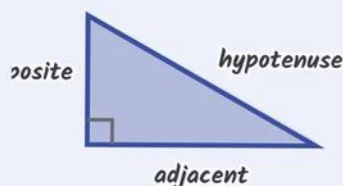


ratios of the sides of a right triangle, the identities they satisfy, and heights measured without climbing

The six ratios, defined from one angle *

- fix an acute angle θ in a right angled triangle. The side opposite θ , the side adjacent to it and the hypotenuse are then all decided
- the hypotenuse is always the side opposite the right angle and never changes whichever acute angle is chosen
- the adjacent side is the one touching θ that is not the hypotenuse
- these are ratios of lengths, so they have no units and depend only on the angle, not on the size of the triangle
- that independence is exactly why similar triangles all give the same value for a given angle



the three sides named from the point of view of the marked acute angle: swap to the other acute angle and opposite and adjacent trade places, while the hypotenuse stays where it is

The definitions and their reciprocals

sine, opposite over hypotenuse	$\sin\theta = \frac{\text{opp}}{\text{hyp}}$
cosine, adjacent over hypotenuse	$\cos\theta = \frac{\text{adj}}{\text{hyp}}$
tangent, opposite over adjacent	$\tan\theta = \frac{\text{opp}}{\text{adj}}$
cosecant, the reciprocal of sine	$\csc\theta = \frac{1}{\sin\theta}$
secant, the reciprocal of cosine	$\sec\theta = \frac{1}{\cos\theta}$
cotangent, the reciprocal of tangent	$\cot\theta = \frac{1}{\tan\theta} = \frac{\cos\theta}{\sin\theta}$

note which pairs are reciprocals: sine goes with cosecant and cosine with secant, which is the opposite of what the names suggest and is worth fixing in memory now

The standard angles, which must be known cold

θ	$\sin \theta$	$\cos \theta$	$\tan \theta$
0°	0	1	0
30°	$1/2$	$\sqrt{3}/2$	$1/\sqrt{3}$
45°	$1/\sqrt{2}$	$1/\sqrt{2}$	1
60°	$\sqrt{3}/2$	$1/2$	$\sqrt{3}$
90°	1	0	not defined

sine climbs from 0 to 1 while cosine falls from 1 to 0, so the cosine column is the sine column read upwards. Learning one column gives the other free