Mathematics Cheatsheet

A comprehensive mathematics cheat sheet covering essential formulas, concepts, and techniques from basic arithmetic to calculus and statistics. This resource is designed for students, educators, and professionals seeking a quick reference guide.

Basic Arithmetic & Algebra

Arithmetic Operations

Addition	a + b = c
Subtraction	a - b = c
Multiplication	a * b = c
Division	a / b = c (b ≠ 0)
Exponents	an (a to the power of n)
Order of Operations	PEMDAS/BODMAS (Parentheses/Brackets, Exponents/Orders, Multiplication and Division, Addition and Subtraction)

Algebraic Formulas

Quadratic Formula	x = (-b ± √(b2 - 4ac)) / 2a
Difference of Squares	a2 - b2 = (a + b)(a - b)
Perfect Square Trinomial	(a + b)2 = a2 + 2ab + b2 (a - b)2 = a2 - 2ab + b2
Binomial Theorem	(a + b)n = ∑ (n choose k) an-k bk
Laws of Exponents	am * an = am+n am / an = am-n (am)n = amn
Logarithms	logb(x) = y ⇔ by = x

Geometry & Trigonometry

Basic Geometry Formulas

Area of a Rectangle	A = l * w (length * width)
Area of a Triangle	A = 0.5 * b * h (base * height)
Area of a Circle	A = πr2 (r = radius)
Circumference of a Circle	C = 2πr
Volume of a Sphere	V = (4/3)πr3
Volume of a Cylinder	V = πr2h (h = height)

Trigonometric Functions

Sine (sin)	sin(θ) = Opposite / Hypotenuse
Cosine (cos)	cos(θ) = Adjacent / Hypotenuse
Tangent (tan)	tan(θ) = Opposite / Adjacent
Cosecant (csc)	csc(θ) = 1 / sin(θ)
Secant (sec)	sec(θ) = 1 / cos(θ)
Cotangent (cot)	cot(θ) = 1 / tan(θ)
Pythagorean Identity	sin2(θ) + cos2(θ) = 1

Calculus

Differentiation Rules

Power Rule	d/dx (xn) = nxn-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 [ex] = ex

Integration Rules

Power Rule	∫ xn dx = (xn+1) / (n+1) + C (n ≠ -1)
Integral of 1/x	∫ (1/x) dx = ln|x| + C
Integral of ex	∫ ex dx = ex + C
Integral of sin(x)	∫ sin(x) dx = -cos(x) + C
Integral of cos(x)	∫ cos(x) dx = sin(x) + C
Integration by Parts	∫ u dv = uv - ∫ v du

Statistics & Probability

Descriptive Statistics

Mean	μ = (∑xi) / n (Average of values)
Median	Middle value when data is sorted
Mode	Most frequent value
Variance	σ2 = ∑((xi - μ)2) / n
Standard Deviation	σ = √(σ2) (Square root of variance)
Range	Max(x) - Min(x)

Probability

Probability of an Event	P(A) = Number of favorable outcomes / Total number of outcomes
Conditional Probability	P(A|B) = P(A ∩ B) / P(B)
Independent Events	P(A ∩ B) = P(A) * P(B)
Bayes' Theorem	P(A|B) = [P(B|A) * P(A)] / P(B)
Expected Value	E[X] = ∑ [x * P(x)]
Variance of a Random Variable	Var(X) = E[(X - E[X])²]