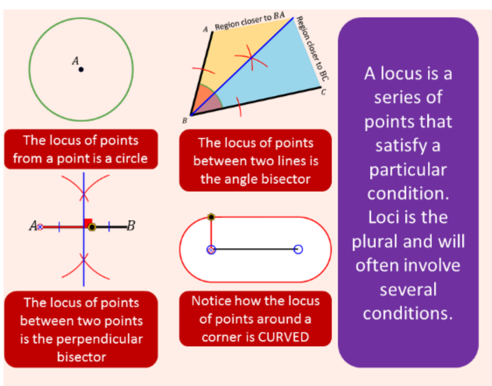
2) Collecting data
Sampling populations (152)
Data – discrete and continuous (63)
Tally charts & Bar charts (15)

3) Construction
Constructing perpendiculars (line and from a point (145a/b)
Bisecting an angle (145c)
Loci (146)
Drawing a triangle using compasses (147)

Key Formulae/Rules

Construction requires for you to use a pencil, compass and sometimes a protractor.
You **MUST** leave in your construction lines.

Loci



A locus is a series of points that satisfy a particular condition. Loci is the plural and will often involve several conditions.

Set compass to over halfway

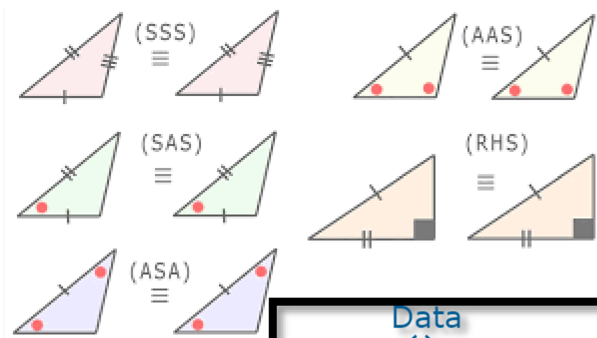
Create arcs above and below the line

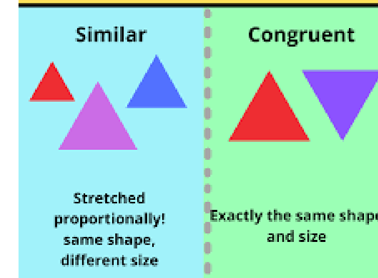
Do not alter the compass at all!

Sometimes you will need to create a separate line segment

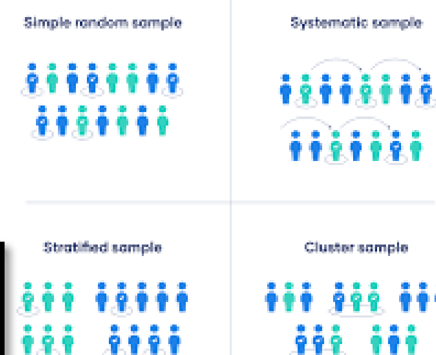
Similarity and Congruence

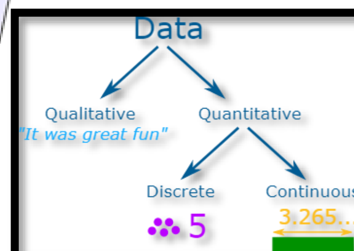
	L	length scale factor	Eg. x3
$=L^2$	A	area scale factor	Eg. $x3^2 = x9$
$=L^3$	V	volume scale factor	Eg. $x3^3 = x27$

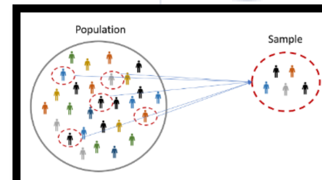




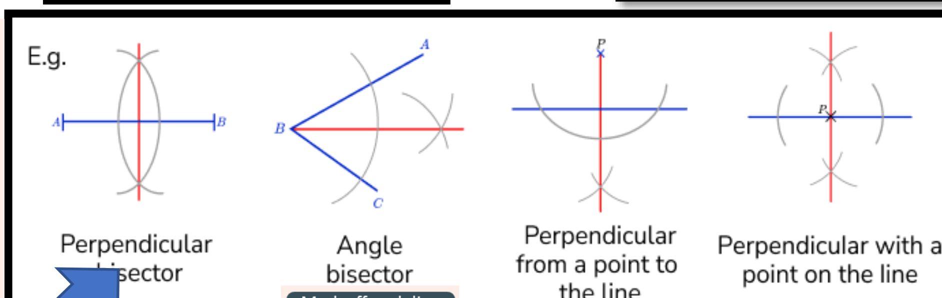
Collecting Data







Construction



Mark off each line segment

Create arcs within the angle

Do not alter the compass at all!

YEAR 11 SPRING 1 HIGHER

1) Functions

Inverse functions (214a/214b)
Composite functions (215)

2) Construction

Constructing perpendiculars (line and from a point (145a/b)
Bisecting an angle (145c)
Loci (146)
Drawing a triangle using compasses (147)

3) Transformations (including the transformations of graphs)

Trigonometric graphs (195a/195b)
Translating graphs (196a/196b)

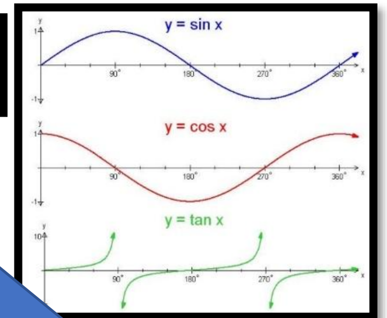
Key Formulae/Rules

Construction requires for you to use a pencil, compass and sometimes a protractor.
You **MUST** leave in your construction lines.

Transformations

Transformations of the graphs of functions	
$f(x)+c$	shift $f(x)$ up c units
$f(x)-c$	shift $f(x)$ down c units
$f(x+c)$	shift $f(x)$ left c units
$f(x-c)$	shift $f(x)$ right c units
$f(-x)$	reflect $f(x)$ about the y-axis
$-f(x)$	reflect $f(x)$ about the x-axis

Trig Graphs



Functions

Find the inverse of $f(x) = 5x + 3$

write the function using a "y" → $5y + 3 = x$ ← set equal to "x"

$5y = x - 3$

$y = \dfrac{x-3}{5}$ ← rearrange to make y the subject

use f^{-1} notation → $f^{-1} = \dfrac{x-3}{5}$

Input Value

$f(x) = \underbrace{x - 5}$

Function Name — Output Value

Composite Functions

A composite function is created when one function is substituted into another function.

Example:

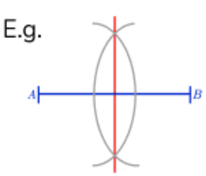
Given $f(x) = 3x + 2$ and $g(x) = x + 5$

$f(g(x)) = f(x+5)$
$= 3(x+5) + 2$
$= 3x + 15 + 2$
$= 3x + 17$

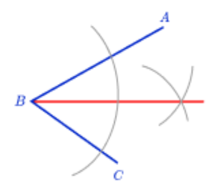
$g(f(x)) = g(3x+2)$
$= (3x + 2) + 5$
$= 3x + 7$

Construction

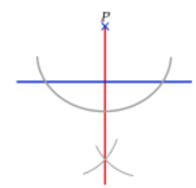
E.g.



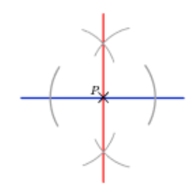
Perpendicular bisector



Angle bisector



Perpendicular from a point to the line

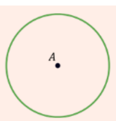


Perpendicular with a point on the line

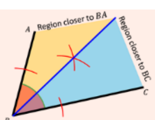
- Set compass to over halfway
- Create arcs above and below the line
- Do not alter the compass at all!
- Sometimes you will need to create a separate line segment

- Mark off each line segment
- Create arcs within the angle
- Do not alter the compass at all!

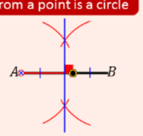
Loci



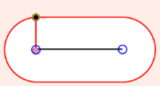
The locus of points from a point is a circle



The locus of points between two lines is the angle bisector



The locus of points between two points is the perpendicular bisector


Notice how the locus of points around a corner is CURVED

A locus is a series of points that satisfy a particular condition. Loci is the plural and will often involve several conditions.

YEAR 11 SPRING 2 FOUNDATION

1) Trial and Improvement
Solve an equation to 1 decimal place using Trial and Improvement Methods including quadratics and cubics (179)

2) Algebraic Reasoning
Answer 'show that' questions (193)

3) Vectors
Add and subtract vectors and multiply vectors by a scalar (219)
Represent information graphically given column vectors and identify two column vectors which are parallel (219)

Vectors

Vectors describe translations

$\begin{pmatrix} x \\ y \end{pmatrix}$ x → Direction along, y → Direction up/down

Notation

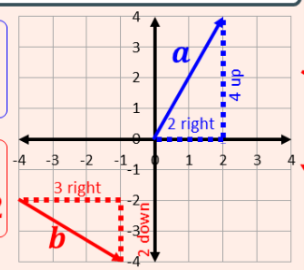
$\overrightarrow{AB}$ $\boldsymbol{a}$ $\underline{a}$

Magnitude = Length of Arrow
Direction = Where arrow is pointing

Represented by arrows

$\boldsymbol{a} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$

$\boldsymbol{b} = \begin{pmatrix} 3 \\ -2 \end{pmatrix}$

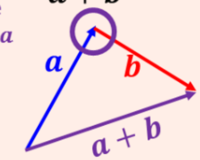


Adding and Subtracting

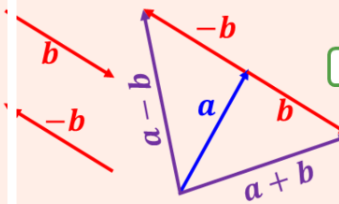
Start arrow at end of previous vector

$\boldsymbol{b}$ starts at the end of $\boldsymbol{a}$

$\boldsymbol{a}+\boldsymbol{b}$



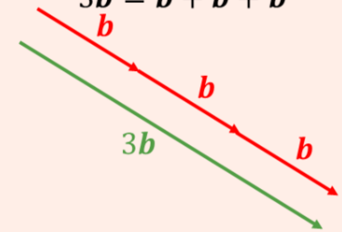
Negative vector goes in opposite direction



Multiplying

Only affects magnitude, not direction

$3\boldsymbol{b} = \boldsymbol{b}+\boldsymbol{b}+\boldsymbol{b}$



Parallel Vectors

Same direction. May have different magnitude.

Same Direction

$\boldsymbol{a} - 3\boldsymbol{b}$ $3(\boldsymbol{a} - 3\boldsymbol{b})$

Algebraic Reasoning

Algebraic Proof Toolkit.....

use "n" to represent any whole number

Number fact	Written using algebra
Even Number	2n
Odd Number	2n + 1 or 2n - 1
Multiple of 3	3n
Consecutive Numbers	n, n + 1, n + 2, ...
Consecutive Even Numbers	2n, 2n + 2, 2n + 4,......
Consecutive Odd Numbers	2n + 1, 2n + 3, 2n + 5,.......
Consecutive Square Numbers	n^2, $(n + 1)^2$, $(n + 2)^2$ ......

Peter says

The sum of an odd number and an even number is even.

The example 3 + 4 = 7 shows that Peter is **not** correct.

Write an example to show that each of these statements is **not** correct.

(a) The sum of two prime numbers is always odd.

Key Formulae/Rules

If the question says "**show that**" or "**prove that**" then you need to write down <u>every</u> stage of your working.

Trial and Improvement

Solve $x^2 + 2x - 1 = 3$ to 2 decimal places

x	$x^2 + 2x - 1$	Decision?
1.2	2.84	Too small
1.3	3.29	Too big
1.23	2.9729	Too small
1.24	3.0176	Too big
1.235	2.995225	Too small

Based on the table, what must the correct answer be?

A

Use Trial & Improvement to find an **integer solution** to each equation.

1) $x^2 + x = 240$

2) $a^3 + a = 350$

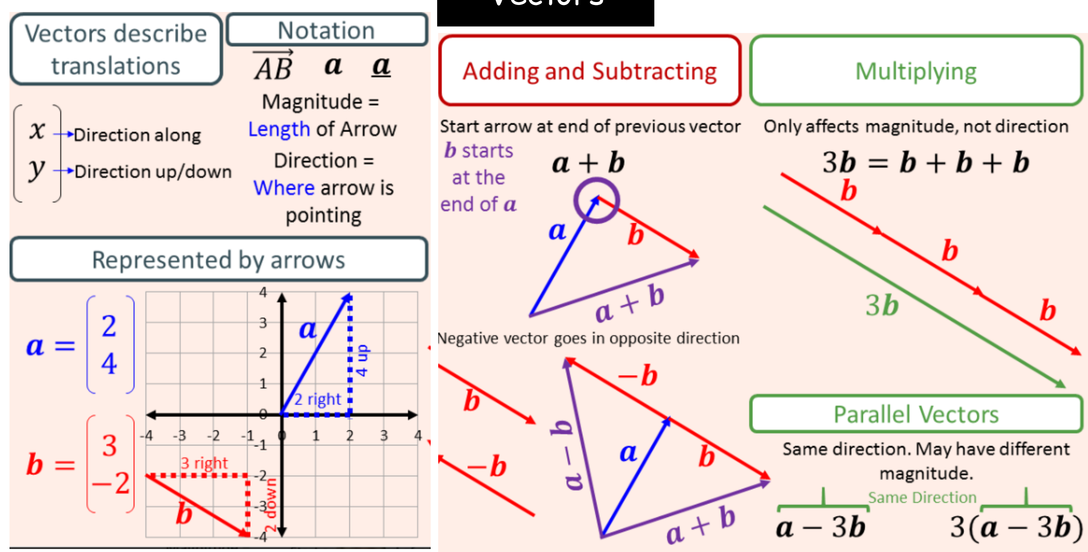
YEAR 11 SPRING 2 HIGHER

1) Inequalities
Understanding inequality notation (138)
Solve simple linear inequalities (139)
Solve quadratic inequalities (212)
Represent the solution set, using set notation

2) Bounds
Calculate upper and lower bounds of numbers and use inequalities to represent this (132)
Upper and lower bounds of expressions (206)
Upper and lower bounds for problem solving (206)

3) Vectors
Vector Notation (174)
Add and subtract vectors and multiply (219)
Length of vector using Pythagoras (219)
Vector Proof

Vectors



Key Formulae/Rules

How to find the Upper and Lower Bounds?

1. Half the degree of accuracy specified
2. Add to get the upper bound.
3. Subtract to get lower bound.

Bounds

Error Intervals

By definition, a rounded number does not give us the exact value

Lower Bound The minimum a value might be

Upper Bound The maximum a value might be

Continuous Values (Decimal values)

Halve accuracy level	Add on for Upper bound	Subtract for Lower bound

$240m$ to nearest $10m$

$235m \leftarrow \boxed{240m} \rightarrow 245m$

$235m \le x < 245m$

Discrete values (Whole values)

The number of people on a train is 400 to the nearest 100

$350 \leftarrow \boxed{400} \rightarrow 449$

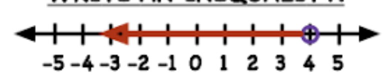
Inequalities

Equality and Inequality

larger > smaller

= equal
≠ not equal
> greater than
≥ greater than or equal
< less than
≤ less than or equal

WRITE AN INEQUALITY:

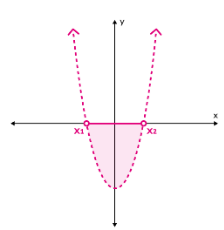
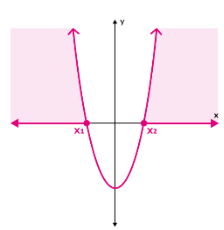


CIRCLES:
closed = included
open = not included

ARROWS:
left point = <
right point = >

$\boxed{n < 4}$

Quadratic Inequalities

	$ax^2+bx+c < 0$	$ax^2+bx+c \ge 0$
a > 0		
a < 0