


Addition

$$\frac{3}{x-1} + \frac{x}{x+1}$$

$$\frac{3(x+1) + x(x-1)}{(x-1)(x+1)}$$

$$\frac{3x+3+x^2-x}{(x-1)(x+1)}$$

$$\frac{x^2+2x+3}{(x-1)(x+1)}$$


Subtraction

$$\frac{3}{x} - \frac{1}{x+5}$$

$$\frac{3(x+5) - x}{x(x+5)}$$

$$\frac{3x+15-x}{x(x+5)}$$

$$\frac{2x+15}{x(x+5)}$$

Straight Line

Graph of $y = mx + c$

Possible values for gradient

- $m < 0$
- $m = 0$
- $m = \text{undefined}$
- $m > 0$

Note: $2y + 4x = 8$ rearrange into correct form $y = -2x + 4$

Two points needed (x_1, y_1) and (x_2, y_2) to calculate gradient

Parallel lines have same gradient

$m = \text{gradient } m = \frac{y_2 - y_1}{x_2 - x_1}$

$C = y \text{ intercept } (0, C)$

Area & Volumes

Simple Areas

- Rectangle: $A = L \times B$
- Circle: $A = \pi r^2$
- Triangle: $A = \frac{1}{2}bh$

Simple Volume

- Prism: $V = L \times B \times H$
- Cylinder: $V = \pi r^2 h$

Area & Volume of a Prism

Composite Areas

- Triangle: $A = \frac{1}{2}(a+b)h$
- Triangle: $A = L \times B + \frac{1}{2}bh$

Composite Volume

- Prism: $V = (L \times B \times H) + (\frac{1}{2}BhL)$

Algebraic Fractions

Straight Line

S4 Mathematics Credit Course

Surds & Indices

Indices

- $x^m \cdot x^n = x^{(m+n)}$
- $\frac{x^m}{x^n} = x^{(m-n)}$
- $x^0 = 1$

Surds

- $\sqrt{x^4} = x^2$
- $\sqrt[4]{x^4} = x$

Area & Volume

- $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$
- $\sqrt{\frac{9}{16}} = \frac{\sqrt{9}}{\sqrt{16}} = \frac{3}{4}$
- $\sqrt{ab} = \sqrt{a} \times \sqrt{b}$
- $\sqrt{48} = \sqrt{16} \times \sqrt{3} = 4\sqrt{3}$

Quadratics

Graphs

Line of Symmetry half way between roots

Max. Point

Mini. Point

Roots

Evaluating

Quadratic Functions $y = ax^2 + bx + c$

Factorisation $ax^2 + bx + c = 0$

Foil / SAC e.g. $(x+1)(x-2) = 0$

Cannot Factorise

Roots $x = -1$ and $x = 2$

Roots $x = -1.2$ and $x = 0.7$

Decimal places

Quadratics

Sine Rule / Cosine Rule

How to determine which rule

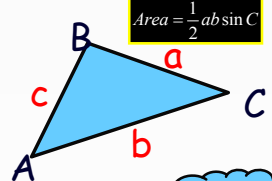
Two questions

- Do you know ALL the lengths.
- Do you know 2 sides and the angle in between.

OR

If YES Cosine Rule $a^2 = b^2 + c^2 - 2bc \cos A$

Otherwise use the Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$



Another example of similar volumes?

Work out the volume of each shape and try to link volume and scale factor

Small cube: $V = 3 \times 2 \times 2 = 12 \text{ cm}^3$

Large cube: $V = 6 \times 4 \times 4 = 96 \text{ cm}^3$

Scale factor = $ESF = \frac{6}{3} = 2$

Large Volume = $(2)^3 \times 12 = 8 \times 12 = 96 \text{ cm}^3$

Similarity

Comparing Data

Order data

Back to back stem leaf

Boxplots

Things to note

- Median
- Mode
- Mean
- Range

Mean and standard deviation See separate mindmap

Ways of comparing data

Things to note

- $Q_1 = 25\%$ of data
- $Q_2 = \text{Median} = 50\%$ of data
- $Q_3 = 75\%$ of data
- Interquartile range $Q_3 - Q_1$
- Semi-Interquartile $\div 2$

Comparing Data

Trig Functions

Basic Strategy for Solving Trig Equations

Trig Functions and Solving Trig Equations

Complex Graph

Basic Graphs

Exact Value Table

	sin	cos	tan
0°	0	1	0
30°	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{3}}$
45°	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{2}}$	1
60°	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$
90°	1	0	undefined

Graphs of $\sin x$, $\cos x$, and $\tan x$

Complex Graph $y = 2\sin 4x + 1$

Max. Value = $2 + 1 = 3$ Period = $360 \div 4 = 90^\circ$

Mini. Value = $-2 + 1 = -1$ Amplitude = 2

Trig Functions

Solving Equations

Multiply EVERY term to get rid of fractional term. and Apply 'Balancing Method'

Multiply EVERY term by 3

$$\frac{x+1}{3} + 4 = 6$$

$$(x+1) + 12 = 18$$

$$x+13 = 18$$

$$x = 5$$

Subtract 13 from each side

Solving Equations

Similarity

Find the values of x given that the triangles are similar.

Corresponding sides are in proportion

$$\frac{PQ}{ST} = \frac{PR}{PT}$$

$$\frac{3}{5} = \frac{18-x}{x}$$

$$3x = 5(18-x)$$

$$3x = 90 - 5x$$

$$8x = 90$$

$$x = 11.25$$
