FORMULAE SHEET

Area of an annulus
\[ A = \pi (R^2 - r^2) \]
\[ R = \text{radius of outer circle} \]
\[ r = \text{radius of inner circle} \]

Area of an ellipse
\[ A = \pi ab \]
\[ a = \text{length of semi-major axis} \]
\[ b = \text{length of semi-minor axis} \]

Area of a sector
\[ A = \frac{\theta}{360} \pi r^2 \]
\[ \theta = \text{number of degrees in central angle} \]

Arc length of a circle
\[ l = \frac{\theta}{360} 2\pi r \]
\[ \theta = \text{number of degrees in central angle} \]

Simpson’s rule for area approximation
\[ A \approx \frac{h}{3} \left( d_f + 4d_m + d_l \right) \]
\[ h = \text{distance between successive measurements} \]
\[ d_f = \text{first measurement} \]
\[ d_m = \text{middle measurement} \]
\[ d_l = \text{last measurement} \]

Surface area
Sphere
\[ A = 4\pi r^2 \]
Closed cylinder
\[ A = 2\pi rh + 2\pi r^2 \]
\[ r = \text{radius} \]
\[ h = \text{perpendicular height} \]

Volume
Cone
\[ V = \frac{1}{3} \pi r^2 h \]
Cylinder
\[ V = \pi r^2 h \]
Pyramid
\[ V = \frac{1}{3} Ah \]
Sphere
\[ V = \frac{4}{3} \pi r^3 \]
\[ r = \text{radius} \]
\[ h = \text{perpendicular height} \]
\[ A = \text{area of base} \]

Sine rule
\[ \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \]

Area of a triangle
\[ A = \frac{1}{2} ab \sin C \]

Cosine rule
\[ c^2 = a^2 + b^2 - 2ab \cos C \]
or
\[ \cos C = \frac{a^2 + b^2 - c^2}{2ab} \]
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Simple interest

\[ I = Prn \]
\[ P = \text{initial quantity} \]
\[ r = \text{percentage interest rate per period, expressed as a decimal} \]
\[ n = \text{number of periods} \]

Declining balance formula for depreciation

\[ S = V_0(1 - r)^n \]
\[ S = \text{salvage value of asset after } n \text{ periods} \]
\[ r = \text{percentage interest rate per period, expressed as a decimal} \]

Compound interest

\[ A = P(1 + r)^n \]
\[ A = \text{final balance} \]
\[ P = \text{initial quantity} \]
\[ n = \text{number of compounding periods} \]
\[ r = \text{percentage interest rate per compounding period, expressed as a decimal} \]

Mean of a sample

\[ \bar{x} = \frac{\sum x}{n} \]

\[ \bar{x} = \frac{\sum f x}{\sum f} \]

\[ \bar{x} = \text{mean} \]
\[ x = \text{individual score} \]
\[ n = \text{number of scores} \]
\[ f = \text{frequency} \]

Future value (A) of an annuity

\[ A = M \left[ \frac{(1 + r)^n - 1}{r} \right] \]
\[ M = \text{contribution per period, paid at the end of the period} \]

Formula for a z-score

\[ z = \frac{x - \bar{x}}{s} \]
\[ s = \text{standard deviation} \]

Present value (N) of an annuity

\[ N = M \left[ \frac{(1 + r)^n - 1}{r(1 + r)^n} \right] \]
\[ \text{or} \]
\[ N = \frac{A}{(1 + r)^n} \]

Gradient of a straight line

\[ m = \frac{\text{vertical change in position}}{\text{horizontal change in position}} \]

Gradient–intercept form of a straight line

\[ y = mx + b \]
\[ m = \text{gradient} \]
\[ b = y\text{-intercept} \]

Probability of an event

The probability of an event where outcomes are equally likely is given by:

\[ P(\text{event}) = \frac{\text{number of favourable outcomes}}{\text{total number of outcomes}} \]