HSC Maths Standard 2 Formula Sheet

Original worked revision examples with notes on units and assumptions.

Use the board PDF below for the official sheet. Coverage of examples varies by subject.

Official reference material

Official NESA reference PDF

What to work out beyond the sheet

The sheet gives the outlier fences. Work out the interquartile range first using $IQR = Q_3 - Q_1$.

Formulas and worked examples

Measurement · error and bounds

Formula or reference: e = precision ÷ 2. Lower bound = measurement − e. Upper bound = measurement + e.

Units and conditions: Use the same unit for the reading and precision.

Worked example: A length of 16 cm to the nearest centimetre has e = 0.5 cm. The rounding bounds are 15.5 cm and 16.5 cm.

Measurement · arc length

Formula or reference: $\ell = (\theta \div 360°) \times 2\pi r$

Units and conditions: θ in degrees. ℓ and r in the same length unit.

Worked example: A 60° arc of radius 3 cm has length π cm.

Measurement · sector area

Formula or reference: $A = (\theta \div 360°) \times \pi r^2$

Units and conditions: θ in degrees. Area in square units.

Worked example: A 90° sector of radius 4 cm has area 4π cm².

Measurement · trapezium

Formula or reference: $A = h(a + b) \div 2$

Units and conditions: a and b are parallel lengths. h is perpendicular to them.

Worked example: Parallel sides of 4 m and 6 m and height 3 m give 15 m².

Measurement · trapezoidal approximation

Formula or reference: $A \approx h(d_1 + d_2) \div 2$

Units and conditions: h is the spacing of adjacent offsets. The offsets and spacing use the same length unit.

Worked example: Offsets of 5 m and 7 m separated by 4 m approximate one strip as 24 m².

Measurement · cylinder surface

Formula or reference: $A = 2\pi r^2 + 2\pi rh$

Units and conditions: Square units. Includes both circular ends.

Worked example: A closed cylinder of radius 2 cm and height 5 cm has area 28π cm².

Measurement · sphere surface

Formula or reference: $A = 4\pi r^2$

Units and conditions: Square units.

Worked example: A sphere of radius 3 cm has surface area 36π cm².

Measurement · pyramid or cone volume

Formula or reference: $V = Ah \div 3$

Units and conditions: A is base area. h is perpendicular height. Volume uses cubic units.

Worked example: Base area 18 cm² and height 5 cm give volume 30 cm³.

Measurement · sphere volume

Formula or reference: $V = 4\pi r^3 \div 3$

Units and conditions: Cubic units.

Worked example: A sphere of radius 3 cm has volume 36π cm³.

Trigonometry · right-triangle ratios

Formula or reference: sin A = opposite ÷ hypotenuse. cos A = adjacent ÷ hypotenuse. tan A = opposite ÷ adjacent.

Units and conditions: Ratios are unitless. Choose degree mode when angles are given in degrees.

Worked example: For sides 3, 4 and 5 and A opposite the side of length 3, sin A = 3/5, cos A = 4/5 and tan A = 3/4.

Trigonometry · triangle area

Formula or reference: $A = ab \sin C \div 2$

Units and conditions: C is the included angle. Use square units for area.

Worked example: Sides 6 cm and 4 cm enclosing 30° give 6 cm².

Trigonometry · sine rule

Formula or reference: $a/\sin A = b/\sin B = c/\sin C$

Units and conditions: Sides in the same unit. Each side is opposite its corresponding angle.

Worked example: If a = 10 cm opposite 30° and B = 45°, then $b = 10\sqrt{2}$ cm.

Trigonometry · cosine rule

Formula or reference: $c^2 = a^2 + b^2 - 2ab \cos C$. $\cos C = (a^2 + b^2 - c^2) \div (2ab)$.

Units and conditions: Sides in the same unit. C is opposite c.

Worked example: With a = 3 cm, b = 4 cm and C = 90°, c = 5 cm. Reversing the formula gives cos C = 0.

Finance · compound growth

Formula or reference: $FV = PV(1 + r)^n$

Units and conditions: PV and FV are monetary amounts. r is a decimal rate per period and n counts those periods.

Worked example: $800 at 5% per year for two years becomes $882.

Finance · straight-line depreciation

Formula or reference: $S = V_0 - Dn$

Units and conditions: D is a monetary decrease per period. n counts those periods.

Worked example: A $1,000 item losing $120 each year is worth $640 after three years under this model.

Finance · declining-balance depreciation

Formula or reference: $S = V_0(1 - r)^n$

Units and conditions: r is the decimal rate per period. S and V_0 use the same monetary unit.

Worked example: A $1,000 item losing 20% of its value each year is worth $640 after two years.

Statistics · outlier fences

Formula or reference: Lower = $Q_1 - 1.5 \times IQR$. Upper = $Q_3 + 1.5 \times IQR$.

Units and conditions: Fences have the data's units.

Worked example: With $Q_1 = 10$, $Q_3 = 14$ and IQR = 4, the fences are 4 and 20. A value of 21 is beyond the upper fence.

Statistics · standard score

Formula or reference: $z = (x - \mu) \div \sigma$

Units and conditions: z is unitless. x, μ and σ use the same units.

Worked example: A score of 72 from a distribution with mean 60 and standard deviation 8 gives z = 1.5.

Statistics · normal distribution bands

Formula or reference: About 68%, 95% and 99.7% lie within 1, 2 and 3 standard deviations of the mean, respectively.

Units and conditions: Percentages are approximate and assume a normal distribution.

Worked example: With mean 50 and standard deviation 4, about 95% of normal observations are between 42 and 58.

More worked examples

Compound growth

A = P(1 + r)^n, with r as a decimal rate per compounding period.

An original practice scenario: $2,000 grows at 4% annually for three years without deposits or fees. Find its value.

P = 2000, r = 0.04 and n = 3. A = 2000 × 1.04^3 = 2249.728, so the final balance is $2,249.73. Interest earned is $249.73, which is different from the balance.

Check: Do not use r = 4 or mix a monthly rate with a count of years. This simplified exercise is not an investment forecast.

A non-right-angled triangle

Area = ½ab sin C when C is the angle between sides a and b.

Two sides are 8 cm and 5 cm with an included angle of 30°. Find the triangle's area.

Area = ½ × 8 × 5 × sin 30° = 10 cm². The two side lengths and the included angle are enough; no third side is required.

Check: Check degree mode and use the angle between the stated sides. Area needs square units.

Standardised scores

z = (x − mean) / standard deviation.

A value of 74 comes from a distribution with mean 62 and standard deviation 8. Find and interpret its z-score.

z = (74 − 62) / 8 = 1.5. The value is 1.5 standard deviations above the mean. No normality assumption is required to calculate this standardised score.

Check: A z-score has no units. It is not a percentage or an ATAR; normal probabilities need an appropriate distribution assumption.