NCERT Solutions for Class 10 Maths Chapter 8 Exercise 8.1: The NCERT Solutions for Class 10 Maths Chapter 8 Exercise 8.1 focus on the fundamentals of trigonometry, introducing students to trigonometric ratios such as sine, cosine, tangent, cosecant, secant, and cotangent. This exercise emphasizes calculating these ratios in right-angled triangles, helping students understand their relationships and applications.

By solving these questions, students gain a solid foundation in trigonometric concepts, preparing them for more complex problems in the subsequent exercises.

NCERT Solutions for Class 10 Maths Chapter 8 Exercise 8.1 Overview

Exercise 8.1 of Chapter 8 Introduction to Trigonometry, introduces students to the core concepts of trigonometric ratios in right-angled triangles. The questions focus on defining sine, cosine, tangent, cosecant, secant, and cotangent using the sides of a triangle.

Students are required to calculate these ratios and establish relationships among them, such as reciprocal and quotient identities. This exercise lays the groundwork for understanding how trigonometry works, making it an essential step in mastering this branch of mathematics. It helps develop problem-solving skills and enhances understanding of trigonometric applications in real-life contexts.

NCERT Solutions for Class 10 Maths Chapter 8 Exercise 8.1 PDF

The NCERT Solutions for Class 10 Maths Chapter 8 Exercise 8.1 provide step-by-step explanations for solving problems related to trigonometric ratios. These solutions help students grasp the foundational concepts of trigonometry and build confidence in tackling related questions effectively. To make learning easier, a PDF containing detailed solutions is available for download below. Students can use this resource for offline study and thorough revision.

NCERT Solutions for Class 10 Maths Chapter 8 Exercise 8.1 PDF

NCERT Solutions for Class 10 Maths Chapter 8 Introduction to Trigonometry Exercise 8.1

Below is the NCERT Solutions for Class 10 Maths Chapter 8 Introduction to Trigonometry Exercise 8.1

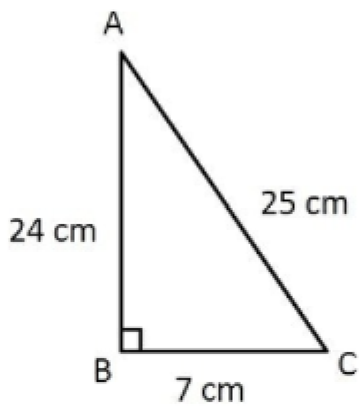
Solve the followings Questions.

1. In Δ ABC, right-angled at B, AB = 24 cm, BC = 7 cm. Determine :
(i) sin A, cos A
(ii) sin C, cos C

Answer:

Let us draw a right angled triangle ABC, right angled at B.

Using Pythagoras theorem,



$AC^2 = AB^2 + BC^2$

[By using Pythagoras theorem]

$AC^2 = 24^2 + 7^2$

$AC^2 = 576 + 49$

$AC^2 = 625$

$AC = \sqrt{625}$

AC= 25

(i) Hypotenuse (AC) = 25

By definition,

sin A = $\frac{Perpendicular\ side\ opposite\ to\ angle\ A}{Hypotenuse}$

sin A = $\frac{BC}{AC}$

sin A = $\frac{7}{25}$

And,

cos A = $\frac{Base\ side\ adjacent\ to\ angle\ A}{Hypotenuse}$

cos A = $\frac{AB}{AC}$

cos A = $\frac{24}{25}$

sin C = $\frac{Perpendicular\ side\ opposite\ to\ angle\ C}{Hypotenuse}$

sin C = $\frac{AB}{AC}$

sin C = $\frac{24}{25}$

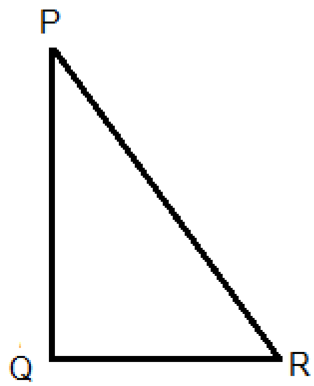
And,

cos C = $\frac{Base\ side\ adjacent\ to\ angle\ C}{Hypotenuse}$

(ii)

$$\text{Cos C} = \frac{\mathbf{BC}}{\mathbf{AC}} = \frac{7}{25}$$,

2. In adjoining figure, find tan P – cot R.



Answer:

using Pythagoras law we got

$QR^2 = PR^2 - PQ^2$

=> $QR = \sqrt{PR^2 - PQ^2}$

=> $QP = \sqrt{(13)^2 - (12)^2}$

=> $QP = \sqrt{169 - 144}$

=> $QP = \sqrt{25}$

=> $QP = 5$

now

tan P - Cot R

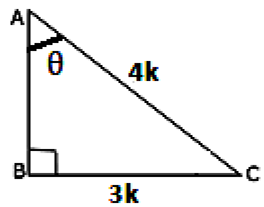
= 5/12 - 5/12

= 0

3. If sin A =3/4, calculate cos A and tan A.

Answer:

Given: A triangle ABC in which

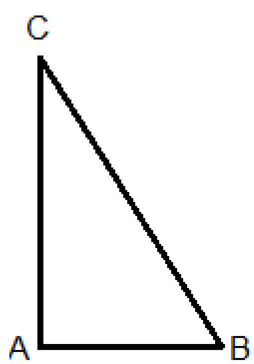


B =90

We know that sin A = BC/AC = 3/4
Let BC be 3k and AC will be 4k where k is a positive real number.
By Pythagoras theorem we get,
$AC^2 = AB^2 + BC^2$
$(4k)^2 = AB^2 + (3k)^2$
$16k^2 - 9k^2 = AB^2$
$AB^2 = 7k^2$
AB = $\sqrt{7}$ k
cos A = AB/AC = $\sqrt{7}$ k/4k = $\sqrt{7}/4$
tan A = BC/AB = 3k/$\sqrt{7}$ k = 3/$\sqrt{7}$

4. Given 15 cot A = 8, find sin A and sec A.

Answer:

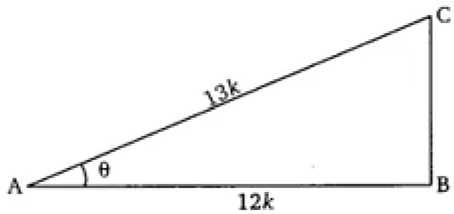


Let ΔABC be a right-angled triangle, right-angled at B.
We know that cot A = AB/BC = 8/15 (Given)
Let AB be 8k and BC will be 15k where k is a positive real number.
By Pythagoras theorem we get,
$AC^2 = AB^2 + BC^2$
$AC^2 = (8k)^2 + (15k)^2$
$AC^2 = 64k^2 + 225k^2$
$AC^2 = 289k^2$
AC = 17 k
sin A = BC/AC = 15k/17k = 15/17
sec A = AC/AB = 17k/8 k = 17/8

5. Given sec θ = 13/12, calculate all other trigonometric ratios.

Answer:

Consider a triangle ABC in which



Let AB = 12k and AC = 13k

Then, using Pythagoras theorem,

(AC)2 = (AB)2 + (BC)2

(13 *k*)2 = (12 *k*)2 + (BC)2

169 *k*2 = 144 *k*2 + BC2

25 *k*2 = BC2

BC = 5 *k*

(I) Sin θ = $\frac{BC}{AC}$

= $\frac{5k}{13k}$ = $\frac{5}{13}$

(ii) Cos θ = $\frac{AB}{AC}$

= $\frac{12k}{13k}$ = $\frac{12}{13}$

(iii)Tan θ = $\frac{BC}{AB}$

= $\frac{5k}{12k}$ = $\frac{5}{12}$

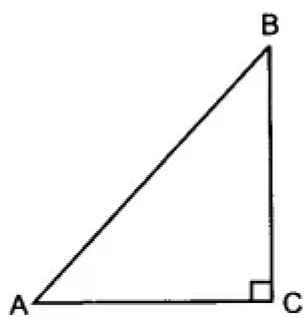
(iv) Cot θ = $\frac{AB}{BC}$

= $\frac{12k}{5k}$ = $\frac{12}{5}$

(v) Cosec θ = $\frac{AC}{BC}$

= $\frac{13k}{5k}$ = $\frac{13}{5}$

6. If ∠A and ∠B are acute angles such that cos A = cos B, then show that ∠A = ∠B.



Answer:

cosA=cos

In a right angled triangle ABC,

cos A = $\frac{AC}{AB}$ and cos B = $\frac{BC}{AB}$

∵ cos A = cos B

$\frac{AC}{AB} = \frac{BC}{AB}$

∴ AC = BC

We have, opposite sides of equal angles are equal.

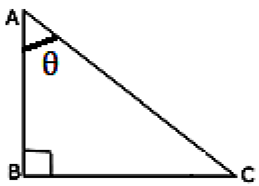
Therefore, In a right angled triangle ABC

But ∠A = ∠B = 45°

7. If cot θ =7/8, evaluate :
(i)(1+sin θ)(1-sin θ)/(1+cos θ)(1-cos θ)
(ii) $\cot^2\theta$

Answer:

Consider a triangle ABC



$$\frac{(1+sin\theta)(1-sin\theta)}{(1+cos\theta)(1-cos\theta)}$$

given = cot θ = $\frac{7}{8}$

Taking the numerator, we have

(1+sin θ)(1–sin θ) = 1 – $\sin^2\theta$ **[Since, (a+b)(a-b) = $a^2 - b^2$]**

Similarly,

(1 + cos θ)(1 – cos θ) = 1 – $\cos^2\theta$

We know that,

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

⇒ $1 - \cos^2\theta = \sin^2\theta$

And,

$1 - \sin^2 \theta = \cos^2 \theta$

Thus,

$(1 + \sin \theta)(1 - \sin \theta) = 1 - \sin^2 \theta = \cos^2 \theta$

$(1 + \cos \theta)(1 - \cos \theta) = 1 - \cos^2 \theta = \sin^2 \theta$

$\Rightarrow \frac{(1+sin\theta)(1-sin\theta)}{(1+cos\theta)(1-cos\theta)}$

$= \cos2 \theta / \sin2 \theta$

$= (\frac{\cos \theta}{\sin \theta})^2$

And, we know that

$(\frac{\cos \theta}{\sin \theta}) = \cot \theta$

$\frac{(1+\sin \theta)(1-\sin \theta)}{(1+\cos \theta)(1-\cos \theta)}$

$= (\cot \theta)^2$

$= (\frac{7}{8})^2$

(ii)

Given,

$\cot \theta = \frac{7}{8}$

So, by squaring on both sides we get

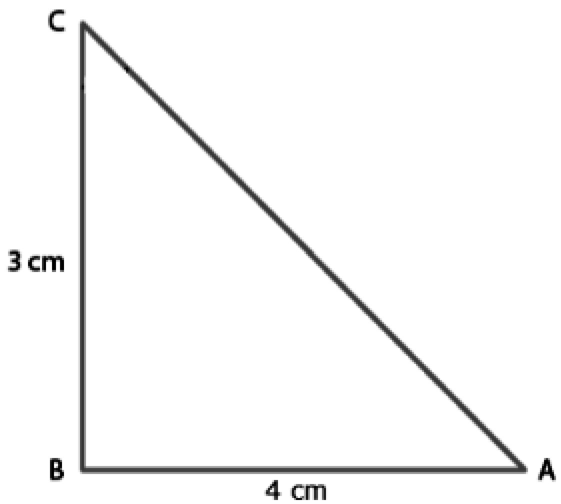
$(\cot \theta)^2 = (\frac{7}{8})^2$

$\therefore \cot^2 \theta = \frac{49}{64}$

8. If 3cot A = 4/3 , check whether $(1-\tan^2 A)/(1+\tan^2 A) = \cos^2 A - \sin^2 A$ or not.

Answer:

Consider a triangle ABC AB=4cm, BC= 3cm



3 cot A = 4

⇒ cot A = $\frac{4}{3}$

By definition,

tan A = $\frac{1}{Cot\ A}$ = $\frac{1}{(\frac{4}{3})}$

⇒ tan A = $\frac{3}{4}$

Thus, Base side adjacent to ∠A = 4

Perpendicular side opposite to ∠A = 3

In ΔABC, Hypotenuse is unknown

Thus, by applying Pythagoras theorem in ΔABC

We get

$AC^2 = AB^2 + BC^2$

$AC^2 = 4^2 + 3^2$

$AC^2 = 16 + 9$

$AC^2 = 25$

AC = 5

Hence, hypotenuse = 5

Now, we can find that

sin A = $\frac{opposite\ side\ to\ \angle A}{Hypotenuse}$ = $\frac{3}{5}$

And,

cos A = $\frac{adjacent\ side\ to\ \angle A}{Hypotenuse}$ = $\frac{4}{5}$

Taking the LHS,

L.H.S = $\frac{1 - \tan^2 A}{1 + \tan^2 A}$

Putting value of tan A

We get,

L.H.S= $\frac{1 - (\frac{3}{4})^2}{1 + (\frac{3}{4})^2}$

And

$$\frac{1 - \tan^2 A}{1 + \tan^2 A} = \frac{1 - (\frac{3}{4})^2}{1 + (\frac{3}{4})^2}$$

$\cos^2 A - \sin^2 A = \left(\frac{4}{5}\right)^2 - \left(\frac{3}{5}\right)^2$

$\cos^2 A - \sin^2 A = \frac{16}{25} - \frac{9}{25}$

$\cos^2 A - \sin^2 A = \frac{16-9}{25}$

$\cos^2 A - \sin^2 A = \frac{7}{25}$

Therefore,

$$\frac{1-\tan^2 A}{1+\tan^2 A} = \cos^2 A - \sin^2 A$$

Hence Proved

9. In triangle ABC, right-angled at B, if tan A =1/√3 find the value of:

(i) sin A cos C + cos A sin C
(ii) cos A cos C – sin A sin C

Answer:

Consider a triangle ABC in which

$\tan A = \frac{1}{\sqrt{3}}$

$\frac{P}{B} = \frac{1}{\sqrt{3}}$

Let $P = k$ and $B = k\sqrt{3}$

Now by Pythagoras theorem

$P^2 + B^2 = H^2$

H=2k

(i)

$$SinACosC + CosASinC = \left(\frac{P}{H}\right)\left(\frac{B}{H}\right) + \left(\frac{B}{H}\right)\left(\frac{P}{H}\right)$$
$$= \left(\frac{BC}{AC}\right)\left(\frac{BC}{AC}\right) + \left(\frac{AB}{AC}\right)\left(\frac{AB}{AC}\right)$$
$$= \frac{k^2}{4k^2} + \frac{3k^2}{4k^2} = 1$$

(ii)

$$CosACosC - SinASinC = \left(\frac{P}{H}\right)\left(\frac{P}{H}\right) + \left(\frac{B}{H}\right)\left(\frac{B}{H}\right)$$
$$= \left(\frac{BC}{AC}\right)\left(\frac{AB}{AC}\right) - \left(\frac{AB}{AC}\right)\left(\frac{BC}{AC}\right)$$
$$= 0$$

10. In Δ PQR, right-angled at Q, PR + QR = 25 cm and PQ = 5 cm. Determine the values of sin P, cos P and tan P.

Answer:

Given that, PR + QR = 25 , PQ = 5
Let PR be x. ∴ QR = 25 - x
By Pythagoras theorem ,
PR2 = $PQ^2 + QR^2$
$x^2 = (5)2 + (25 - x)^2$
$x^2 = 25 + 625 + x^2 - 50x$
50x = 650
x = 13
∴ PR = 13 cm
QR = (25 - 13) cm = 12 cm
sin P = QR/PR = 12/13
cos P = PQ/PR = 5/13
tan P = QR/PQ = 12/5

11. State whether the following are true or false. Justify your answer.
(i) The value of tan A is always less than 1.
(ii) sec A = 12/5 for some value of angle A.
(iii) cos A is the abbreviation used for the cosecant of angle A.
(iv) cot A is the product of cot and A.
(v) sin θ = 4/3 for some angle θ.

Answer:

i) False.
In ΔABC in which ∠B = 90º,
AB = 3, BC = 4 and AC = 5
Value of tan A = 4/3 which is greater than.
The triangle can be formed with sides equal to 3, 4 and hypotenuse = 5 as it will follow the Pythagoras theorem.
$AC^2 = AB^2 + BC^2$
$5^2 = 3^2 + 4^2$
25 = 9 + 16
25 = 25

(ii) True.
Let a ΔABC in which ∠B = 90º,AC be 12k and AB be 5k, where k is a positive real number.
By Pythagoras theorem we get,
$AC^2 = AB^2 + BC^2$
$(12k)^2 = (5k)^2 + BC^2$
$BC^2 + 25k^2 = 144k^2$
$BC^2 = 119k^2$
Such a triangle is possible as it will follow the Pythagoras theorem.

(iii) False.
Abbreviation used for cosecant of angle A is cosec A.cos A is the abbreviation used for cosine of angle A.

(iv) False.
cot A is not the product of cot and A. It is the cotangent of ∠A.

(v) False.
sin θ = Height/Hypotenuse
We know that in a right angled triangle, Hypotenuse is the longest side.
∴ sin θ will always less than 1 and it can never be 4/3 for any value of θ.

Benefits of Solving NCERT Solutions for Class 10 Maths Chapter 8 Exercise 8.1

Understanding Trigonometric Ratios: Exercise 8.1 focuses on introducing students to trigonometric ratios such as sine, cosine, and tangent, helping them grasp their definitions and applications effectively.

Improves Calculation Skills: Practicing these problems sharpens calculation skills and familiarizes students with the numerical aspect of trigonometry.

Preparation for Exams: These solutions follow the NCERT pattern, ensuring alignment with the CBSE syllabus, which helps in scoring well in board exams.

Clarity of Complex Topics: Detailed explanations simplify the learning of complex trigonometric concepts and make them easier to understand.