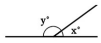
GCSE MATHS NEED TO KNOW - HIGHER

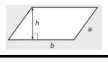
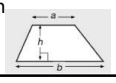
GEOMETRY

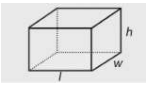
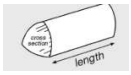
Angle facts - lines		
1	Vertically opposite angles	are equal 
2	Angles on a straight line	add up to 180 
3	Angles at a point	add up to 360 
4	Alternate angles	are equal 
5	Corresponding angles	are equal 
6	Co-interior angles	add up to 180 

Angle facts – triangles and quadrilaterals		
7	Angles in a triangle	add up to 180 
8	Base angles of an isosceles triangle	are equal 
9	Angles in an equilateral triangle	are equal (all 60)
10	Angles in a quadrilateral	add up to 360 

Angle facts - polygons		
11	Exterior angles of a polygon	add up to 360°
12	The interior and exterior angle of any polygon	add up to 180°
13	The sum of the interior angles of a polygon can be found by using the formula	**(number of sides-2) x 180º**
14	Regular polygons have all sides the same length and all angles the same size	

Congruence and similarity		
15	The four tests for congruence are	SSS ASA SAS RASH
16	Triangles are similar if…	All angles are the same (AAA They are an enlargement of each other
17	Area scale factor	Length scale factor ^{2}
18	Volume scale factor	Length scale factor ^{3}

Area Formulas		
19	Area of a rectangle	= length x width 
20	Area of a parallelogram	=base x perpendicular height 
21	Area of a triangle	$=\frac{1}{2}$base x perpendicular height 
22	Area of a trapezium	= ½ (a + b) x h 

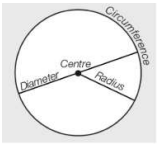
Volumes		
23	Volume of a cuboid	= l x w x h 
24	Volume of a prism	= area of cross section x l 
25	Volume of a cylinder	= πr^2 x h 
26	Pyramid 	= $\frac{1}{3} \times area\ of\ base \times h$

Surface area		
27	Surface area of a prism	The sum of the area of all the 2D faces
28	Surface area of a cylinder	$2 \times \pi r^2 + \pi d \times h$

"Half the sum of the parallel sides, times the distance between them
That is how you calculate
The area of a trapezium"

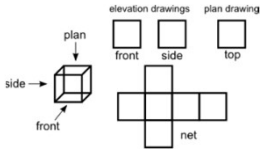
"Factors come in two by two, hurrah, hurrah"

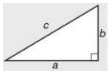
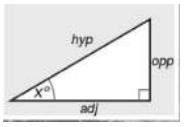
"Multiples are in the times tables…"

Circles		
30	Circumference	$= \pi \, x \, d$ 
31	Area	$= \pi r^2$
32	Area of a sector	$\frac{\theta}{360} \times \pi r^2$
33	Arc length	$\frac{\theta}{360} \times \pi d$

Describing Transformations		
40	Rotation	• Direction (clockwise or anticlockwise) • Degrees • Centre of rotation
41	Reflection	• Line of reflection
42	Translation	• Vector $\begin{pmatrix} x \\ y \end{pmatrix}$
43	Enlargement	• Scale factor • Centre of enlargement

Circumference is pi times diameter, pi times diameter, pi times diameter
Circumference is pi times diameter, pi times diameter, pi times diameter
Area is pi r squared

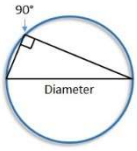
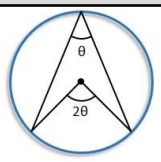
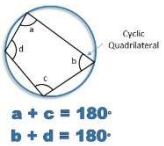
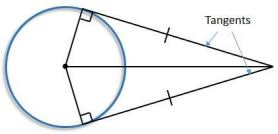
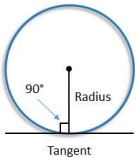
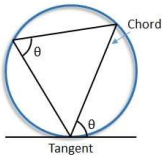
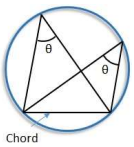


Pythagoras and Trigonometry		
34	Pythagoras' Theorem For a right angled triangle,	$a^2 + b^2 = c^2$  c is always the hypotenuse!
35	Trigonometric ratios 	$sin\theta = \frac{opp}{hyp}$ $cos\theta = \frac{adj}{hyp}$ $tan\theta = \frac{opp}{adj}$ SOHCAHTOA
36	Sine rule	$\frac{a}{sinA} = \frac{b}{sinB} = \frac{c}{sinC}$
37	Cosine rule	$a^2 = b^2 + c^2 - 2bc \, CosA$
38	Area of a triangle	$A = \frac{1}{2} ab \sin C$

Exact values

39

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

Circle theorems					
44	The angle in a semi-circle is 90		48	The angle at the centre is twice the angle at the circumference	
45	Opposite angles in a cyclical quadrilateral add up to 180		49	Two tangents from the same point are equal in length	
46	The angle between a tangent and a radius is 90		50	Alternate Segment Theorem	
47	Angles at the circumference in the same segment are equal				

NUMBER

FDP		
51	% increase	Find the % and add it on
52	% decrease	Find the % and take it away
53	Compound interest	**original x % multiplier** $^{\text{number of years}}$
54	Compound depreciation	**original x % multiplier** $^{\text{number of years}}$
55	Convert a fraction to a decimal	Make the denominator 10 or 100 OR divide the numerator by the denominator
56	Convert a decimal to a %	X 100

Conversions		
57	1 cm	10mm
58	1m	100cm
59	1km	1000m
60	cm → m	÷ 100
61	m → cm	× 100
62	cm^2 → m^2	÷ 100^2
63	cm^3 → m^3	÷ 100^3
64	1kg	1000g
65	1l	1000ml

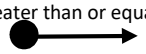
Standard form		
66	0.0004	4 x 10^{-4} (the number must be between 1 and 10)
67	40000	4 x 10^4 (the number must be between 1 and 10)

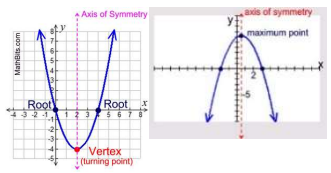
Surds		
68	$\sqrt{a} \times \sqrt{b}$	$\sqrt{ab}$
69	$\frac{\sqrt{a}}{\sqrt{b}}$	$\sqrt{\frac{a}{b}}$
70	$\sqrt{a} \times \sqrt{a}$	a
71	$(\sqrt{a}+1)(\sqrt{a}-1)$	$a-1$

Indices		
72	$a^b \times a^c$	a^{b+c}
73	$\frac{a^b}{a^c}$	a^{b-c}
74	$(a^b)^c$	a^{bc}
75	a^0	1
76	a^{-b}	$\frac{1}{a^b}$
78	$a^{\frac{b}{c}}$	$\sqrt[c]{a^b}$

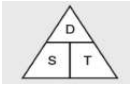
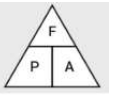
Special Numbers		
79	A factor is	A number that divides into another number without a remainder, factors always come in pairs
80	A multiple is	A number in a given numbers times table
81	A square number	Is a number multiplied by itself: 1, 4, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225
82	A prime number	Has only two factors, one and itself: 2, 3, 5, 7, 11, 13, 17……

ALGEBRA

Equations		
83	Like terms have what…	Same letter, same index
Inequalities		
84	≤	Less than or equal to
85	<	Less than
86	≥	Greater than or equal to 
87	>	Greater than

Graphs		
88	$y = mx + c$	$m = gradient$ $\frac{Difference\ in\ y}{Difference\ in\ x} = \frac{y_2 - y_1}{x_2 - x_1}$ $c = y\ intercept$ (where the line crosses y axis)
89	To find the mid-point	$(\frac{x1+x2}{2}, \frac{y1+y}{2})$
90	Parallel lines	Have the same gradient
91	Perpendicular lines	Gradient = $-\frac{1}{gradient}$
92	Roots or solutions are	The points at which the graph passes through the x-axis
93	The turning point	The maximum or minimum point of a graph, also referred to as the vertex 

Quadratic formula and completing the square		
94	$x =$	$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
95	$x^2 + 2a + b$	$(x + a)^2 - a^2 + b$
96	$(x + a)^2 - b$	Completed square form where the turning point is (-a , +b)

Compound measures			
97	Speed	$speed = \frac{distance}{time}$	
98	Density	$density = \frac{mass}{volume}$	
99	Pressure	$pressure = \frac{force}{area}$	

Functions of graphs		
100	$f(x + a)$	Translate by vector $\binom{-a}{0}$ (Shift in the x-direction by –a)
101	$f(x - a)$	Translate by vector $\binom{+a}{0}$ (Shift in the x-direction by + a)
102	$f(x) + a$	Translate by vector $\binom{0}{+a}$ (Shift in the y-direction by +a)
103	$f(x) - a$	Translate by vector $\binom{0}{-a}$ (Shift in the y-direction by -a)
104	$-f(x)$	Reflection in the x-axis
105	$f(-x)$	Reflection in the y-axis
106	a$f(x)$	Shrink or stretch graph vertically by a factor of a. (Multiply y-coordinates of f(x) by a)
107	$f(ax)$	Shrink or stretch graph horizontally by a factor of a. (Divide x-coordinates f(x) by a)

DATA, RATIO AND PROPORTION

Correlation		
108	Positive correlation means…	As one variable increases the other variable increases, this looks like: 
109	Negative correlation means….	As one variable increases the other variable decreases, this looks like: 
110	No correlation means….	There is no relationship between the two variables, this looks like: 
111	Line of best fit	A straight line drawn with a ruler that goes through the data with roughly the same number of points on each side of the line
112	Interpolation	Estimating a value within a given data set
113	Extrapolation	Estimating a value outside the give date set by assuming a trend

Averages		
114	Mean	Add all the numbers and divide by how many there are
115	Median	Order the numbers from smallest to biggest and find the middle number
116	Mode	Most frequent
117	Range	Difference between the highest and lowest value
118	Mean from a frequency table	$\frac{Total\ Fx}{Total\ F}$
119	Mean from a grouped frequency table	1. Find the mid point of each group 2. $\frac{Total\ Fx}{Total\ F}$

Probability		
120	Probabilities of mutually exclusive events	Add up to 1
121	$P(A \cap B)$	Probability of A AND B
122	$P(A \cup B)$	Probability of A OR B
123	$P(A \mid B)$	Probability of A GIVEN B
124	$P(B \mid A)$	Probability of B GIVEN A
125	$P(B')$	Probability of NOT B

Proportion		
126	Direct proportion	$y \propto x$ $y = kx$
127	Indirect proportion	$y \propto \frac{1}{x}$ $y = \frac{k}{x}$