NCERT Solutions Class 10 Maths
Chapter 8: Introduction to Trigonometry
Exercise 8.3

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Quick Summary: In NCERT Solutions Class 10 Maths Chapter 8 Exercise 8.3, students learn about trigonometric ratios of complementary angles and fundamental trigonometric identities. This exercise covers the relationships between trigonometric functions and their co-functions, along with standard trigonometric identities that are essential for solving complex problems in CBSE Class 10 board exams and competitive tests.

Key Takeaways:

- Complementary angle relationships: \sin(90° - A) = \cos A and \cos(90° - A) = \sin A
- Standard trigonometric identities including \sin^2 A + \cos^2 A = 1 and related derived identities
- Expression of trigonometric ratios in terms of one another using fundamental identities
- Step-by-step identity proof techniques essential for CBSE exam problem-solving

Complete Solutions

Question 1

QUESTION

Express the trigonometric ratios sin A, sec A and tan A in terms of cot A.

SOLUTION

Goal: Express , , and only in terms of .

Step 1: Start from the basic definitions

We know the reciprocal and quotient relations:

and .

Step 2: Write in terms of

Since and are reciprocals,

.

Step 3: Use the identity

One important Pythagorean identity is:

.

Taking square root on both sides (for acute angles, values are positive):

.

Step 4: Convert to

We know .

So,

Taking reciprocal:

.

Step 5: Find in terms of

We use another identity:

and also .

A quicker way is to use:

.

Now substitute :

.

Since ,

.

Final Results:

, , .

Student Tip: When you are asked to write ratios in terms of , the identity is the fastest starting point.

ANSWER

\sin A = (1)/(√1 + \cot^2 A)

\tan A = (1)/(\cot A)

\sec A = √1 + \cot^2 A\cot A

Question 2

QUESTION

Write all the other trigonometric ratios of \angle A in terms of sec A.

SOLUTION

Goal: Express all other trigonometric ratios of in terms of .

Step 1: Start with the definition of secant

We know:

So, directly:

Step 2: Use the identity connecting and

One very important identity is:

Rearrange it to get :

Now take square root on both sides:

Student Note: In school problems like this, we usually take the positive root because is taken as an **acute angle** in a right triangle (so trigonometric ratios are positive).

Step 3: Find using and

We know:

and .

Divide by :

So,

Substitute :

Step 4: Find and using reciprocals

is the reciprocal of :

is the reciprocal of :

Final Results (in terms of):

ANSWER

\sin A = √\sec^2 A - 1\sec A

\cos A = (1)/(\sec A)

\tan A = √\sec^2 A - 1

$$\cot A = \frac{1}{\sqrt{\sec^2 A - 1}}$$

$$\text{cosec}\, A = \frac{\sec A}{\sqrt{\sec^2 A - 1}}$$

Question 3

QUESTION

Choose the correct option. Justify your choice:

1. 9 \sec^2 A - 9 \tan^2 A =
   (A) 1   (B) 9   (C) 8   (D) 0
2. (1 + \tan θ + \sec θ)(1 + \cot θ - \textcosec θ) =
   (A) 0   (B) 1   (C) 2   (D) -1
3. (\sec A + \tan A)(1 - \sin A) =
   (A) \sec A   (B) \sin A   (C) \text{cosec } A   (D) \cos A
4. (1 + \tan^2 A)/(1 + \cot^2 A) =
   (A) \sec^2 A   (B) -1   (C) \cot^2 A   (D) \tan^2 A

SOLUTION

We will use standard trigonometric identities to simplify each expression and then match it with the correct option.

Useful identities (keep in mind):

, , ,

, .

(i)

Take 9 common:

.

Using ,

.

Correct option: (B) 9.

(ii)

Step 1: Rewrite each bracket in a helpful way.

.

Also,

.

Step 2: Multiply them:

Step 3: Use with :

Expand :

.

So numerator becomes:

.

Therefore,

.

Correct option: (C) 2.

(iii)

Step 1: Write in terms of and :

.

Step 2: Multiply:

.

Step 3: Use :

.

Correct option: (D) .

(iv)

Use identities:

and .

So,

.

Now write in and :

.

Correct option: (D) .

Final Answers: (i) B, (ii) C, (iii) D, (iv) D.

ANSWER

(i) B

(ii) C

(iii) D

(iv) D

Question 4

QUESTION

Prove the following identities, where the angles involved are acute angles for which the expressions are defined:

1. $(\text{cosec}\,\theta - \cot\theta)^2 = (1 - \cos\theta)/(1 + \cos\theta)$
2. $(\cos A)/(1 + \sin A) + (1 + \sin A)/(\cos A) = 2 \sec A$
3. $(\tan\theta)/(1 - \cot\theta) + (\cot\theta)/(1 - \tan\theta) = 1 + \sec\theta\, \text{cosec}\,\theta$
4. $(1 + \sec A)/(\sec A) = (\sin^2 A)/(1 - \cos A)$
5. $(\cos A - \sin A + 1)/(\cos A + \sin A - 1) = \text{cosec}\, A + \cot A$
6. $\sqrt{(1 + \sin A)/(1 - \sin A)} = \sec A + \tan A$
7. $(\sin\theta - 2 \sin^3\theta)/(2 \cos^3\theta - \cos\theta) = \tan\theta$
8. $(\sin A + \text{cosec}\, A)^2 + (\cos A + \sec A)^2 = 7 + \tan^2 A + \cot^2 A$
9. $(\text{cosec}\, A - \sin A)(\sec A - \cos A) = (1)/(\tan A + \cot A)$
10. $(1 + \tan^2 A)/(1 + \cot^2 A) = \left((1 - \tan A)/(1 - \cot A) \right)^2 = \tan^2 A$

SOLUTION

Note: In identity proofs, we usually start from one side (LHS) and simplify step-by-step using standard identities until we get the other side (RHS). Since the angles are acute, all values like are positive and denominators stay non-zero (where defined).

Useful identities (we will use repeatedly):

, , ,

,

(i) Prove:

LHS

Now use .

So,

. Hence proved.

(ii) Prove:

LHS

Take LCM :

Expand numerator:

Group :

So,

. Hence proved.

(iii) Prove:

LHS

Write , :

First term:

Second term:

Note , so:

Second term

Now add:

Take common denominator :

Use with , :

Cancel :

Replace :

But **.**

So, . Hence proved.

(iv) Prove:

LHS

RHS

Use :

So LHS = RHS. Hence proved.

(v) Prove:

LHS

Multiply numerator and denominator by (a helpful conjugate-type factor):

Numerator is of form with , :

Numerator

But . So numerator:

Now use :

So numerator **.**

Denominator:

Therefore,

. Hence proved.

(vi) Prove:

Start with LHS:

Multiply inside by :

But . So:

For acute angles, , so:

. Hence proved.

(vii) Prove:

LHS

Factor numerator and denominator:

Numerator

Denominator

So,

Now use :

So the fraction becomes 1, hence:

. Hence proved.

(viii) Prove:

LHS

Expanding both squares:

Since , this becomes:

Since , we get:

Adding both expressions:

Using identities , , and :

Hence proved:

(ix) Prove:

LHS

Write in :

Use and :

RHS

So LHS = RHS. Hence proved.

(x) Prove:

Part 1:

Use and :

Part 2:

Inside the bracket, write . Let ():

But , so:

Now square it:

So both expressions equal . Hence proved.

Final Note: In proofs, always keep denominators non-zero and use identities like , , and to simplify quickly.

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📝 Key Formulas

Important Formulas for Exercise 8.3

Formula / Concept	Description
Complementary Angles	Two angles are said to be complementary if their sum is equal to 90°. For an angle A, its complementary angle is 90^\circ - A.
	The sine of an angle's complement is equal to the cosine of the angle.

Formula / Concept	Description
\sin(90^\circ - A) = \cos A	
\cos(90^\circ - A) = \sin A	The cosine of an angle's complement is equal to the sine of the angle.
\tan(90^\circ - A) = \cot A	The tangent of an angle's complement is equal to the cotangent of the angle.
\cot(90^\circ - A) = \tan A	The cotangent of an angle's complement is equal to the tangent of the angle.
\sec(90^\circ - A) = \csc A	The secant of an angle's complement is equal to the cosecant of the angle.
\csc(90^\circ - A) = \sec A	The cosecant of an angle's complement is equal to the secant of the angle.
Trigonometric Ratios	Basic ratios in a right-angled triangle: \sin A = \textPerpendicular\textHypotenuse \cos A = \textBase\textHypotenuse \tan A = \textPerpendicular\textBase
Reciprocal Identities	\csc A = (1)/(\sin A) \sec A = (1)/(\cos A) \cot A = (1)/(\tan A)

? Top FAQs

Q1. How many questions are in NCERT Solutions Class 10 Maths Chapter 8 Introduction to Trigonometry Exercise 8.3 for CBSE board exam 2025-26?

NCERT Solutions Class 10 Maths Chapter 8 Introduction to Trigonometry Exercise 8.3 contains exactly 4 questions focused on trigonometric ratios of complementary angles. These questions cover important concepts that carry weightage in the CBSE Class 10 board exam 2025-26 and are essential for mastering trigonometric identities.

Q2. Where can I download free PDF of NCERT Solutions for Class 10 Maths Chapter 8 Introduction to Trigonometry Exercise 8.3 with step by step solutions?

You can download the free PDF of NCERT Solutions for Class 10 Maths Chapter 8 Introduction to Trigonometry Exercise 8.3 from the official NCERT website or various educational portals. These PDFs contain detailed step by step solutions for all 4 questions, making them ideal for CBSE board exam 2025-26 preparation and self-study.

Q3. How many marks does Introduction to Trigonometry Chapter 8 Exercise 8.3 carry in CBSE Class 10 Maths board exam 2025-26?

Introduction to Trigonometry Chapter 8 is part of Unit IV (Trigonometry) which carries approximately 8 marks in CBSE Class 10 Maths board exam 2025-26. Exercise 8.3 specifically covers trigonometric ratios of complementary angles, which are frequently asked in board exams and form the foundation for advanced trigonometric problems.

Q4. Which is the most difficult question in NCERT Solutions Class 10 Maths Chapter 8 Introduction to Trigonometry Exercise 8.3 for step by step practice?

Question 4 in Exercise 8.3 of Class 10 Maths Chapter 8 Introduction to Trigonometry is generally considered the most challenging as it involves complex applications of complementary angle identities. Students are advised to practice this question with step by step solutions to master the concept thoroughly for CBSE board exam 2025-26.

Q5. What is the concept of Trigonometric Ratios of Complementary Angles in NCERT Class 10 Maths Chapter 8 Introduction to Trigonometry Exercise 8.3?

Trigonometric Ratios of Complementary Angles in NCERT Class 10 Maths Chapter 8 Exercise 8.3 explain the relationship between trigonometric functions where the sum of two angles equals 90°. Key identities include $\sin(90°-\theta) = \cos\theta$, $\tan(90°-\theta) = \cot\theta$, and $\sec(90°-\theta) = \operatorname{cosec}\theta$, which are crucial for CBSE board exam 2025-26 and solving higher-level trigonometry problems.

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