

Probability

For any event $A$ and its complement $A'$	$P(A') = 1 - P(A)$
$P(A \cup B) = P(A) + P(B) - P(A \cap B)$	$P(A B) = \frac{P(A \cap B)}{P(B)}$

Random variables and probability distributions		
Bernoulli: mean is the sample proportion $\hat{p}$	$\hat{p}$	$\sigma^2 = p(1 - p)$
Binomial distribution: $P(X = x) = \binom{n}{x} p^x (1 - p)^{n-x}$	$np$	$\sigma^2 = np(1 - p)$
Discrete random variable: $P(X = x) = P(x)$	$n = \sum xp(x)$	$\sigma^2 = \sum (x - n)^2 p(x)$
Continuous random variable: $P(a \leq X \leq b) = \int_a^b p(x) dx$		
Expected value: $\mu = E(X) = \int_{-\infty}^{\infty} xp(x) dx$		
Variance: $\sigma^2 = \int_{-\infty}^{\infty} (x - \mu)^2 p(x) dx$		

Sample proportions	Standard deviation:	Margin of error:
$\frac{\hat{p}}{X}$	$\sigma = \sqrt{\frac{p(1 - p)}{n}}$	Confidence interval: $\hat{p} - z \sqrt{\frac{p(1 - p)}{n}} \leq p \leq \hat{p} + z \sqrt{\frac{p(1 - p)}{n}}$
Mean: $E(\hat{p}) = p$		

Note: Any additional formulas identified by the examination panel as necessary will be included in the body of the particular question.

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This document is valid for teaching and examining until 31 December 2020.

Published by the School Curriculum and Standards Authority of Western Australia  
303 Sevenoaks Street  
CANNINGTON WA 6107

MATHEMATICS METHODS  
ATAR COURSE  
FORMULA SHEET  
2020



School Curriculum and Standards Authority  
Government of Western Australia



Differentiation and integration

$\frac{d}{dx}(x^n) = nx^{n-1}$	$\int x^n dx = \frac{x^{n+1}}{n+1} + c, \quad n \neq -1$
$\frac{d}{dx}(e^{ax-b}) = ae^{ax-b}$	$\int e^{ax} dx = \frac{1}{a} e^{ax} + c$
$\frac{d}{dx}(\ln x) = \frac{1}{x}$	$\int \frac{1}{x} dx = \ln x + c, \quad x > 0$
$\frac{d}{dx}(\ln f(x)) = \frac{f'(x)}{f(x)}$	$\int \frac{f'(x)}{f(x)} dx = \ln f(x) + c, \quad f(x) > 0$
$\frac{d}{dx}(\sin(ax-b)) = a \cos(ax-b)$	$\int \sin(ax-b) dx = -\frac{1}{a} \cos(ax-b) + c$
$\frac{d}{dx}(\cos(ax-b)) = -a \sin(ax-b)$	$\int \cos(ax-b) dx = \frac{1}{a} \sin(ax-b) + c$
Product rule	<div><div>If <math>y = uv</math> then <math>\frac{d}{dx}(uv) = u \frac{dv}{dx} + \frac{du}{dx} v</math></div><div>If <math>y = f(x) g(x)</math> or then <math>y' = f'(x) g(x) + f(x) g'(x)</math></div></div>
Quotient rule	<div><div>If <math>y = \frac{u}{v}</math> then <math>\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}</math></div><div>If <math>y = \frac{f(x)}{g(x)}</math> or then <math>y' = \frac{f'(x) g(x) - f(x) g'(x)}{(g(x))^2}</math></div></div>
Chain rule	<div><div>If <math>y = f(u)</math> and <math>u = g(x)</math> then <math>\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}</math></div><div>If <math>y = f(g(x))</math> or then <math>y' = f'(g(x)) g'(x)</math></div></div>
Fundamental theorem	$\frac{d}{dx}\left(\int_a^x f(t) dt\right) = f(x)$ and $\int_a^b f(x) dx = f(b) - f(a)$
Increments formula	$\delta y \approx \frac{dy}{dx} \times \delta x$
Exponential growth and decay	$\frac{dP}{dt} = kP \Leftrightarrow P = P_0 e^{kt}$

See next page

Mensuration

Parallelogram	$A = bh$
Triangle	$A = \frac{1}{2}bh$ or $A = \frac{1}{2}ab \sin C$
Trapezium	$A = \frac{1}{2}(a+b)h$
Circle	$A = \pi r^2$ and $C = 2\pi r = \pi d$
Prism	$V = Ah$ , where $A$ is the area of the cross section
Pyramid	$V = \frac{1}{3}Ah$ , where $A$ is the area of the cross section
Cylinder	$V = \pi r^2 h$ <span><math>TSA = 2\pi rh + 2\pi r^2</math></span>
Cone	$V = \frac{1}{3}\pi r^2 h$ <span><math>TSA = \pi rs + \pi r^2</math>, where <math>s</math> is the slant height</span>
Sphere	$V = \frac{4}{3}\pi r^3$ <span><math>TSA = 4\pi r^2</math></span>

Trigonometry

$\sin^2 x + \cos^2 x = 1$	$\tan x = \frac{\sin x}{\cos x}$
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Logarithms

$x = \log_a b \Leftrightarrow a^x = b$	$a^{\log_a b} = b$ and $\log_a(a^b) = b$
$\log_a mn = \log_a m + \log_a n$	$\log_a \frac{m}{n} = \log_a m - \log_a n$
$\log_a(m^k) = k \log_a m$	$\log_a x = \ln x$

See next page