

List of Facts and Formulae to Memorise: Higher Tier

This document lists the facts and formulae that will not be provided in your maths GCSE exam. Keep testing yourself until you get them right every time. This is not a full revision list – it only covers facts and does not list all the skills and procedures you also need to know.

Number Facts

- First fifteen square numbers: 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225
- First five cube numbers: 1, 8, 27, 64, 125
- Powers of 2: 2, 4, 8, 16, 32, 64, 128, ...
- Powers of 3: 3, 9, 27, 81, ...
- Powers of 4: 4, 16, 64, ...
- Powers of 5: 5, 25, 125, 625, ...
- Powers of 10: 10, 100, 1000, 10000, ...
- The triangular numbers: 1, 3, 6, 10, 15, 21, 28, ...
- The Fibonacci sequence: 1, 1, 2, 3, 5, 8, 13, 21, ...
- Primes: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, ...

Index Laws

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

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

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

$$a^0 = 1$$

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

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

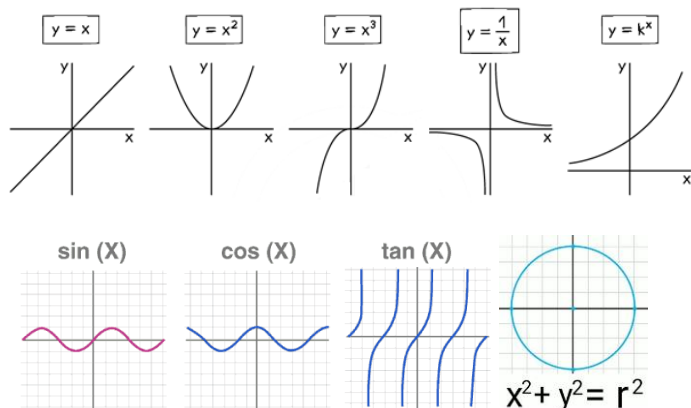
Inequalities

	Not included	Included
On a number line	○	●
Graphical	Dashed line	Solid line

Linear Graphs

- In $y = mx + c$, m is the gradient and c is the y-intercept
- $m = \frac{\text{change in } y}{\text{change in } x}$
- Parallel lines have the same gradient
- Perpendicular gradient = negative reciprocal
- $y = c$ is a horizontal line
- $x = a$ is a vertical line

Standard Graph Shapes



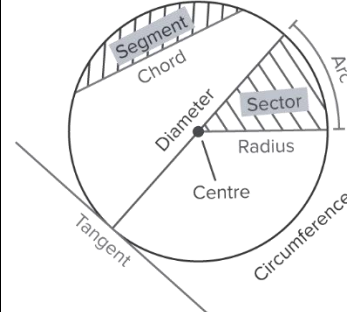
Graph Transformations

- $y = f(x + a)$: translate a units left
- $y = f(x) + a$: translate a units up
- $y = -f(x)$: reflect in x axis (vertical)
- $y = f(-x)$: reflect in y axis (horizontal)

Metric Unit Conversions

- Length: 10mm in 1cm, 100cm in 1m, 1000m in 1km
- Mass: 1000mg in 1g, 1000g in 1kg, 1000kg in 1 tonne
- Capacity 1000ml in 1l, 100cl in 1l

Parts of a Circle



Area

- Area of rectangle, square and parallelogram = base x perpendicular height
- Area of triangle = $\frac{1}{2}$ x base x perpendicular height

Sectors and Arcs

- Area of sector (radius r , angle x): $\frac{x}{360} \pi r^2$
- Length of arc (diameter d , angle x): $\frac{x}{360} \pi d$

Describing Shape Transformations

Reflection: Line of reflection

Rotation: Centre, angle and direction

Translation: Vector

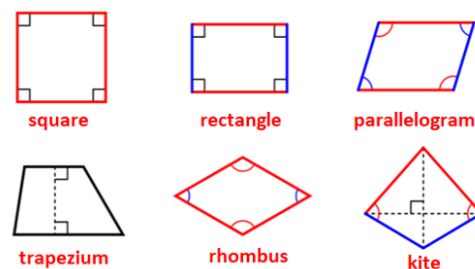
Enlargement: Centre and scale factor

Invariance: When a point or shape remains in the same place after a transformation has been applied.

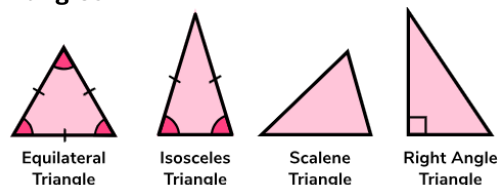
Types of Angle

- Acute: Between 0° and 90°
- Right: 90°
- Obtuse: Between 90° and 180°
- Reflex: Between 180° and 360°

Quadrilaterals



Triangles



Proportion Formulae

- y is directly proportion to x : $y = kx$
- y is inversely proportional to x : $y = \frac{k}{x}$

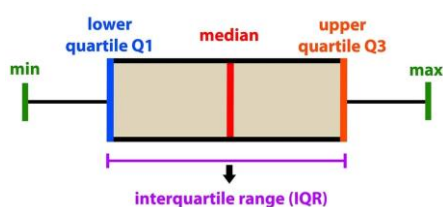
Exact Trig Values

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

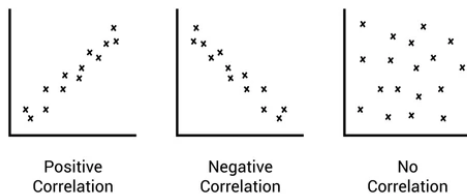
Averages and Spread

- Mode = most frequent value
- Median = middle value (when ordered)
- Mean = sum the values and divide by how many there are [from a grouped frequency table, estimate the mean using the midpoint of each class]
- Range = maximum value minus minimum value
- Interquartile range = upper quartile minus lower quartile

Box Plots



Scatter Graphs

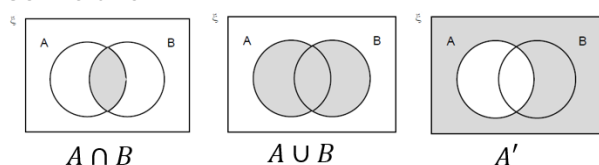


- Interpolation: making a prediction within the range of the data [using a line of best fit]
- Extrapolation: making a prediction outside the range of the data [unreliable]

Histograms

$$\text{Frequency density} = \frac{\text{frequency}}{\text{class width}}$$

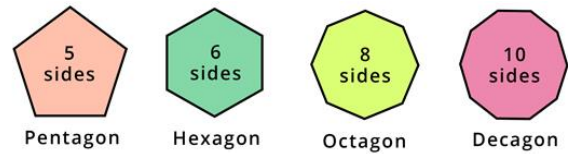
Set Notation



Types of Sequence

- Arithmetic: add the same amount each time (common difference)
- Geometric: multiply by the same amount each time (common ratio)
- Quadratic: common second difference
- Fibonacci: add the previous two terms

Polygon Names



Angle Facts

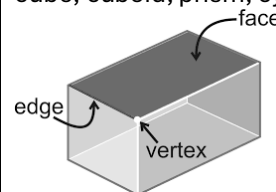
- Angles around a point sum to 360°
- Adjacent angles on a straight line sum to 180°
- Vertically opposite angles are equal
- Interior angles in a triangle sum to 180°
- Alternate angles in parallel lines are equal
- Corresponding angles in parallel lines are equal
- Co-interior angles in parallel lines sum to 180°
- Opposite angles in parallelograms are equal
- Interior angles in a quadrilateral sum to 360°
- Sum of the interior angles of an n -sided polygon is $180(n - 2)$
- Sum of the exterior angles of any polygon is 360°
- interior angle + exterior angle = 180°

Circle Theorems

- The angle at the centre is twice the angle at the circumference
- The angle in a semicircle is a right angle
- Angles in the same segment are equal
- Opposite angles of a cyclic quadrilateral sum to 180°
- A tangent meets a radius at 90°
- Tangents from an external point are equal in length
- The perpendicular from the centre to a chord bisects the chord
- The angle between a tangent and a chord is equal to the angle in the alternate segment

3D Solids

cube, cuboid, prism, cylinder, pyramid, cone and sphere



Similarity

- Length scale factor = k
- Area scale factor = k^2
- Volume scale factor = k^3

Bearings

Measure clockwise from the north and give three figures.

Congruency Proofs

- SSS: Side, Side, Side
- SAS: Side, Angle, Side (must be the included angle)
- ASA: Angle, Side, Angle
- RHS: Right Angle, Hypotenuse, Side

Compound Measures

$$\text{Speed} = \text{Distance} \div \text{Time}$$

$$\text{Density} = \text{Mass} \div \text{Volume}$$