

# Number

## Topic 1

Set notations

$\cup$  union

$\cap$  intersection

$\subset$  subset (improper) \*

$\subseteq$  Subset (proper)

$\not\subset$  not a subset

$\in$  element

$\emptyset$  Null set

$\notin$  not an element

When some elements are missing  
but the ones that are there all belong to  $A$ .

$$a^m \times a^n = a^{m+n}$$

$$a^m \div a^n = a^{m-n}$$

$$(a^m)^n = a^{mn}$$

Upper & lower bounds

$$4.45 \leq x \leq 4.55$$

- included
- not

↓ denominator & numerator ↑

$$\cancel{3} \over \cancel{5} \times 35$$

natural numbers [0, 1, 2, 3...]

Integers [... -3, -2, -1, 0, 1...]

rational numbers [anything written as a fraction]

irrational numbers [e.g.  $\pi$ ]

Prime numbers [only factors are 1 & itself]

Square numbers

reciprocal = when a number is

divided by 1 ( $\frac{2}{5} \rightarrow \frac{5}{2}$ )

Cube numbers

factors

Prime factors

Highest CAF [Commons multiplied]

LCM [HCF x everything left]

$$SI = \frac{P \cdot t}{100}$$

t = time (y)

P = principle

r = rate

Inverse proportion is ↑ causes a ↓

$$a^{-m} = \frac{1}{a^m}$$

$$a^{\frac{m}{n}} = \sqrt[n]{a^m}$$

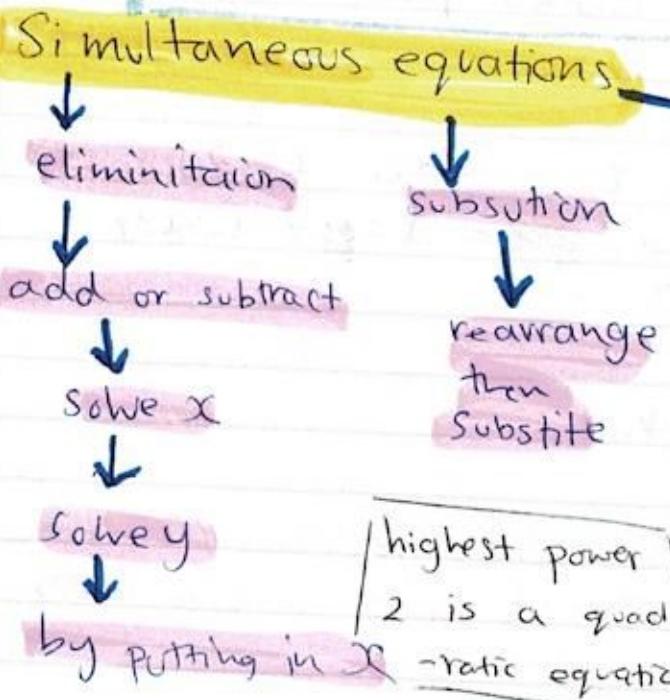
$$a^{\frac{1}{n}} = \sqrt[n]{a}$$

$$S = \frac{d}{t}$$

$$a^0 = 1$$

# Algebra and Graphs

Topic 2



$$S = d \div t$$

Note:  
You might  
have to multiply

$$a = \frac{v-u}{t}$$

Quadratic formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\frac{y_2 - y_1}{x_2 - x_1}, \quad 27^{\frac{1}{4}} = \sqrt[4]{27}$$

$$a^{\frac{m}{n}} = \sqrt[n]{a^m}$$

Factorization

a)  $56x^2y - 28xy^2$  (28x by 2 to get 56)  $\rightarrow (7a)^m$

The difference of 2 squares

$$\begin{aligned} e) 16x^4 - 81y^4 &\rightarrow (2x)^4 - (3y)^4 \\ 4^2x^4 - 9^2y^4 &\rightarrow (2^2x^2)^2 - (3^2y^2)^2 \\ (2^2)^2x^4 - (3^2)^2y^4 &\rightarrow (2^2x^2 - 3^2y^2)(2^2x^2 + 3^2y^2) \\ 2^4x^4 - 3^4y^4 & \end{aligned}$$

Transformation of formulae

$$\frac{ab}{c} = de \quad \frac{ab}{de} = c$$

Further factorisation

$$\begin{aligned} d) 2a^2 + 2ab + b^2 + ab \\ 2a(a+b) + b(b+a) \end{aligned}$$

Expanding brackets

$$\begin{aligned} e) (7-5y)^2 \\ (7-5y)(7-5y) \\ 49 - 35y - 35y + 25y^2 \\ 49 - 70y + 25y^2 \end{aligned}$$

Simplifying complex algebraic fractions

$$\begin{aligned} \frac{2}{x+1} + \frac{3}{x+2} &= \frac{2(x+2)}{(x+1)(x+2)} + \frac{3(x+1)}{(x+1)(x+2)} \\ &= \frac{2(x+2) + 3(x+1)}{(x+1)(x+2)} = \frac{2x+4 + 3x+3}{(x+1)(x+2)} \\ &= \frac{5x+7}{(x+1)(x+2)} \end{aligned}$$

# 2 chapter) functions

## Variation

\* Direct variation is when 1 thing increase the other increases.

\* Linear equation has the highest power of 1

\* Inverse variation is when 1 thing increase the other decreases.

$$y = kx \quad y=6 \quad x=2$$

when ~~y=6~~  $x=7$  what  
y?

$$y=kx$$

\* Linear inequalities are treated the same as a linear equations.

## Composition of functions

$$\begin{aligned} f(x) &= 2+x \\ f(f(x)) &= 2+(2+x) \end{aligned}$$

## Hyperbola

→ Reciprocal function (inverse function)

$$x^2 - y^2 = (x+y)(x-y)$$

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

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

# Geometry

Topic 3

Congruent triangles  
are identical

→ SSS → SAS → ASA

Similar triangles

scalene & isosceles

→ angles are the same  
& sides are proportional

- \* Scale factor is found by  $\frac{\text{side from 2nd}}{\text{side from 1st}} = k$  to each other.
- exterior angles =  $360^\circ$
- \* Area factor =  $k^2$
- $180^\circ(n-2)$  = sum of interior angles
- \* Volume factor =  $k^3$

interior angles  
of a polygon

$$\rightarrow 180^\circ \times (n-2)$$

Exterior angles  $\rightarrow 360^\circ$   
acute, obtuse, exterior

\* Scale factor for enlargement =  $\frac{A}{a} = \frac{B}{b} = \frac{C}{c}$

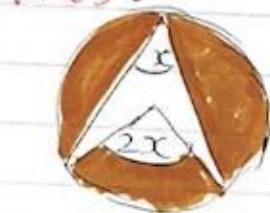
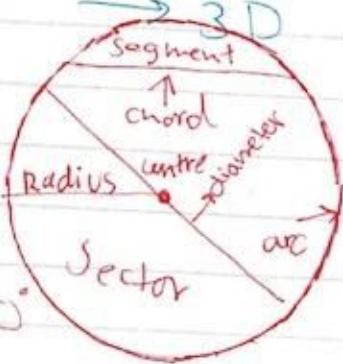
Corresponding angles. F

alternate angles. Z

cyclic quadrilateral

\* Angles suspended at the centre are  $2$  the angles on the circumference.

\* exterior = interior  
opposite angle



# Mensuration

Topic 4

$$1m^2 = 10000 \text{ cm}^2$$

$$a\Delta = \frac{1}{2}bh$$

$$1cm^2 = 100mm^2$$

$$\text{Trapezium} = \frac{1}{2}h(a+b)$$

$$1m^3 = 1000000 \text{ cm}^3$$

$$\text{Parallelogram} = b \times \cancel{\text{height}}$$

$$1cm^3 = 1000mm^3$$

Surface area of a cylinder  
 $\rightarrow 2\pi r(r+h)$

circumference  
 $\rightarrow 2\pi r$

Prism ~~area~~ volume  
 $\rightarrow A \times \text{cross section}$

Arc ~~length~~ of circle ( $l$ )  
 $\rightarrow \frac{\phi}{360} \times 2\pi r$

$\phi$  = angle.  
Area of Sector  
 $\rightarrow \frac{\phi}{360} \times \pi r^2$

Volume of a sphere  
 $\rightarrow \frac{4}{3} \pi r^3$

Surface area of a Sphere  
 $\rightarrow 4\pi r^2$

Volume of a pyramid  
 $\rightarrow \frac{1}{3} \times \text{area of base} \times \text{perpendicular height}$

~~Length of arc~~  
 ~~$\frac{\phi}{360} \times 2\pi r$~~   
 $\rightarrow \frac{1}{3} \times \pi r^2 \times \text{height}$

# Coordinate geometry Topic 5

- \*  $\frac{y_2 - y_1}{x_2 - x_1} = m$   $m^2 + m^2 = -1$   
 ~~$c = \text{intercept}$~~   $y = mx + c$  Lines with the same gradient are parallel
- \* to find a segment we use  $a^2 + b^2 = c^2$
- \* To plot a line, substitute & get 2 points

- \*  $(1, 3)$  &  $(5, 6)$   
 Find the mid-point.

$$\left( \frac{1+5}{2}, \frac{3+6}{2} \right) \rightarrow (3, 4.5)$$

- \*  $d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$   
 This is the formula used if you cannot plot the points.
- \* To find the length of a line segment use  $a^2 + b^2 = c^2$
- \* Equation of  $(-3, 3), (5, 5)$

- \*  $m_1, m_2 = -1$   
 For perpendicular lines  
 $m_1 = -\frac{1}{m_2}$

$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{1}{4} \quad y = \frac{1}{4}x + c$$

$$5 = \frac{1}{4} \times 5 + c \quad 5 = \frac{5}{4} + c$$

$$c = 3\frac{3}{4} \quad y = \frac{1}{4}x + 3\frac{3}{4}$$

# Trigonometry

Topic 6

abc = side Pythagoras

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

c  
hyp

$$\sin \theta = \text{opp/hyp}$$

$$\cos \theta = \text{adj/hyp}$$

$$\tan \theta = \text{opp/adj}$$

opp  
adj

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Verticle line

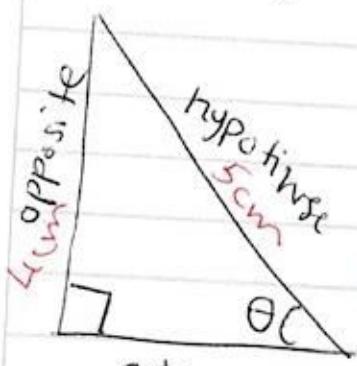
= angle of Depression

Horizontal line

= angle of elevation

\* Right angled triangle

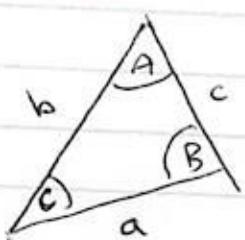
c = is the length of the hypotenuse.



$$\sin \theta = \frac{4}{5} = 0.8$$

$$\cos \theta = \frac{3}{5} = 0.6$$

$$\tan \theta = \frac{4}{3} = 1.33$$

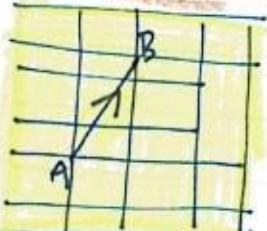


$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c} \rightarrow \text{missing angle}$$

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \rightarrow \text{missing side}$$

# Matrices & Transformation

translation → sliding motion described using vectors.



$$\vec{AB} = \begin{pmatrix} 1 \\ 3 \end{pmatrix} \text{ from point } A \text{ to } B$$

addition

$$\begin{pmatrix} 2 \\ 5 \end{pmatrix} + \begin{pmatrix} -3 \\ -2 \end{pmatrix} = \begin{pmatrix} -1 \\ 3 \end{pmatrix}$$

subtraction

$$\begin{pmatrix} 2 \\ 5 \end{pmatrix} - \begin{pmatrix} -3 \\ -2 \end{pmatrix} = \begin{pmatrix} 5 \\ 7 \end{pmatrix}$$

$$\sqrt{x^2+y^2} = |a|$$

magnitude

Rows x Columns  
↑  
order

$m=n \rightarrow$  square matrix  
 $m=1 \rightarrow$  row matrix  
 $n=1 \neq \rightarrow$  column matrix

addition & subtract matrices like normal. Only works for same orders

Determinant  
if  $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$

$$|A| = ad - bc$$

reflection  
rotation  
translation  
enlargement

$$\begin{pmatrix} 3 & 4 \\ -1 & 0 \end{pmatrix} \begin{pmatrix} 2 \\ 1 \end{pmatrix} = \begin{pmatrix} 3 \times 2 + 4 \times 1 \\ -1 \times 2 + 0 \times 1 \end{pmatrix}$$

$2 \times 2 / 2 \times 1$

$$\begin{pmatrix} 6 & 4 \\ -2 & 0 \end{pmatrix}$$

Inverse of a matrix

$$\begin{pmatrix} a & b \\ c & d \end{pmatrix} \times \begin{pmatrix} d & -b \\ -c & a \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

# Quadratics

\* A Quadratic equation has the highest power 2.

1) Factorise

2) each bracket = 0

3) Solve 2 linear equations

4) Check answers

$$\textcircled{1} \quad x^2 + 4x + 3 = 0$$

$\downarrow$        $\downarrow$   
+ to 4      x to give 3 (3 + 1)

$$(x+1)(x+3) = 0$$

$$x+1=0 \quad x+3=0$$

$$x=-1 \quad x=-3$$

$$\textcircled{2} \quad 5x^2 - 3x - 14 = 0$$

$$(5x-10)(5x+3)$$

$$(x-2)(5x+3)=0$$

$$x=+2 \quad x = -\frac{3}{5}$$

$$\textcircled{4} \quad x^2 + 5x = -4$$

$$+4 \qquad \qquad \qquad +4$$

$$x^2 + 5x + 4 = 0$$

$$(x+1)(x+4)$$

$$x=-1 \quad x=-4$$

$$x^2 - 10x + 18$$

$$(x-5)^2 - 25 + 18$$

$$5 \times 5$$

$$18$$

$$(x-5)^2 - 7$$

$$a = -5 \quad b = -7$$

$$\textcircled{1} \quad 5x-14 = -70$$

$$\textcircled{2} \quad \text{mult} \rightarrow -70 \quad \left. \begin{array}{l} \\ \end{array} \right\} -10, 7$$

$$\textcircled{3} \quad 3x^2 + 12x = 0$$

$$3x(x+4) = 0$$

$$3x=0 \quad x+4=0$$

$$x=0 \quad x=-4$$

Completing the Square

$$\textcircled{5} \quad x^2 + 8x + 5$$

$$(x+4)^2 - 16 + 5$$

$$4 \times 4 = 16$$

$$(x+4)^2 - 11 \quad p=4 \quad q=-11$$

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2b} = x$$

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

Simplify  
 $(8a^9e^6)^{1/3}$

$$\sqrt[3]{8a^9e^6} \rightarrow (2^3)^{1/3} (a^9)^{1/3} (e^6)^{1/3}$$

$$2a^3e^2$$

$$f(x) = 2x - 5 \quad y = f(x)$$

$$y = 2x - 5$$

$$y + 5 = 2x$$

$$\frac{2x+5}{2} = f^{-1}(x) \quad f(x)$$

$$gf(x) = -1$$

$$gf(x) = (2x-5)^2 - 10 = -1$$

$$(2x-5)^2 = 9$$

$$2x-5 = \pm 3$$

$$2x-5 = +3$$

+5

$$2x = 8$$

$$x = 4$$

$$2x-5 = -3$$

+5

$$2x = 2$$

$$x = 1$$

$$(7+2\sqrt{50})(5-2\sqrt{2})$$

$$35 - 14\sqrt{2} + 10\sqrt{50} - 4\sqrt{100}$$

# Factorisation

$$5x + 30 \\ 6(x+5)$$

$$15x + 20 \\ 5(3x+4)$$

$$4x + 12 \\ 4(x+3)$$

$$8x + 16 \\ 8(x+2)$$

$$x^2 + 5x \\ x(x+5)$$

$$4a^2 - 5a \\ 2a(2a - 3)$$

$$15x^2 - 20x \\ 5x(3x - 4)$$

Quadratic factorisation

$$(x+5)(x+2) \\ x^2 + 7x + 10$$

$$x^2 + 7x + 10$$

$$x^2 - 4x + 4 \\ (x-2)(x-2)$$

$$x^2 + 8x + 15 \\ (x+5)(x+3)$$

$$x^2 + 3x - 18 \\ (x-3)(x+6)$$

$$\begin{array}{r} + \quad x \\ \hline -3 \quad 6 \end{array}$$

$$ax^2 + bx + c \\ + x$$

$$2x^2 + 11x + 5$$

$$8x^2 - 2x - 1 \\ (4x+1)(2x-1) \rightarrow 1 - 1*$$

$$(2x+1)(x+5)$$

$$\begin{array}{r} 1 \quad 5 \\ 5 \quad 1 \end{array}$$

$$x^2 = 49x$$

$$x^2 - 49x = 0$$

$$x^2 - 4x + 18 = 4x + 2$$

$$x(x-49) = 0$$

$$x^2 - 8x + 16 = 0$$

$$(x-4)(x-4) = 0$$

$$x=0 \quad x=49$$

$$x=4 \quad x=4$$

$$x=4$$

# vectors

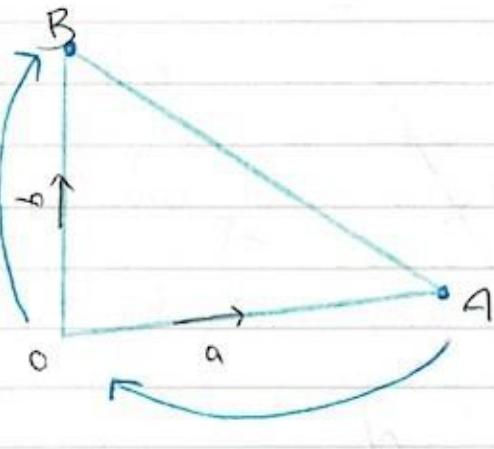
$OAB$  is a triangle

$$\vec{OA} = \mathbf{a}$$

$$\vec{OB} = \mathbf{b}$$

i) find  $\vec{AB}$  in terms of  $a$  &  $b$

$$\vec{AB} = -\mathbf{a} + \mathbf{b}$$



$$\text{Given } P = (0, -4) \quad Q = (-1, 9)$$

Find  $\vec{PQ}$

$$PQ = Q - P \quad \vec{PQ} \\ \begin{pmatrix} -1 \\ 13 \end{pmatrix} \times 8 = \begin{pmatrix} -8 \\ 104 \end{pmatrix}$$

then

Find the unit vector of  $\vec{PQ}$

$$\vec{AB} = \frac{\vec{AB}}{|AB|}$$

$$\vec{PQ} = \begin{pmatrix} -1 \\ 13 \end{pmatrix}$$

$$|AB| = \sqrt{x^2 + y^2}$$

magnitude

$$A = (4, 0) \quad B = (-6, 10)$$

Find the unit vector of  $\vec{AB}$

$$\vec{AB} = \begin{pmatrix} -10 \\ 10 \end{pmatrix}$$

$$|AB| = \sqrt{(-10)^2 + 10^2} = \sqrt{200} = 10\sqrt{2} \quad \begin{pmatrix} -10 \\ 10 \end{pmatrix} = \left( \frac{-\sqrt{2}}{2}, \frac{\sqrt{2}}{2} \right)$$

# Inequalities & Graphs

$<$  → dotted line

$\leq$  → straight line

use values till they satisfy the inequality & then plot accordingly

Actual method

$$y + 2 > x \rightarrow y > x - 2$$

1) make  $y$  the subject

2) plot  $y = x - 2$

3) determine which side to shade by testing both sides

## Adding Standard Form

$$(9 \times 10^5) + (4 \times 10^4)$$

$$(9 \times 10^5) + (0.4 \times 10^5) \quad 9.4 \times 10^5$$

$$(3 \times 10^{-19}) (2 \times 10^{20})$$

$$\begin{aligned} & \times 10^2 \\ & (0.03 \times 10^{20}) + (2 \times 10^{20}) \\ & \underline{2.03 \times 10^{20}} \end{aligned}$$

What is done to one the ✓ is to the other make the same then continue.

## Formula for circles

$$2\pi r \rightarrow \text{circumference}$$

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

$$\pi r^2 \rightarrow \text{area}$$

$$\frac{\psi}{360} \pi r^2 \rightarrow \text{area of sector}$$

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\frac{\theta}{360} 2\pi r \rightarrow \text{length of arc}$$

$$\begin{array}{c} a \\ \hline \sin A \\ \downarrow \\ a \\ \theta \end{array}$$

$$4\pi r^2 \rightarrow \text{SA of a sphere}$$

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5%

$$\text{side} \leftarrow a^2 = b^2 + c^2 - 2bc \cos A$$

$$\text{angle} \rightarrow \cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

$$\frac{9}{\sin 100} = \frac{8}{\sin x}$$

$$\frac{8}{9.138839507} = \frac{8}{\sin x}$$

$$\sin^{-1}(0.8753846693) = \sin x \\ 61.09$$

A model sa statue has a height of 4cm. The volume of the model is 12 cm<sup>3</sup>. The volume of the statue is 40500 cm<sup>3</sup>. Calculate the height of the statue.

find the coordinates of the turning point of the graph

$$y = 6 + 4x - x^2$$

$$\frac{dy}{dx} = -2x + 4 \rightarrow 0 = -2x + 4 \quad x = 2$$

Differentiate  $6 + 4x - x^2$

$$4 - 2x^1$$

$$\overbrace{x}^n$$

$$3x^4$$

$$12x^3$$

A line from the point  $(2, 3)$  is perpendicular to the line  $y = \frac{1}{3}x + 1$ . They meet at P.

Find P.

$$y = mx + c \quad -3x + m = \frac{1}{3}x + 1$$

Simplify  $\frac{vx - 2v - u + 2}{v^2 - 1}$

$$(u)(x) \downarrow (u-1)(u+1)$$
$$vx - x - 2u + 2 \rightarrow (x-2)(u-1)$$
$$x(u-1) - 2u + 2$$
$$\underline{(x-2)(u-1)}$$

$$\tan x = 2 \quad \text{for } 0^\circ \leq x \leq 360^\circ$$

# Cumulative Frequency

Age in years	Frequency	C.F.
$20 < A \leq 30$	12	12
$30 < A \leq 40$	15	$12 + 15 = 27$
$40 < A \leq 50$	18	$27 + 18 = 45$
$50 < A \leq 60$	12	$27 + 18 + 12 = 57$
$60 < A \leq 70$	3	$57 + 3 = 60$

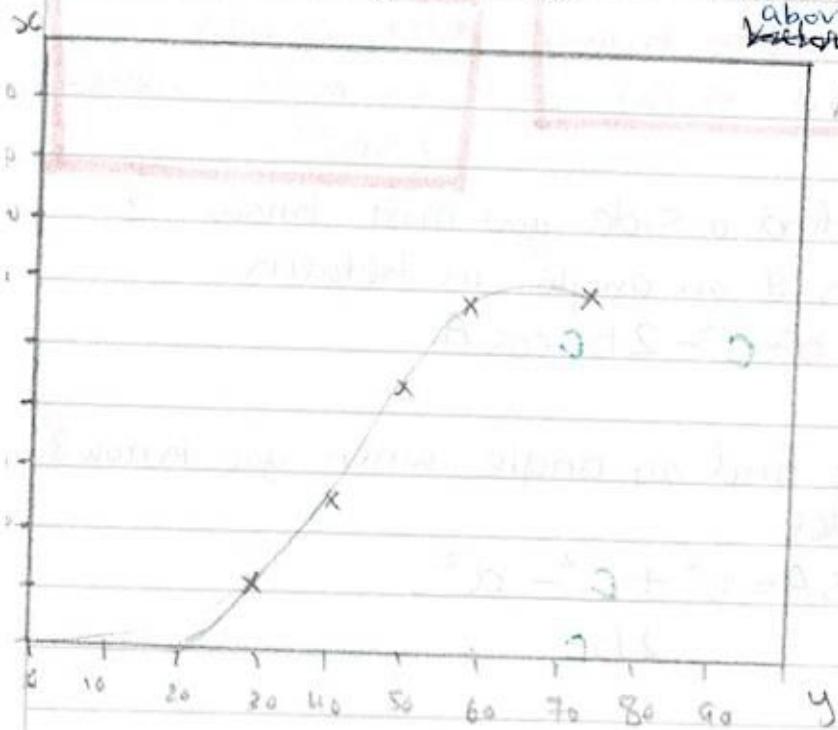
Median = 41 years old

LQ = 32 years

UQ = 58 years old

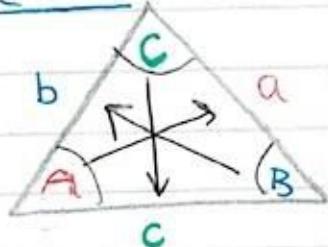
Number of teachers = 6 years below 25

Number of teacher above 45 =  $60 - 38 = 22$  years



# Sine and Cosine rule

## \* Sine rule



$$* \text{For sides} \rightarrow \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

\* for angles you flip the above division

## \* Use the sine rule

when you are given angle and side which are opposite.

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

\* Label the angle (side) you're trying to find A (a)

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

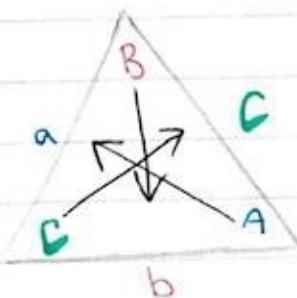
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\* For angles you must inverse ( $\sin^{-1}$ )

## \* Cosine rule

\* To find a side you must know 2 sides & an angle in between

$$a^2 = b^2 + c^2 - 2bc \cos A$$



\* To find an angle when you know 3 sides

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

\* A prime number is a number that can only divide by 1 & itself.

\* Area of a triangle is  $A = \frac{1}{2}ab \sin C$

$$b = 10$$

$$c = 10$$

# Inequalities & Graphs

$<$  → dotted line

$\leq$  → straight line

use values till they satisfy the inequality & then plot accordingly

## Actual method

$$- y+2 > x \rightarrow y > x - 2$$

1) make  $y$  the subject

2) plot  $y = x - 2$

3) determine which side to

shade by testing both sides

# Revision

1)  $2x^2 + 7x - 3 = 0$

quadratic equations  
highest square is  $x^2$

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

plug in

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$a=2 \quad b=7 \quad c=-3$$

- \* There are 2 answers for this due to the + - in the formula

## 2) Similarity of triangles

$$\frac{-b \pm \sqrt{b^2 + 4ac}}{2a}$$

3)  $\cup \rightarrow$  union  
 $\cap \rightarrow$  intersect  
 $\complement \rightarrow$  not  
 $\emptyset \rightarrow$  null  
 $E \rightarrow$  element

$$-b \pm \sqrt{b^2 + 4ac} \in \mathbb{R}$$

$$\frac{2a}{2a} \cdot \frac{\sqrt{b^2 + 4ac}}{\sqrt{b^2 + 4ac}} = 1$$

Find y

when  
 $x=6$

4)  $y = \frac{k}{x} \rightarrow$  indirectly proportional

$$y = 8 \quad x = 9 \quad k \\ 8 = \frac{k}{9} \\ 8 \times 9$$

$$= \frac{72}{6} = 12 = y$$

5) Find  $f(2)$ .  $f(x) = 7 - x$

$$f(2) = 7 - 2 = 5 \rightarrow \text{answer}$$

$$f(2) = 7 - 5 = 2$$

\* Simpliest form for  $gf(x)$ .  $g(x) = 4x + 2$

$$4(7-x) + 2 \\ 28 - 4x + 2 \\ 30 - 4x$$

# Revision 29

1) Make t the subject

$$\begin{aligned} s &= k - t^2 \\ t^2 &= k - s \\ s + t^2 &= k \\ t^2 &= k - s \\ t &= \pm \sqrt{k-s} \end{aligned}$$

you must  
put a plus  
minus

3)

$$t = \frac{-b \pm \sqrt{b^2 + 4ac}}{2a}$$

2) Factorise  $x^2 - 25$

$$\begin{aligned} (x)^2 - 5^2 &= (x+5)(x-5) \\ a^2 - b^2 &= (a+b)(a-b) \end{aligned}$$

use this formula  
when they both  
fit into squares. (+ negative)

$$x^2 - 2x - 35 \rightarrow -35x^2$$

$$\begin{aligned} 1 \times 35 &\quad x \times 2 \\ 5 \times 7 &\\ 7 - 5 &= 2 \\ (x-5)(x+5) &\\ (x-7)(x+5) & \end{aligned}$$

$x^2 - 7x + 5x - 35$   
multiplies to give

4) hexagonal prism volume

$$V = \frac{3\sqrt{3}}{2} a^2 \times h$$

a = base h = height  
surface area

$$SA = 6ah + 3\sqrt{3}a^2$$

$$A = \frac{3\sqrt{3}a^2}{2}$$



$$A = \frac{\sqrt{3}}{2} p \times a$$

$$\frac{3\sqrt{3}}{2} a^2 \times h$$

$$\frac{3\sqrt{3}}{2} a^2 \times h$$

find the coordinates of the turning point of the graph

$$y = 6 + 4x - x^2$$

$$\frac{dy}{dx} = -2x + 4 \rightarrow 0 = -2x + 4 \quad x = 2$$

Differentiate  $6 + 4x - x^2$

$$4 - 2x^1$$

$$x^n$$

$$3x^4$$

$$12x^3$$

A line from the point  $(2, 3)$  is perpendicular to the line  $y = \frac{1}{3}x + 1$ . They meet at p.

Find p.

$$y = mx + c \quad -3x + c = \frac{1}{3}x + 1$$

Simplify  $\frac{vx - 2v - x + 2}{v^2 - 1}$

$(u)(x) \downarrow$

$(u-t)(u+1)$

$$vx - x - 2v + 2 \rightarrow (x-2)(u-1)$$
$$x(u-1) - 2v + 2$$
$$\underline{(x-2)(u-1)}$$

$$\tan x = 2 \quad \text{for } 0^\circ \leq x \leq 360^\circ$$

Solve it completely.

Read the question  
margin

$$\text{HCF} \rightarrow 140 \text{ & } x = 20$$

$$\text{LCM} \rightarrow 140 \text{ & } x = 420$$

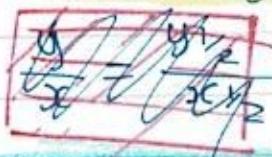
What's  $x$ ?

$0 \leq x < 6$	4	$3 \times 4$	12
$6 \leq x < 12$	6	$9 \times 6$	54
$12 \leq x < 18$	8	$15 \times 8$	120
$18 \leq x < 24$	9	$21 \times 9$	189
$24 \leq x < 30$	3	$27 \times 3$	81
Total			456

estimate the total money ↑  
raised

Round the number

Similar triangles!



product of both numbers

$$= 140 \times x = \text{HCF} \times \text{LCM}$$

$$20 \times 420$$

$$140 \times x = \frac{8400}{140} = 60 \rightarrow x$$

M is proportionate to  $p^3$

$$M = 128 \quad p = 8$$

a) M in terms of P

$$M = kP^3 \rightarrow M = 0.25P^3$$

replace K  
for my sa

$$a^2 - b^2 = (a-b)(a+b)$$

$$x^2 - 25 = (x-5)(x+5)$$

$$2x^2 - 9x - 5$$

$$\frac{2x^2 - 9x - 5}{2x(x-5) + 1(x-5)} = \frac{2x^2 - 9x - 5}{(2x+1)(x-5)}$$

$$\frac{2x^2 - 9x - 5}{-10x^2} \rightarrow (-10, +1)$$

$$\leftarrow 2x^2 - 10x + x - 5$$

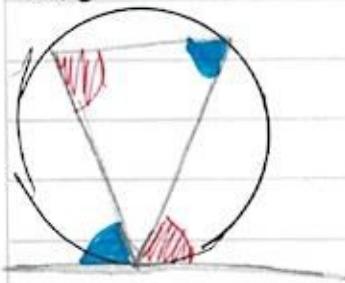
$$\frac{(x-5)(x+5)}{(2x+1)(x-5)}$$

$$= (x+5)$$

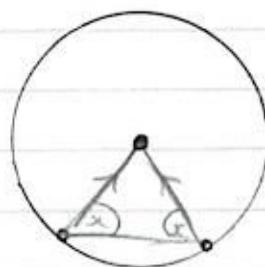
$$\frac{}{2x+1}$$

## Circle language

- circumference
- Arc
- Chord
- Segment
- Subtend is to create an angle at a particular point
- Subtended by an arc

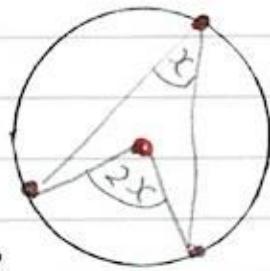


These angles equal each other.

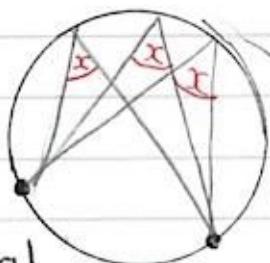


isosceles triangle

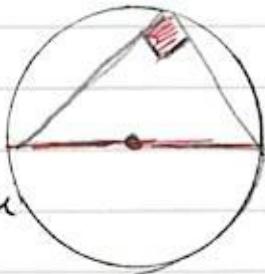
Centre angle is double the one on the circumference



Subtended from same 2 points thus all are equal



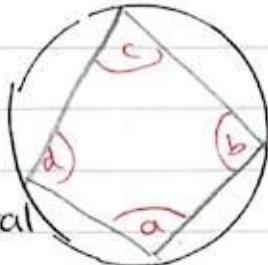
Angle in a semi-circle is a right angle



$$c + a = 180$$

$$d + b = 180$$

cyclic quadrilateral



$a+b=c+d$   
from  
centre to tangent is perpendicular

