



Basic Arithmetic & Algebra

Arithmetic Operations

Addition	$a + b = c$
Subtraction	$a - b = c$
Multiplication	$a * b = c$
Division	$a / b = c \text{ (} b \neq 0 \text{)}$
Exponents	$a^n \text{ (} a \text{ to the power of } n \text{)}$
Order of Operations	PEMDAS/BODMAS (Parentheses/Brackets, Exponents/Orders, Multiplication and Division, Addition and Subtraction)

Algebraic Formulas

Quadratic Formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Difference of Squares	$a^2 - b^2 = (a + b)(a - b)$
Perfect Square Trinomial	$(a + b)^2 = a^2 + 2ab + b^2$ $(a - b)^2 = a^2 - 2ab + b^2$
Binomial Theorem	$(a + b)^n = \sum (n \text{ choose } k) a^{n-k} b^k$
Laws of Exponents	$a^m * a^n = a^{m+n}$ $a^m / a^n = a^{m-n}$ $(a^m)^n = a^{mn}$
Logarithms	$\log_b(x) = y \Leftrightarrow b^y = x$

Geometry & Trigonometry

Basic Geometry Formulas

Area of a Rectangle	$A = l * w \text{ (length * width)}$
Area of a Triangle	$A = 0.5 * b * h \text{ (base * height)}$
Area of a Circle	$A = \pi r^2 \text{ (} r = \text{radius)}$
Circumference of a Circle	$C = 2\pi r$
Volume of a Sphere	$V = \frac{4}{3}\pi r^3$
Volume of a Cylinder	$V = \pi r^2 h \text{ (} h = \text{height)}$

Trigonometric Functions

Sine (sin)	$\sin(\theta) = \text{Opposite} / \text{Hypotenuse}$
Cosine (cos)	$\cos(\theta) = \text{Adjacent} / \text{Hypotenuse}$
Tangent (tan)	$\tan(\theta) = \text{Opposite} / \text{Adjacent}$
Cosecant (csc)	$\csc(\theta) = 1 / \sin(\theta)$
Secant (sec)	$\sec(\theta) = 1 / \cos(\theta)$
Cotangent (cot)	$\cot(\theta) = 1 / \tan(\theta)$
Pythagorean Identity	$\sin^2(\theta) + \cos^2(\theta) = 1$

Calculus

Differentiation Rules

Power Rule	$d/dx (x^n) = nx^{n-1}$
Constant Rule	$d/dx (c) = 0$
Product Rule	$d/dx [f(x)g(x)] = f'(x)g(x) + f(x)g'(x)$
Quotient Rule	$d/dx [f(x)/g(x)] = [g(x)f'(x) - f(x)g'(x)] / [g(x)]^2$
Chain Rule	$d/dx [f(g(x))] = f'(g(x)) * g'(x)$
Derivative of sin(x)	$d/dx [\sin(x)] = \cos(x)$
Derivative of cos(x)	$d/dx [\cos(x)] = -\sin(x)$
Derivative of ex	$d/dx [e^x] = e^x$

Integration Rules

Power Rule	$\int x^n dx = (x^{n+1}) / (n+1) + C \text{ (} n \neq -1 \text{)}$
Integral of 1/x	$\int (1/x) dx = \ln x + C$
Integral of ex	$\int e^x dx = e^x + C$
Integral of sin(x)	$\int \sin(x) dx = -\cos(x) + C$
Integral of cos(x)	$\int \cos(x) dx = \sin(x) + C$
Integration by Parts	$\int u dv = uv - \int v du$

Statistics & Probability

Descriptive Statistics

Mean	$\mu = (\sum x_i) / n \text{ (Average of values)}$
Median	Middle value when data is sorted
Mode	Most frequent value
Variance	$\sigma^2 = \sum ((x_i - \mu)^2) / n$
Standard Deviation	$\sigma = \sqrt{\sigma^2} \text{ (Square root of variance)}$
Range	$\text{Max}(x) - \text{Min}(x)$

Probability

Probability of an Event	$P(A) = \text{Number of favorable outcomes} / \text{Total number of outcomes}$
Conditional Probability	$P(A B) = P(A \cap B) / P(B)$
Independent Events	$P(A \cap B) = P(A) * P(B)$
Bayes' Theorem	$P(A B) = [P(B A) * P(A)] / P(B)$
Expected Value	$E[X] = \sum [x * P(x)]$
Variance of a Random Variable	$\text{Var}(X) = E[(X - E[X])^2]$