Extra information not in official formula sheets
In the official formula sheets you need to become familiar with all the symbols and equations used.

VCE Mathematical methods
HSC Mathematics
AISSE Mathematics

Algebra:
$(a + b)^2 = a^2 + 2ab + b^2$
$a^2 – b^2 = (a - b)(a + b)$

Solve $a x^2 + b x + c = 0$	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$1 = 0! = 0^0 = 1^0$
Binomial theorem k^{th} term of $(a + b)^n$ is $C_k^n a^{n-k} b^k$ for k = 0, 1,.., n.
$\log_e(x) = \ln(x) = \ln x$ = natural log of x
$\log_a(b) = \log_e(b)/\log_e(a)$

Surd: irrational number e.g. sqrt(2)

Geometry:
Sides of simple right-angled triangles:
3, 4, 5
5, 12, 13
7, 24, 25
1/sqrt(2), 1/sqrt(2), 1
1, sqrt(3), 2
sec(x) = 1/cos(x)
cosec(x) = 1/sin(x)
cot(x) = 1/tan(x)

Rule for positive result in quadrant (start at top right and rotate anti-clockwise):
ASTC: all science teachers count. (meaning all, sine, tangent, cosine)

Surface area of sphere: $4 \pi r^2$

Area of a triangle given vertex coordinates: $(1/2) | a_x(b_y - c_y) + b_x(c_y - a_y) + c_x(a_y - b_y)|$

Statistics:
Approximate % for Pr(X) within 1, 2 or 3 standard deviations: 68, 95, 99.7 .

Binomial formula term. $C_n^N \quad p^n (1 - p)^{N-n}$

Binomial distribution. $\mu = n p$ $\quad$ var = $n p (1 - p) = \sigma^2$

C_n^N = (N!) / (n! (N-n)!) = number of ways of choosing n from N when order is unimportant such as cards.

(n!) C_n^N = (N!) / (N-n)! = number of ways of choosing n from N when order is important such as a race.

Z-score = standardised score = $(x- \mu)/ \sigma$

VCE Further Mathematics

Residual = actual – predicted.
Bearing is measured anticlockwise in degrees.

Networks and decision maths
In Euler's formula: v = vertices, f = faces, e = edges.
For triangle: v + f = e + 2 becomes 3 + 2 = 3 + 2. The triangle has 2 faces: inside and outside.
Euler path: must include every edge just once.
Hamiltonian circuit: goes through each vertex only once and ends at start.
Degree of a vertex = number of edges. For a loop both ends count.
Degree of a graph = largest vertex degree.

Correlation:
Correlation = r = Pearsons correlaton = Pearsons product-moment correlation. (Range -1 to 1)

$$r = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{\sqrt{[\, n\Sigma x^2 - (\Sigma x)^2 \,][\, n\Sigma y^2 - (\Sigma y)^2 \,]}}$$

Coefficient of determination = r^2

Series:
Arithmetic series: a + (a + d) +…+(a + (n - 1)d) = (n/2)[2a + (n - 1)d] = (n/2)(a + l)

Geometric series: a + ar + ar^2 +… ar^(n - 1) = a(1 - r^n)/(1 - r), r not equal 1.

Infinite geometric series: a + ar + ar^2 +… = a/(1 - r), |r| < 1.

geometry and trigonometry
Pythagoras theorem c^2 = a^2 + b^2

business-related mathematics
R = annual interest rate
N = payments/year
P = principal
T = time in years

I = interest paid

Simple interest: $I = PRT/100$

Compound interest: $I = P\,(1 + R/(100N))^{NT} - P$

Hire purchase:

$r_f = (100\,I\,M)/(PN)$ = flat rate of interest paid for hire purchase

I = total interest paid = repayments – principal repayments

P = principal – deposit

M = number of repayments/year

N = total number of repayments or periods

$r_e = r_f\,(2N)/(2N + 1)$ = effective rate of interest

VCE Physics

Photon energy $E = hf = hc/\lambda$

Relativistic mass $m = m_0\,\gamma$ (γ always >1)

Total energy as seen by observer $E_{total} = E_k + E_{rest} = mc^2$

Time dilation $t = t_0\,\gamma$ t_0 = proper time of observed. t = time for observer.

Length contraction $L = L_0 / \gamma$ L_0 = proper length of observed. L = length for observer.

Stress $\sigma = F/A$

Strain $\varepsilon = (\Delta L)/L$

Young's modulus E = stress/strain

Capacitor time constant $\tau = R\,C$

Extra data:

Mass of proton $m_p = 938.3$ MeV equivalent energy or MeV/c^2

Mass of neutron $m_n = 939.6$ MeV equivalent energy or 1.675×10^{-27} kg

Speed of sound in air 340 m/s