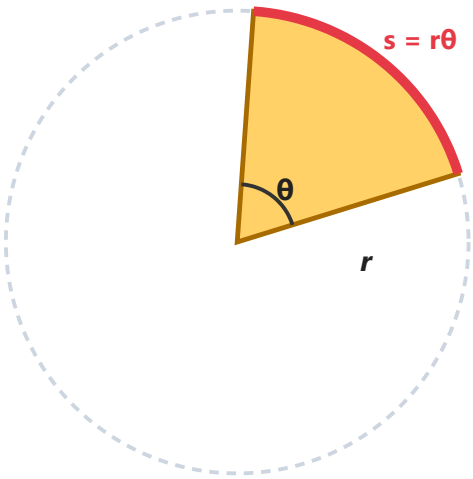
Circular Measure

Radian
The angle when the arc length equals the radius.

Convert
Degrees → radians × π/180. Radians → degrees × 180/π.

Arc length
s = rθ, θ in radians.

Sector of a circle



π rad = 180° · 1 rad ≈ 57.3°
Arc length s = rθ (θ in RADIANS)
Area of sector = ½r²θ
Area of segment = ½r²(θ − sin θ)
Set the calculator to RAD mode for sin θ

Sector
Area = ½r²θ. Perimeter = 2r + rθ.

Segment
Sector area − triangle area = ½r²(θ − sin θ).

Calculator
For sin θ with θ in radians, use RAD mode.

FORMULA / KEY TERMS
- π rad = 180°
- s = rθ
- A = ½r²θ
- Segment = ½r²(θ − sin θ)

COMMON MISTAKE
❌ "s = rθ with θ = 60."
✅ θ must be in RADIANS: 60° = π/3 ≈ 1.047 rad.

QUICK CHECK (worked answers at the back, page 22)
1. Convert 60° to radians.
2. r = 10 cm, θ = 1.2 rad. Find the arc length and the sector area.
3. Find the segment area when r = 6 cm and θ = π/3.

Differentiation

Gradient

dy/dx = gradient of the tangent at any point.

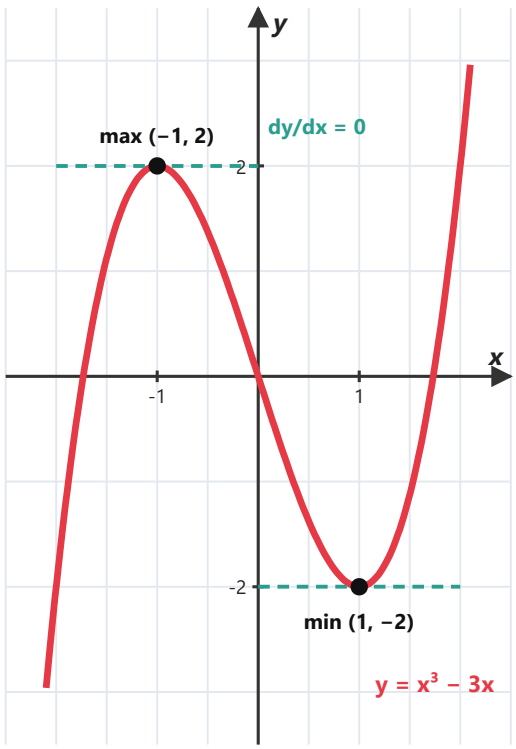
Rules

Power, chain, product and quotient rules.

Tangent + normal

Tangent gradient m; normal gradient −1/m.

Turning points: dy/dx = 0



Turning points

dy/dx = 0. $d^2y/dx^2 > 0$ minimum, < 0 maximum.

Rates of change

dA/dt = dA/dr × dr/dt (chain the rates).

Small changes

$\delta y \approx (dy/dx) \times \delta x$.

FORMULA / KEY TERMS

- $d/dx\ (ax^n) = nax^{n-1}$
- $d/dx\ (ax + b)^n = na(ax + b)^{n-1}$
- Product: $u\ dv/dx + v\ du/dx$
- Quotient: $(v\ du/dx - u\ dv/dx) \div v^2$

COMMON MISTAKE

❌ "$d/dx\ (2x + 1)^5 = 5(2x + 1)^4$."

✅ Chain rule: multiply by the inside derivative 2: $10(2x + 1)^4$.

QUICK CHECK (worked answers at the back, page 22)

1. Differentiate $y = (2x + 1)^5$.
2. Find the turning points of $y = x^3 - 3x$ and their type.
3. The radius of a circle grows at 0.2 cm s^{-1}. Find the rate of change of area when r = 5 cm.

Integration

Reverse of differentiating

If dy/dx = f(x), then y = ∫f(x) dx.

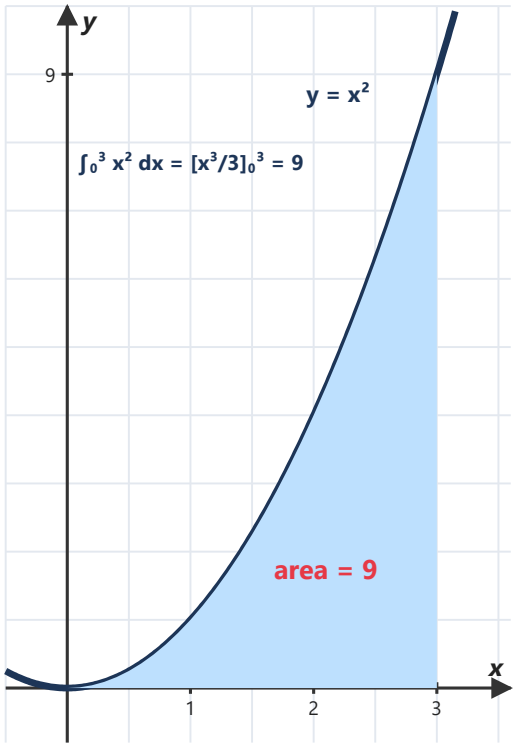
+ c

Indefinite integrals always need the constant c.

Find c

Use a given point on the curve.

Area under a curve



Definite

Upper limit − lower limit; no c needed.

Area

Area between curve and x-axis = ∫ y dx (below the axis gives a negative value).

Volume

Rotate about the x-axis: V = π∫y² dx.

📐 FORMULA / KEY TERMS

- ∫axⁿ dx = axⁿ⁺¹/(n + 1) + c, n ≠ −1
- ∫(ax + b)ⁿ dx = (ax + b)ⁿ⁺¹/[a(n + 1)] + c
- $\int_a^b f(x)\,dx = F(b) - F(a)$
- $V = \pi \int_a^b y^2\,dx$

⚠️ COMMON MISTAKE

❌ "∫x² dx = 2x."

✅ That is differentiating. Integrate: add 1 to the power, divide by the new power: x³/3 + c.

✍️ QUICK CHECK (worked answers at the back, page 22)

1. Find ∫(6x² − 4x) dx.
2. Evaluate $\int_0^3 x^2\,dx$.
3. dy/dx = 2x + 1 and the curve passes through (1, 4). Find y.

Probability Distribution

Random variable

Discrete: countable values. Continuous: any value in a range.

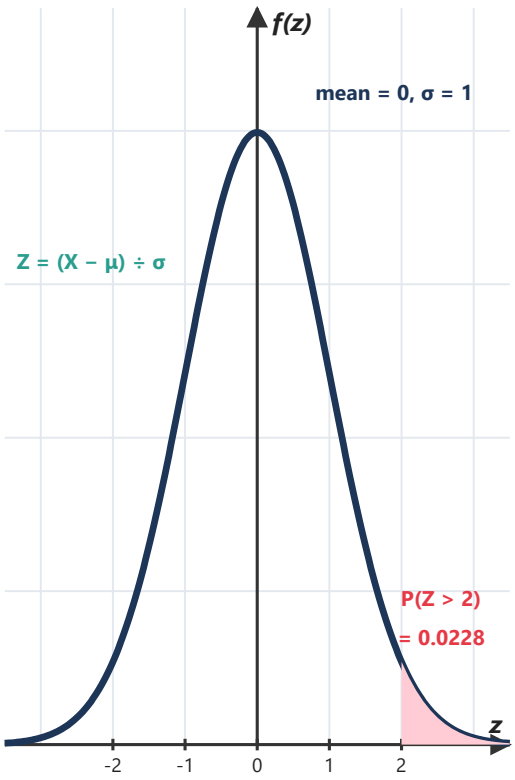
Binomial

n independent trials, each success p, failure q = 1 − p.

Binomial mean

μ = np, σ = √(npq).

Standard normal distribution



Normal

Bell-shaped, symmetric about μ. Total area = 1.

Standardise

Z = (X − μ)/σ, then use the standard normal table.

Symmetry

P(Z < −a) = P(Z > a); P(Z < a) = 1 − P(Z > a).

FORMULA / KEY TERMS

- $P(X = r) = {}^{n}C_{r}\, p^{r}\, q^{n-r}$
- Mean = np, variance = npq
- Z = (X − μ) ÷ σ
- P(a < Z < b) = P(Z > a) − P(Z > b)

COMMON MISTAKE

❌ "P(Z < 2) = 0.0228 from the table."

✅ The table gives the UPPER tail: P(Z > 2) = 0.0228, so P(Z < 2) = 0.9772.

QUICK CHECK (worked answers at the back, page 22)

1. X ~ B(5, 0.3). Find P(X = 2).
2. X ~ B(100, 0.2). Find the mean and standard deviation.
3. X ~ N(50, 5^2). Find P(X > 60).

Trigonometric Functions

Reciprocals

sec = 1/cos, cosec = 1/sin, cot = 1/tan.

Graphs

y = a sin bx + c: amplitude |a|, b cycles in 0°–360°, shift c.

Identities

$\sin^2 + \cos^2 = 1$; $1 + \tan^2 = \sec^2$; $1 + \cot^2 = \text{cosec}^2$.

Amplitude 2, shifted up 1



Compound angles

sin(A ± B) = sin A cos B ± cos A sin B.

Double angles

sin 2A = 2 sin A cos A; cos 2A = 1 − $2\sin^2 A$.

Solving

Factorise or use an identity first; give ALL answers in the range.

FORMULA / KEY TERMS

- $\sin^2 A + \cos^2 A = 1$
- $\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$
- $\cos 2A = \cos^2 A - \sin^2 A = 2\cos^2 A - 1$
- $\tan 2A = 2 \tan A \div (1 - \tan^2 A)$

COMMON MISTAKE

❌ "$2 \sin^2 x - \sin x = 0 \rightarrow$ divide by sin x → sin x = ½."

✅ Never divide by sin x: you lose sin x = 0. Factorise: sin x(2 sin x − 1) = 0.

QUICK CHECK (worked answers at the back, page 22)

1. Solve $2 \sin^2 x - \sin x = 0$ for $0° \le x \le 360°$.
2. sin A = 3/5 with A acute. Find sin 2A and cos 2A.
3. State the maximum and minimum values of y = 2 sin x + 1.

Worked Answers (2/2)

Form 4 Chapter 10: Index Number

1. $10 \div 8 \times 100 = 125$.
2. $(240 + 330 + 650) \div 10 = 1220 \div 10 = 122$.
3. $125 \times 120 \div 100 = 150$.

Form 5 Chapter 1: Circular Measure

1. $60 \times \pi/180 = \pi/3 \approx 1.047$ rad.
2. $s = 10 \times 1.2 = 12$ cm. $A = \frac{1}{2}(100)(1.2) = 60$ cm^2.
3. $\frac{1}{2}(36)(1.047 - 0.866) = 18 \times 0.181 = 3.26$ cm^2.

Form 5 Chapter 2: Differentiation

1. $dy/dx = 5(2x + 1)^4 \times 2 = 10(2x + 1)^4$.
2. $dy/dx = 3x^2 - 3 = 0 \rightarrow x = \pm 1$. $d^2y/dx^2 = 6x$: at $x = 1$ it is $6 > 0$, minimum $(1, -2)$; at $x = -1$ it is $-6 < 0$, maximum $(-1, 2)$.
3. $A = \pi r^2$, $dA/dr = 2\pi r = 10\pi$. $dA/dt = 10\pi \times 0.2 = 2\pi \approx 6.28$ cm^2 s^{-1}.

Form 5 Chapter 3: Integration

1. $2x^3 - 2x^2 + c$.
2. $[x^3/3]_0^3 = 27/3 - 0 = 9$.
3. $y = x^2 + x + c$; $4 = 1 + 1 + c \rightarrow c = 2$. $y = x^2 + x + 2$.

Form 5 Chapter 4: Permutation and Combination

1. 5 letters, A twice: $5! \div 2! = 60$.
2. ${}^8C_3 = 8! \div (3!\,5!) = 56$.
3. ${}^6P_4 = 6 \times 5 \times 4 \times 3 = 360$.

Form 5 Chapter 5: Probability Distribution

1. ${}^5C_2(0.3)^2(0.7)^3 = 10 \times 0.09 \times 0.343 = 0.3087$.
2. Mean $= 20$; $\sigma = \sqrt{(100 \times 0.2 \times 0.8)} = \sqrt{16} = 4$.
3. $Z = (60 - 50) \div 5 = 2$. $P(Z > 2) = 0.0228$.

Form 5 Chapter 6: Trigonometric Functions

1. $\sin x(2 \sin x - 1) = 0$. $\sin x = 0$: $x = 0°, 180°, 360°$. $\sin x = \frac{1}{2}$: $x = 30°, 150°$.
2. $\cos A = 4/5$. $\sin 2A = 2(3/5)(4/5) = 24/25$. $\cos 2A = 1 - 2(9/25) = 7/25$.
3. Maximum $2 + 1 = 3$; minimum $-2 + 1 = -1$.

Form 5 Chapter 7: Linear Programming

1. $(0, 0)$, $(8, 0)$, $(4, 4)$ [from $x + y = 8$ and $x + 2y = 12$], $(0, 6)$.
2. P: $(8, 0) \rightarrow 24$; $(4, 4) \rightarrow 28$; $(0, 6) \rightarrow 24$. Maximum P = 28 at $(4, 4)$.
3. $x + 2y = 12$ ($12 + 0 = 12$).

Form 5 Chapter 8: Kinematics of Linear Motion

1. $v = 3t^2 - 12t + 9 = 3(t - 1)(t - 3) = 0 \rightarrow t = 1$ s and $t = 3$ s. $a = 6t - 12 = -6$ m s^{-2} at $t = 1$.
2. $s(1) = 4$ m, $s(3) = 0$. Distance $= 4 + 4 = 8$ m.
3. $s = 2t^2 - t^3/3 + c$, $c = 0$. $s(3) = 18 - 9 = 9$ m.

Key Terms: English – Bahasa Melayu (2/2)

Form 5. Use the English words in your DLP answers; the BM words help when you read BM books or past papers.

English	Bahasa Melayu
radian	radian
arc length	panjang lengkok
sector	sektor
segment	tembereng
differentiation	pembezaan
first derivative	terbitan pertama
second derivative	terbitan kedua
chain rule	petua rantai
product rule	petua hasil darab
quotient rule	petua hasil bahagi
tangent	tangen
normal	normal
rate of change	kadar perubahan
small change	perubahan kecil
integration	pengamiran
indefinite integral	kamiran tak tentu
definite integral	kamiran tentu
area under a curve	luas di bawah lengkung
volume of revolution	isi padu janaan
permutation	pilih atur
combination	gabungan
factorial	faktorial
random variable	pemboleh ubah rawak
discrete	diskret
continuous	selanjar
binomial distribution	taburan binomial
normal distribution	taburan normal
standard score	skor piawai
mean	min
standard deviation	sisihan piawai
secant	sekan
cosecant	kosekan
cotangent	kotangen
identity	identiti
compound angle	sudut majmuk
double angle	sudut berganda
amplitude	amplitud
linear programming	pengaturcaraan linear
constraint	kekangan
feasible region	rantau tersaur
objective function	fungsi objektif
optimum value	nilai optimum
displacement	sesaran
velocity	halaju
acceleration	pecutan
instantaneous rest	rehat seketika
total distance	jumlah jarak
particle	zarah
fixed point	titik tetap
uniform	seragam

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