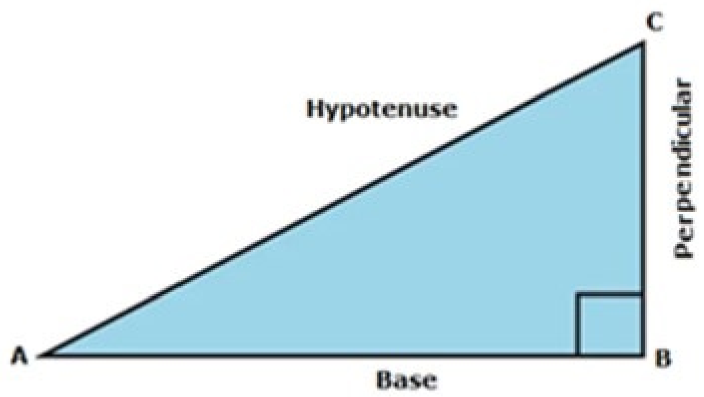
Trigonometry Class 10 Formulas: Essential Equations You Need to Know

The trigonometric formulas for ratios are majorly based on the three sides of a right-angled triangle, such as the adjacent side or base, perpendicular and hypotenuse (See the above figure). Applying Pythagoras theorem for the given right-angled triangle, we have:

$(\text{Perpendicular})^2 + (\text{Base})^2 = (\text{Hypotenuse})^2$

$\Rightarrow (P)^2 + (B)^2 = (H)^2$



let us see the Trigonometry Class 10 Formulas based on trigonometric ratios (sine, cosine, tangent, secant, cosecant and cotangent)

Trigonometry Class 10 Basic Formulas

S.no	Property	Mathematical value
1	sin A	Perpendicular/Hypotenuse
2	cos A	Base/Hypotenuse
3	tan A	Perpendicular/Base
4	cot A	Base/Perpendicular
5	cosec A	Hypotenuse/Perpendicular
6	sec A	Hypotenuse/Base

Reciprocal Relation Between Trigonometric Ratios

S.no	Identity	Relation
1	tan A	sin A/cos A
2	cot A	cos A/sin A
3	cosec A	1/sin A
4	sec A	1/cos A

Trigonometric Sign Functions

- $\sin(-\theta) = -\sin\theta$
- $\cos(-\theta) = \cos\theta$
- $\tan(-\theta) = -\tan\theta$
- $\text{cosec}(-\theta) = -\text{cosec}\,\theta$
- $\sec(-\theta) = \sec\theta$

- $\cot(-\theta) = -\cot\theta$

Trigonometric Identities

1. $\sin^2 A + \cos^2 A = 1$
2. $\tan^2 A + 1 = \sec^2 A$
3. $\cot^2 A + 1 = \mathrm{cosec}^2 A$

Periodic Identities

- $\sin(2n\pi + \theta) = \sin\theta$
- $\cos(2n\pi + \theta) = \cos\theta$
- $\tan(2n\pi + \theta) = \tan\theta$
- $\cot(2n\pi + \theta) = \cot\theta$
- $\sec(2n\pi + \theta) = \sec\theta$
- $\mathrm{cosec}(2n\pi + \theta) = \mathrm{cosec}\,\theta$

Complementary Ratios

Quadrant I

- $\sin(\pi/2 - \theta) = \cos\theta$
- $\cos(\pi/2 - \theta) = \sin\theta$
- $\tan(\pi/2 - \theta) = \cot\theta$
- $\cot(\pi/2 - \theta) = \tan\theta$
- $\sec(\pi/2 - \theta) = \mathrm{cosec}\,\theta$
- $\mathrm{cosec}(\pi/2 - \theta) = \sec\theta$

Quadrant II

- $\sin(\pi - \theta) = \sin\theta$
- $\cos(\pi - \theta) = -\cos\theta$
- $\tan(\pi - \theta) = -\tan\theta$
- $\cot(\pi - \theta) = -\cot\theta$
- $\sec(\pi - \theta) = -\sec\theta$
- $\mathrm{cosec}(\pi - \theta) = \mathrm{cosec}\,\theta$

Quadrant III

- $\sin(\pi + \theta) = -\sin\theta$
- $\cos(\pi + \theta) = -\cos\theta$
- $\tan(\pi + \theta) = \tan\theta$
- $\cot(\pi + \theta) = \cot\theta$
- $\sec(\pi + \theta) = -\sec\theta$
- $\mathrm{cosec}(\pi + \theta) = -\mathrm{cosec}\,\theta$

Quadrant IV

- $\sin(2\pi - \theta) = -\sin\theta$
- $\cos(2\pi - \theta) = \cos\theta$
- $\tan(2\pi - \theta) = -\tan\theta$
- $\cot(2\pi - \theta) = -\cot\theta$
- $\sec(2\pi - \theta) = \sec\theta$
- $\mathrm{cosec}(2\pi - \theta) = -\mathrm{cosec}\,\theta$

Sum and Difference of Two Angles

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

- $\tan(A + B) = [(\tan A + \tan B)/(1 – \tan A \tan B)]$
- $\tan(A – B) = [(\tan A – \tan B)/(1 + \tan A \tan B)]$

Double Angle Formulas

- $\sin 2A = 2 \sin A \cos A = [2 \tan A /(1 + \tan^2 A)]$
- $\cos 2A = \cos^2 A – \sin^2 A = 1 – 2 \sin^2 A = 2 \cos^2 A – 1 = [(1 – \tan^2 A)/(1 + \tan^2 A)]$
- $\tan 2A = (2 \tan A)/(1 – \tan^2 A)$

Triple Angle Formulas

- $\sin 3A = 3 \sin A – 4 \sin^3 A$
- $\cos 3A = 4 \cos^3 A – 3 \cos A$
- $\tan 3A = [3 \tan A – \tan^3 A]/[1 − 3 \tan^2 A]$

Solving problems involving heights and distances using trigonometry is an important application of the subject. Here is a step-by-step process to solve such problems:

1. Draw a diagram: Draw a diagram that represents the situation described in the problem. Label the given information and the information that needs to be found.
2. Identify the relevant angles: Identify the angles that are involved in the problem. In most cases, you will need to use the angle of elevation or the angle of depression.
3. Identify the sides: Identify the sides of the right triangle that are involved in the problem. You will need to use the opposite, adjacent, or hypotenuse.
4. Use the appropriate trigonometric ratio: Select the appropriate trigonometric ratio (sine, cosine, or tangent) based on the given information and the angle involved. Substitute the values of the known sides and angles and solve for the unknown side or angle.
5. Check your answer: Check your answer to make sure it is reasonable and makes sense in the context of the problem. Make sure you have used the correct units and have rounded to the appropriate number of decimal places.

Here is an example problem on Trigonometry Class 10 Formulas:

A person standing at the foot of a tower looks up and sees that the angle of elevation to the top of the tower is 60°. The person walks 50 meters away from the tower and then looks up again. This time, the angle of elevation to the top of the tower is 30°. How tall is the tower?

Solution:

1. Draw a diagram: Draw a diagram that represents the situation described in the problem. Label the given information and the information that needs to be found.
2. Identify the relevant angles: The angles of elevation to the top of the tower are 60° and 30°.
3. Identify the sides: The height of the tower is the unknown side, which we'll call 'h'. The distance from the tower to the person is 50 meters, which is the adjacent side for the angle of 60° and the opposite side for the angle of 30°.
4. Use the appropriate trigonometric ratio: For the angle of 60°, we can use the tangent ratio: $\tan 60° = h/50$ Simplifying the equation, $h = 50 * \tan 60°$ $h = 50 * \sqrt{3}$ $h = 86.6$ meters (rounded to one decimal place)

   For the angle of 30°, we can use the tangent ratio: $\tan 30° = h/\text{distance from tower}$ Substituting the known values, $h = 50 * \tan 30°$ $h = 50 * 1/\sqrt{3}$ $h = 28.9$ meters (rounded to one decimal place)

   Check your answer: The height of the tower should be between 28.9 meters and 86.6 meters, since it can't be taller than what we calculated for the angle of 60° and it can't be shorter than what we calculated for the angle of 30°. The answer of 86.6 meters makes more sense, as it is taller than the one calculated for the 30° angle. Therefore, the height of the tower is approximately 86.6 meters.

Some Practice Questions on Trigonometry Class 10 Formulas

Example 1:

If $\sin A = 3/5$, then find the value of cos A and cot A.

Solution:

Given,

$\sin A = 3/5$

Using the identity, $\sin^2 A + \cos^2 A = 1$,

$\cos^2 A = 1 - (3/5)^2$

$= (25 - 9)/25$

$= 16/25$

Considering only the positive part,

$\cos A = 4/5$

Also, $\cot A = \cos A/\sin A = (4/5)/(3/5) = 4/3$

Example 2:

Evaluate sin 35° cos 55° + cos 35° sin 55°.

Solution:

Given expression:

sin 35° cos 55° + cos 35° sin 55°

This is of the form sin A cos B + cos A sin B.

Thus, by using the identity sin(A + B) = sin A cos B + cos A sin B, we get;

sin 35° cos 55° + cos 35° sin 55° = sin(35° + 55°) = sin 90° = 1

Example 3:

If tan P = cot Q, then prove that P + Q = 90°.

Solution:

Given,

tan P = cot Q

As we know, tan(90° – A) = cot A.

So, tan P = tan(90° – Q)

Therefore, P = 90° – Q

And

P + Q = 90°

Hence proved.