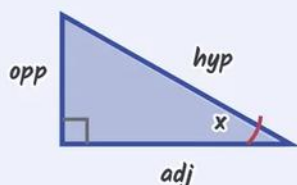


Triangles and Trigonometry

three ratios, two special shapes, and a list of triples worth knowing

Every ratio is measured from ONE angle

- opposite and adjacent are not properties of a side. They are relative to the angle you picked, and they swap the moment you switch to the other acute angle
- the hypotenuse never swaps. It is the longest side and it always faces the 90° corner
- SOH CAH TOA: Sine is O pposite over H ypotenuse, Cosine is A djacent over H ypotenuse, T angent is O pposite over A djacent
- the two acute angles of a right triangle add to 90, which is why the sine of one equals the cosine of the other



the marked angle x sits at the lower corner on the right. The vertical side faces it, so that one is opposite; the side running along the bottom into the angle is adjacent; the long slanting side is the hypotenuse

The five lines this whole topic runs on



sine of the marked angle

$$\sin x = \frac{\text{opp}}{\text{hyp}}$$

cosine

$$\cos x = \frac{\text{adj}}{\text{hyp}}$$

tangent

$$\tan x = \frac{\text{opp}}{\text{adj}}$$

Pythagoras, with c the hypotenuse

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

complementary angles, the one identity you need

$$\sin x = \cos(90^\circ - x)$$

the reference sheet carries the Pythagorean theorem and both special triangles. It does **not** carry SOH CAH TOA, so those three ratios are yours to memorise

Worked: sine, cosine and the complement

Q. in triangle PQR the angle at Q measures 90° . If

$$\sin(P) = \frac{4}{5}, \text{ what is } \cos(R)?$$

- 1 the three angles total 180 and Q takes 90, so $P + R = 90$. The two acute angles are complementary
- 2 that makes $R = 90^\circ - P$
- 3 $\cos(R) = \cos(90^\circ - P)$, and cosine of the complement is sine of the angle itself
- 4 so $\cos(R) = \sin(P) = \frac{4}{5}$

Answer $\cos(R) = \frac{4}{5}$

no side lengths were ever needed. Spotting that the two angles are complementary turns this into a one-line question