GCSE MATHEMATICS · FORMULA & REVISION SHEET 2 OF 3

Geometry & Measures

Area, volume, angles, Pythagoras, trigonometry, vectors and transformations — Foundation core with Higher-tier extensions clearly marked. Works for AQA, Edexcel, OCR and WJEC.

FOUND + HIGHER needed by everyone HIGHER Higher tier only

Note on what's "given" in the exam: On Edexcel & AQA Higher papers, the formula sheet now provides the **sine rule, cosine rule, area = ½ab sin C**, and the **volume/surface area of sphere & cone**. You should still learn them — looking them up wastes time. Everything else on these cards you are expected to **memorise**.

1 Perimeter, Area & Circles

Area of 2D Shapes — FOUND + HIGHER

Rectangle: *length × width*

Triangle: *½ × base × height*

Parallelogram: *base × height*

Trapezium: $\frac{1}{2}(a + b) \times h$

a, b = parallel sides

Circles — FOUND + HIGHER

Circumference = πd = 2πr

Area = πr²

d = diameter, r = radius

Arcs & Sectors — HIGHER

Arc length = $\frac{\theta}{360} \times \pi d$

θ = angle at centre

Sector area = $\frac{\theta}{360} \times \pi r^2$

Compound Shapes — FOUND + HIGHER

Split into simple shapes, find each area, add

Perimeter: add all outer edges only

2 Volume & Surface Area

Prisms & Cylinders — FOUND + HIGHER

Volume of prism = area of cross-section × length

Cylinder volume = πr²h

Cylinder surface area = 2πr² + 2πrh

Cuboid — FOUND + HIGHER

Volume = length × width × height

Surface area = 2(lw + lh + wh)

Sphere — HIGHER

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

Surface area = 4πr²

(Given on the Higher formula sheet)

Cone & Pyramid — HIGHER

Cone volume = $\frac{1}{3}\pi r^2 h$

Cone curved S.A. = πrl

l = slant height

Pyramid volume = $\frac{1}{3}$ **× base area × height**

3 Pythagoras & Trigonometry

Pythagoras' Theorem

FOUND + HIGHER

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

c = hypotenuse (longest side, opposite right angle)

Find a shorter side: $c^2 - b^2 = a^2$

Higher: works in 3D — apply twice

Trigonometry (right-angled)

FOUND + HIGHER

SOH: $\sin\theta = \frac{opp}{hyp}$

CAH: $\cos\theta = \frac{adj}{hyp}$

TOA: $\tan\theta = \frac{opp}{adj}$

Find an angle: use $\sin^{-1}$, $\cos^{-1}$, $\tan^{-1}$

Exact Trig Values

HIGHER

sin 0/30/45/60/90 = $0, \frac{1}{2}, \frac{\sqrt{2}}{2}, \frac{\sqrt{3}}{2}, 1$

cos *is the reverse order of sin*

tan 0/30/45/60 = $0, \frac{1}{\sqrt{3}}, 1, \sqrt{3}$

tan 90 undefined

Sine & Cosine Rules

HIGHER

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

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

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

(all given on the Higher sheet)

4 Angles, Bearings & Polygons

Angle Facts

FOUND + HIGHER

Angles on a straight line = **180°**

Angles around a point = **360°**

Angles in a triangle = **180°**

Angles in a quadrilateral = **360°**

Vertically opposite angles are equal

Parallel Line Angles

FOUND + HIGHER

Corresponding *(F-shape): equal*

Alternate *(Z-shape): equal*

Co-interior *(C-shape): add to 180°*

Polygons

FOUND + HIGHER

Sum of interior angles = (n − 2) × 180°

n = number of sides

Exterior angle = $\frac{360}{n}$ *(regular polygon)*

Interior + exterior = 180°

Bearings

FOUND + HIGHER

Measured **clockwise from North**

Always written with **3 figures** *(e.g. 075°)*

Back bearing: ± 180°

5 Circle Theorems (Higher)

Angle Theorems

HIGHER

Angle at **centre = 2 ×** *angle at circumference*

Angle in a **semicircle = 90°**

(Thales)

Angles in the **same segment** *are equal*

Opposite angles in a **cyclic quadrilateral** *add to 180°*

Tangent & Chord Theorems

HIGHER

A **tangent meets a radius at 90°**

Two tangents from a point are **equal in length**

Alternate segment theorem: *angle between tangent & chord = angle in alternate segment*

6 Transformations, Vectors & Constructions

Transformations — FOUND + HIGHER

Translation: *by a vector (x over y)*

Reflection: *needs a mirror line*

Rotation: *needs centre, angle, direction*

Enlargement: *needs centre & scale factor*

Enlargement & Similarity — HIGHER

Negative scale factor → other side of centre, inverted

Length *scale factor k*

Area *scale factor* = $\mathbf{k^2}$

Volume *scale factor* = $\mathbf{k^3}$

Vectors — HIGHER

Column vector: top = x movement, bottom = y

Add/subtract *component by component*

Magnitude = $\sqrt{(x^2 + y^2)}$

Parallel vectors are scalar multiples; prove points collinear via this

Constructions & Loci — FOUND + HIGHER

Perpendicular bisector: *equal arcs from both ends*

Angle bisector: *arcs from the vertex*

Locus from a point: *a circle*

Locus from a line: *parallel lines / 'racetrack'*

3D Shapes, Nets & Plans — FOUND + HIGHER

Net: *the 2D shape that folds into a 3D solid*

Plan: *the view from directly above*

Front / side elevation: *the view from the front / side*

Cross-section: *the 2D shape made by a straight cut*

Congruence & Proof — HIGHER

Two triangles are congruent if they match by:

SSS · **SAS** · **ASA** *(or AAS)* · **RHS**

State which condition you used to justify the proof

Congruent = identical; similar = same shape, scaled

Exam technique — geometry: For every angle answer, write the *reason* next to it ("alternate angles", "angle in a semicircle") — reasons carry marks. Check your calculator is in **degrees** mode before any trig. For bearings and trig in context, always draw and label a diagram first — most lost marks come from setting the triangle up wrong, not the calculation.