

HSC maths: NESA's reference sheet, section by section

The sheet is printed at the back of every HSC mathematics paper. Standard 1 and 2 share a one-page sheet (since the 2019 HSC); Advanced, Extension 1 and Extension 2 share a four-page sheet (since 2020). Formulas named in words; terms are not defined on the sheet, so know what each letter means.

Mathematics Standard 1 and 2 (one page)

Section	Given	Not given: memorise
Measurement	absolute error = half the precision; upper and lower bounds; arc length and sector area (degrees); trapezium; the trapezoidal approximation $A = h/2 (df + dl)$; cylinder and sphere surface area; pyramid/cone and sphere volume	Pythagoras; unit conversions; speed, distance, time; rates and ratios; fuel, dosage and heart-rate formulas (given in the question)
Trigonometry	sin, cos, tan ratios; half $ab \sin C$; the sine rule; the cosine rule (both forms)	exact values; bearings conventions; the ambiguous case
Financial mathematics	$FV = PV(1 + r)^n$; straight-line depreciation $S = V_0 - Dn$; declining balance $S = V_0(1 - r)^n$	simple interest; loan and annuity tables (given); budgeting arithmetic
Statistical analysis	outlier rule ($1.5 \times IQR$); z-score; normal distribution 68 / 95 / 99.7 percent	mean, median, mode, range, quartiles; box plots; correlation and the line of best fit; network and critical-path methods

Advanced, Extension 1 and 2: pages 1 and 2

Section	Given
Measurement (p1)	arc and sector (degrees); trapezium; cylinder and sphere surface area; cone/pyramid and sphere volume
Financial; sequences and series (p1)	$A = P(1 + r)^n$; arithmetic nth term and sum (both forms); geometric nth term and sum (both forms); limiting sum for $ r < 1$
Functions; logs (p1)	the quadratic formula; sum, pair-products and product of the roots of a cubic; the circle $(x - h)^2 + (y - k)^2 = r^2$; log-power inverse; change of base; $a^x = e^{(x \ln a)}$
Trigonometry (p2)	ratios; half $ab \sin C$; sine and cosine rules; radian arc $l = r \theta$ and sector half $r^2 \theta$; the 45 and 30-60 exact triangles; sec, cosec, cot; $\cos^2 + \sin^2 = 1$; compound angles; t-formulae; products to sums; $\sin^2 nx$ and $\cos^2 nx$
Statistics and probability (p2)	z-score; outlier rule; normal percentages; $E(X)$, $\text{Var}(X)$; product, addition and conditional probability rules; continuous random variables; binomial $P(X = r)$, $E = np$, $\text{Var} = np(1 - p)$

Pages 3 and 4, the memorise list, and exam habits

Page 3: every derivative and integral

Derivatives of: a power of a function, a product, a composite (chain rule), a quotient, sin, cos and tan of a function, $e^f(x)$, $\ln f(x)$, $a^f(x)$, log base a of $f(x)$, and the three inverse trig functions. Integrals of: a power of a function ($n \neq -1$), $f'(x)$ sin, cos and $\sec^2$, $f'(x)$ $e^f(x)$, $f'(x)/f(x)$ ($\ln$), $f'(x)$ $a^f(x)$, the two inverse-trig forms (sin inverse, tan inverse over a), integration by parts, and the trapezoidal rule with n strips. Advanced uses the first ten lines; inverse trig is Extension 1; by parts is Extension 2.

Page 4

Combinatorics: nPr , nCr , the binomial expansion of $(x + a)^n$. Vectors: the magnitude of $x_i + y_j$; the dot product as $|u||v| \cos \theta$ and as $x_1x_2 + y_1y_2$; $r = a + \lambda b$. Complex numbers: polar and exponential form; de Moivre's theorem. Mechanics: the four forms of acceleration; $x = a \cos(nt + \alpha) + c$ and the sine form; $x \text{ double-dot} = -n^2(x - c)$.

Not on the sheet: memorise or derive

Course	Memorise or derive
Advanced	Pythagoras; distance, midpoint, gradient; perpendicular gradients; line equations; index laws; log laws (product, quotient, power); simple interest; recurrence for loans and annuities; mean, median, quartiles, IQR, variance, standard deviation; first principles; stationary points and concavity; area between curves; transformations; even and odd functions; the exact values by quadrant; 180 degrees = π
Extension 1	projectile equations (derive from acceleration); related rates set-ups; inverse functions and domains; the general term of the binomial expansion; induction; integration by substitution; volumes of revolution $V = \pi$ times the integral of y^2
Extension 2	3D dot and vector forms; partial fractions, t -substitution, reduction formulas; proof structures; roots of unity; the conjugate and Euler relations

Exam habits

- [] Practise with the real sheet from Term 1 so its layout is known by the trial
- [] Read the whole formula, including its condition ($|r| < 1$; $n \neq -1$; $t = \tan$ of half A)
- [] Radian forms (page 2) for calculus questions; degree forms (page 1) for measurement
- [] Write the formula in the sheet's letters, then define yours, then substitute: method marks

From

sciencewithshobha.com/blog/hsc-maths-formula-sheet-the-nesa-reference-sheet-for-standard-advanced-extension-1-and-2-what-is-on-it-what-is-not-and-what-to-memorise/