GCSE KNOWLEDGE ORGANISER

First 10 prime numbers

2, 3, 5, 7, 11, 13, 17, 19, 23, 29

First 15 square numbers

1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225

First 5 cube numbers

1, 8, 27, 64, 125

Equivalent FDP

Fraction	Decimal	%
1/10	0.1	10%
1/5	0.2	20%
1/4	0.25	25%
1/3	$0.\dot{3}$	$33.\dot{3}$
1/2	0.5	50%
3/4	0.75	75%

Units of time

1 minute	60 seconds
1 hour	60 minutes
1 hour	3600 seconds

Units of length

1 cm	10 mm
1 m	100 cm
1 km	1000 m

Units of weight

1 g	1000 mg
1 kg	1000 g
1 tonne	1000 kg

Units of capacity

1 litre	1000 ml
1 litre	1000 cm³

Index Laws

$$a^n \times a^m = a^{n+m}$$
$$a^n \div a^m = a^{n-m}$$
$$(a^n)^m = a^{nm}$$
$$a^0 = 1$$
$$a^{-n} = \frac{1}{a^n}$$
$$a^{\frac{1}{m}} = \sqrt[m]{a}$$

Sides	Name
5	Pentagon
6	Hexagon
7	Heptagon
8	Octagon
9	Nonagon
10	Decagon
11	Hendecagon
12	Dodecagon

Polygons

Exterior angles of any polygon sum to 360°

Sum of interior angles of polygon : 180 x (n—2)

Reciprocals

Reciprocal of 7 is $\frac{1}{7}$, reciprocal of $\frac{2}{3}$ is $\frac{3}{2}$ etc

Percentages

Finding percentage increase or decrease (profit/loss)

$$\frac{value\ of\ increase/decrease}{Original} \times 100$$
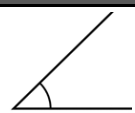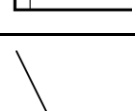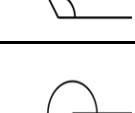
Measures of Average

Mode: most common piece of data

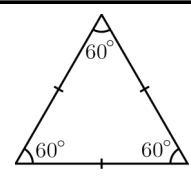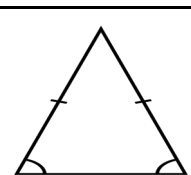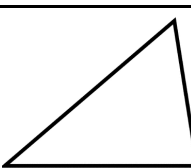**Mean**: Sum of the data ÷ total frequency
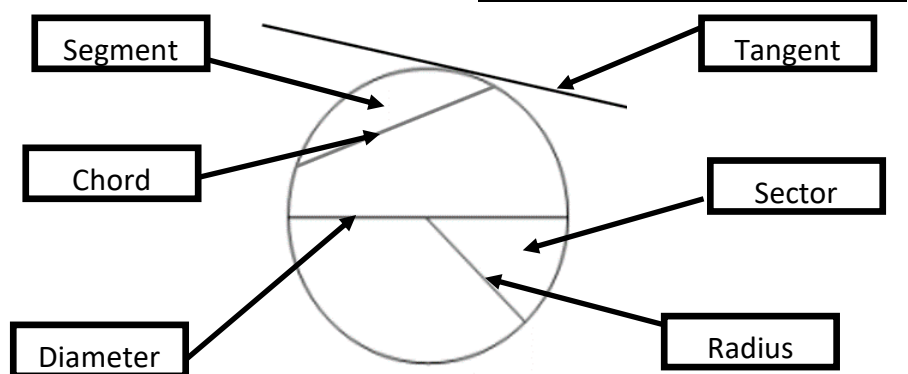
Median: order the data and find the middle value

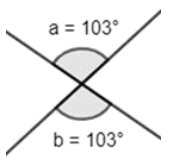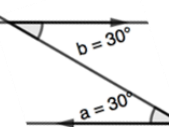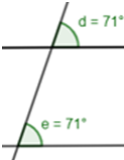**Range**: Highest value – lowest value
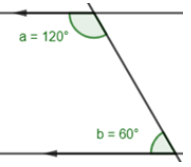
Types of angle
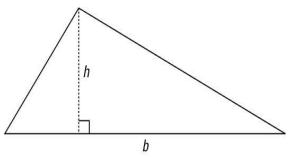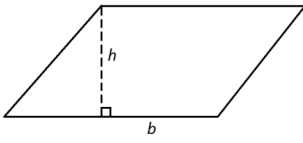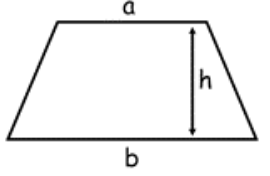
Acute angle	
Right angle	
Obtuse angle	
Reflex angle	

Types of Triangle
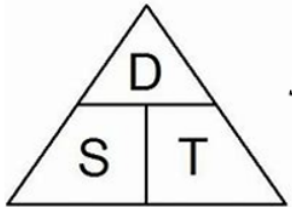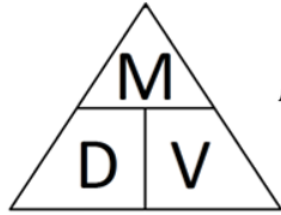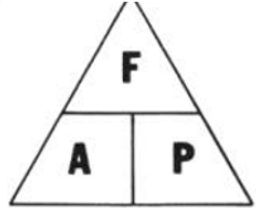
Equilateral	
Isosceles	
Scalene	

Segment

Tangent

Chord

Sector

Diameter

Radius
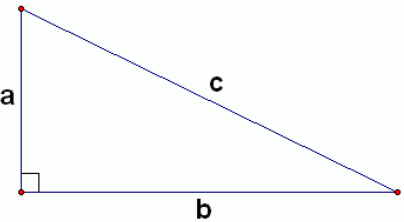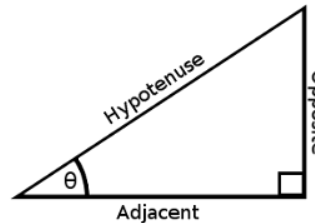
Angles in parallel lines

a = 103°, b = 103°	Vertically opposite angles are equal.
b = 30°, a = 30°	Alternate angles are equal.
d = 71°, e = 71°	Corresponding angles are equal
a = 120°, b = 60°	Co-Interior angles add up to 180°

Area Formulae

	Area of triangle $$\dfrac{b \times h}{2}$$
	Area of parallelogram $$b \times h$$
	Area of a trapezium $$A = \dfrac{a+b}{2} \times h$$
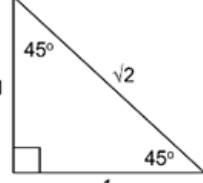
Circle Formulae

Area of a circle	$A = \pi \times r^2$
Circumference of a Circle	$C = \pi \times d$

Pythagoras

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

Right Angled Trigonometry

$$\text{Sine} = \frac{opposite}{hypotenuse} \qquad s = \frac{o}{h}$$

$$\text{Cosine} = \frac{adjacent}{hypotenuse} \qquad c = \frac{a}{h}$$

$$\text{Tangent} = \frac{opposite}{adjacent} \qquad t = \frac{o}{a}$$

Exact Trig Values

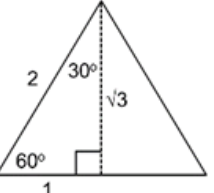| Angle (θ)	sin(θ)	cos(θ)	tan(θ)
0°	0	1	0
30°	$\dfrac{1}{2}$	$\dfrac{\sqrt{3}}{2}$	$\dfrac{1}{\sqrt{3}}$
45°	$\dfrac{1}{\sqrt{2}}$	$\dfrac{1}{\sqrt{2}}$	1
60°	$\dfrac{\sqrt{3}}{2}$	$\dfrac{1}{2}$	$\sqrt{3}$
90°	1	0	undefined

Compound Measures

$$Speed = \frac{Distance}{Time}$$

$$Density = \frac{Mass}{Volume}$$

$$Area = \frac{Force}{Pressure}$$

Algebraic Terms

Expression	no equal signs
	e.g. 2x + 3, 2y, $(3x-2)^2$
Equation	An equal signs, one unknown,
	e.g. y + 4 =10
Identity	Identical expressions
	e.g. $2(y + 4) \equiv 2y + 8$
Formula	equal signs, more than one unknown e.g. A= ½bh

Sequences

Nth term of a linear sequence : **a**n + **b**
Where
a is the term-to-term rule and
b is the 0th term (the number that would come before the 1st term)

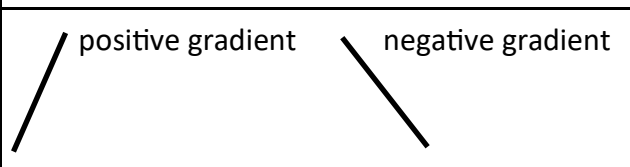8   10   12   14

E.g. Nth term: **2n + 6**

+2   +2   +2

Fibonacci Sequence:
a sequence where each term is the sum of the two previous terms
1, 1, 2, 3, 5, 8, 13, 21, 34 ...

Inequalities

x > 2
-2   0   2   4

x ≥ 2
-2   0   2   4

0 < x ≤ 2
-2   0   2   4

Open circle: < / >

Closed circle: ≤ / ≥

Straight Line graphs

y = mx + c
Where m is the gradient and
c is the y-intercept

positive gradient   negative gradient

Gradient formula

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{change\ in\ y}{change\ in\ x}$$

Parallel Lines have equal gradients

Type of graphs

$y = k^x$

Exponential

Quadratic

Reciprocal

$y = \frac{1}{x}$

$y = kx$

Direct proportion

$y = \frac{k}{x}$

Inverse proportion

Quadratic Graphs

Roots of a quadratic graph: where the graph crosses the x axis

Axis of Symmetry
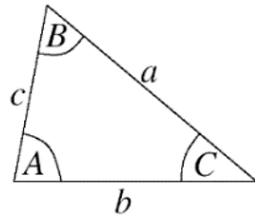
Root   Root

Vertex (turning point)

GCSE HIGHER CONTENT

Trigonometry

Sine rule

angles: $\dfrac{\sin A}{a} = \dfrac{\sin B}{b} = \dfrac{\sin C}{c}$

sides: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

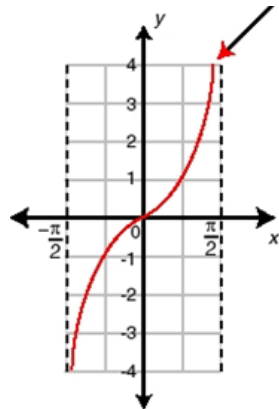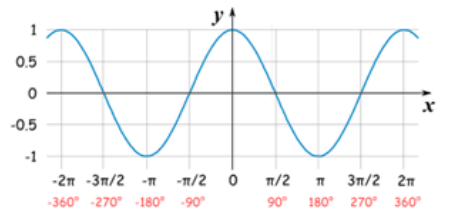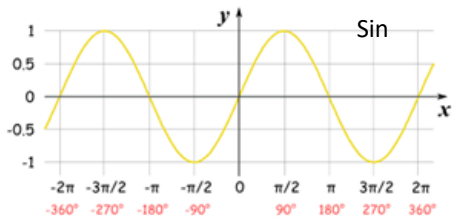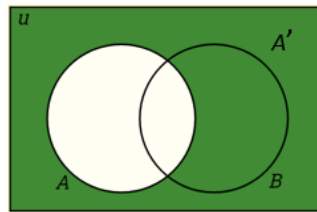### Cosine rule

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

Area of a triangle

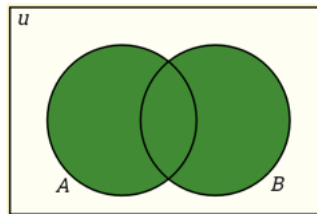$$\frac{1}{2}ab\sin C$$

Sin
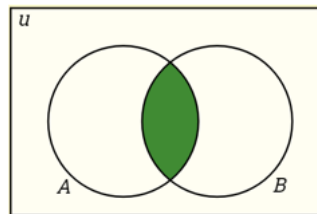
Quadratic formula

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

Quadratic Sequences

For $an^2 + bn + c$

$a + b + c$

$3a + b$

$2a$

Set Notation

A' the complement of A

Either A or B
A union B $A \cup B$

Both A and B
A intersect B $A \cap B$

Quadratic formula

$$V = \frac{\pi r^2 h}{3}$$

$$V = \frac{4}{3}\pi r^3$$

$$V = \frac{l \cdot w \cdot h}{3}$$
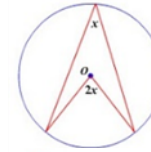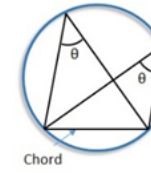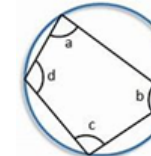
Circle theorems

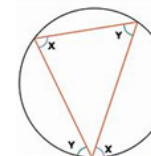Angle at the centre is twice the angle at the circumference
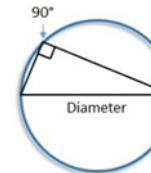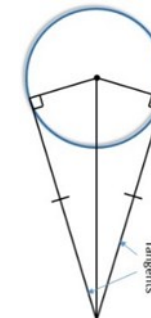
Angles in a semicircle are 90°.

Angles in the same segment are equal.

Opposite angles of a cyclic quadrilateral add up to 180

Alternate segment theorem.

Tangents from an external point are equal in length.

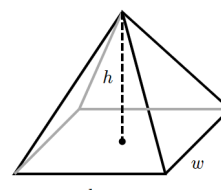The tangent to a circle is perpendicular (90°) to the radius