

① RIGHT-ANGLED TRIANGLE — SOH CAH TOA

Hypotenuse: opposite the right-angle (longest)

Opposite: furthest from the angle

Adjacent: beside the angle

sin = O/H cos = A/H tan = O/A

★ *Silly Old Harry, Caught A Herring, Trawling Off America*

Pythagoras: $a^2 + b^2 = c^2$

② DEGREES, RADIANs, UNIT CIRCLE

360° in a circle 2π radians in a circle

π = 180° (in tables: 1 rad = 53°)

Convert: $\times \pi/180$ (deg → rad) $\times 180/\pi$ (rad → deg)

Unit Circle: any point = (cos A, sin A)

★ *All Silly Tom Cats — quadrant signs*

• Q1: All + • Q2: Sin + • Q3: Tan + • Q4: Cos +

Reference angle rule (A in Q1):

Q2: 180–A Q3: 180+A Q4: 360–A

③ SIMPLE TRIG EQUATIONS

Method:

1. Identify quadrants from the SIGN
2. Find reference angle (Q1) — ignore sign
3. Apply quadrant rule for actual answers

If 2A in question: solve for 2A first, then ÷ 2

Add 360° to 2A repeatedly until A out of range

General form: $A = \alpha + 360^\circ n$

⚠ **WATCH:** $-1 \leq \sin A \leq 1$; $-1 \leq \cos A \leq 1$; tan A unbounded

④ COMPOUND ANGLES (A ± B)

All formulae in tables. Uses:

Type 1: Proofs (must know)

Type 2: Split angle: e.g. $75 = 30 + 45$

Type 3: Given sin A & cos B → find sin/cos/tan of A+B

Type 4: Given tan(A+B) and tan A → find tan B

✓ **TIP:** 3 terms? Group 2 together: $\cos(45 - (A+B))$

⑤ DOUBLE & HALF ANGLES

Double angle (in tables):

$$\sin 2A = 2 \sin A \cos A$$

$$\cos 2A = \cos^2 A - \sin^2 A$$

$$\tan 2A = 2 \tan A / (1 - \tan^2 A)$$

Half-angle: $\cos A = \cos^2(A/2) - \sin^2(A/2)$

★ *Halve angles on left → halve angles on right*

If you have ONE of sin A, cos A, tan A:

→ you can find the other two

⑥ PRODUCT → SUM FORMULAE

In tables — common in integration questions

$$2 \cos A \sin B = \sin(A+B) - \sin(A-B)$$

$$2 \sin A \cos B = \sin(A+B) + \sin(A-B)$$

$$2 \cos A \cos B = \cos(A-B) + \cos(A+B)$$

$$2 \sin A \sin B = \cos(A-B) - \cos(A+B)$$

⚠ **WATCH:** No '2' on the left? Multiply RHS by ½

⑦ SOLVING TRIANGLES — DECISION TREE

Step 1: Read the question — draw it!

Step 2: Fill in all known information

Step 3: Ask: IS IT RIGHT-ANGLED?

YES → SOH CAH TOA or Pythagoras

NO → Sin Rule, Cosine Rule, or Area formula

Sin Rule: need ≥ 1 angle + opposite side

Cosine Rule: (a) 2 sides + included angle → 3rd side
(b) 3 sides → angle

Area: $\frac{1}{2} ab \sin C$

★ *No length in triangle = useless triangle*

⑧ TRIG IDENTITIES

THE key identity:

$$\sin^2 A + \cos^2 A = 1$$

$$\rightarrow \sin^2 A = 1 - \cos^2 A$$

$$\rightarrow \cos^2 A = 1 - \sin^2 A$$

Method:

- Work each side SEPARATELY
- Write everything in sin and cos
- Only change a term if you GAIN by it

⚠ **WATCH:** Small letters in identity? → use sin rule or cosine rule

⑨ INVERSE TRIG & GRAPHS

$\sin^{-1} x = A$ means $\sin A = x$

⚠ **WATCH:** $\sin^{-1} x \neq 1/(\sin x)$ — they're different!

y = a + b sin(cx) or y = a + b cos(cx):

- Period = $2\pi / c$
- Range = [a – b, a + b]

Practise basic graphs of sin, cos, tan

⑩ KEY VOCAB & RULES

Horizontal: flat ground **Vertical:** standing

Elevation: UP from ground

Depression: DOWN from height

Direction: N, S, E, W

★ *LARGEST angle is OPPOSITE the LARGEST side*

3 question types: 2D, circle, 3D

⚠ **WATCH:** UNITS are vital — always state them!