NCERT Solutions Class 11 Maths
Chapter 3: Trigonometric Functions
EXERCISE 3.2

Document Information:
Class: 11 | **Subject:** Mathematics | **Chapter:** 3 | **Exercise:** 3.2
Total Questions: 10 | **Academic Year:** 2025-26
Source: www.ncertbooks.net | **Generated:** February 21, 2026

Quick Summary: In NCERT Solutions Class 11 Maths Chapter 3 Exercise 3.2, students learn to find all trigonometric ratios when one ratio and quadrant are given. This exercise covers fundamental trigonometric identities and their applications, which are essential for solving complex problems in CBSE board exams and competitive tests.

Key Takeaways:

- Master the Pythagorean identity: \sin^2 x + \cos^2 x = 1 to find unknown ratios
- Apply reciprocal relationships: \sec x = (1)/(\cos x), \csc x = (1)/(\sin x), \cot x = (1)/(\tan x)
- Use quotient identities: \tan x = (\sin x)/(\cos x) and \cot x = (\cos x)/(\sin x)
- Determine correct signs of trigonometric ratios based on the given quadrant using ASTC rule

Complete Solutions

Question 1

QUESTION

cos x = -(1)/(2), x lies in the third quadrant. Find the other five trigonometric ratios.

SOLUTION

We are given that and that lies in the third quadrant. Our goal is to find the values of the other five trigonometric ratios: , , , , and .

Step 1: Find using the Pythagorean identity

We know that . Substituting the given value of :

Since lies in the third quadrant, is negative. Therefore, .

Step 2: Find

is the reciprocal of , so:

Step 3: Find

is the reciprocal of , so:

Step 4: Find

Step 5: Find

is the reciprocal of , so:

Final Answer:

, , , ,

ANSWER

\sin x = -√32, \csc x = -(2)/(√3), \sec x = -2, \tan x = √3, \cot x = (1)/(√3)

Question 2

QUESTION

sin x = (3)/(5), x lies in second quadrant. Find the other five trigonometric ratios.

SOLUTION

We are given that and that lies in the second quadrant. We need to find the other five trigonometric ratios.

Step 1: Find

Since is the reciprocal of , we have:

Step 2: Find

We know the identity . Therefore:

Taking the square root, we get . Since lies in the second quadrant, is negative. Therefore:

Step 3: Find

Since is the reciprocal of , we have:

Step 4: Find

We know that . Therefore:

Step 5: Find

Since is the reciprocal of , we have:

Final Answer:

, , , ,

ANSWER

\csc x = (5)/(3), \cos x = -(4)/(5), \sec x = -(5)/(4), \tan x = -(3)/(4), \cot x = -(4)/(3)

Question 3

QUESTION

cot x = (3)/(4), x lies in third quadrant. Find the other five trigonometric ratios.

SOLUTION

We are given that and that lies in the third quadrant. We need to find the other five trigonometric ratios.

Step 1: Find

Since is the reciprocal of , we have:

Since is in the third quadrant, is positive, which agrees with our calculation.

Step 2: Find using the identity

We have , so:

Step 3: Find

Since , and , we have .

Since is in the third quadrant, is negative. Therefore:

Step 4: Find

Since , we have:

Step 5: Find using the identity

We have , so:

Thus, .

Since is in the third quadrant, is negative. Therefore:

Step 6: Find

Since , we have:

Final Answer:

, , , ,

ANSWER

\sin x = -(4)/(5), \csc x = -(5)/(4), \cos x = -(3)/(5), \sec x = -(5)/(3), \tan x = (4)/(3)

Question 4

QUESTION

sec x = (13)/(5), x lies in fourth quadrant. Find the other five trigonometric ratios.

SOLUTION

We are given that and that lies in the fourth quadrant. Our goal is to find the other five trigonometric ratios.

Step 1: Find

Since is the reciprocal of , we have:

Step 2: Find using the identity

We know that . Substituting the value of , we get:

Step 3: Determine the sign of

Since lies in the fourth quadrant, is negative. Therefore:

Step 4: Find

Since is the reciprocal of , we have:

Step 5: Find

We know that . Substituting the values of and , we get:

Step 6: Find

Since is the reciprocal of , we have:

Therefore, the other five trigonometric ratios are:

, , , ,

ANSWER

\sin x = -(12)/(13), \csc x = -(13)/(12), \cos x = (5)/(13), \tan x = -(12)/(5), \cot x = -(5)/(12)

Question 5

QUESTION

tan x = -(5)/(12), x lies in second quadrant. Find the other five trigonometric ratios.

SOLUTION

We are given that and that lies in the second quadrant. We need to find the other five trigonometric ratios.

Step 1: Find the value of using the identity

We know that . Substituting the given value of :

Step 2: Find the value of

Taking the square root of both sides:

Since lies in the second quadrant, is negative. Therefore, is also negative.

Step 3: Find the value of

Since , we have:

Step 4: Find the value of using the identity

We know that . Substituting the value of :

Since lies in the second quadrant, is positive.

Step 5: Find the values of and

Final Answer:

, , , ,

ANSWER

\sin x = (5)/(13), \csc x = (13)/(5), \cos x = -(12)/(13), \sec x = -(13)/(12), \cot x = -(12)/(5)

Question 6

QUESTION

Find \sin 765^\circ.

SOLUTION

We need to find the value of . Since trigonometric functions are periodic, we can reduce the angle to an equivalent angle within the range of to .

Step 1: Reduce the angle

We know that the sine function has a period of , meaning . We can subtract multiples of from until we get an angle between and .

Therefore, .

Step 2: Evaluate the sine of the reduced angle

We know that .

This is a standard trigonometric value that is often memorized or can be derived from a 45-45-90 triangle.

Step 3: State the final answer

Therefore, .

Final Answer:

ANSWER

(1)/(√2)

Question 7

QUESTION

Find \csc(-1410^\circ).

SOLUTION

We need to find the value of .

Step 1: Use the property of cosecant function

The cosecant function is an odd function, which means . Therefore,

Step 2: Reduce the angle to its principal value

To find the value of , we need to find an angle between and that is coterminal with . We can do this by dividing by and finding the remainder.

with a remainder of . This means .

Therefore, .

Step 3: Find the reference angle

Since is in the fourth quadrant, its reference angle is .

Step 4: Determine the sign of cosecant in the fourth quadrant

In the fourth quadrant, sine is negative, so cosecant is also negative. Therefore, .

Step 5: Evaluate the cosecant of the reference angle

We know that , so .

Step 6: Substitute back to find the final answer

We have . Therefore, .

Finally, .

Final Answer: 2

ANSWER

2

Question 8

QUESTION

Find \tan \left((19π)/(3) \right).

SOLUTION

We need to find the value of . To do this, we will first simplify the angle to lie within a standard range (usually to).

Step 1: Simplify the angle

We can write as a multiple of plus a remainder:

Since represents three full rotations, we can ignore it when evaluating trigonometric functions because the values repeat every .

Therefore, .

Step 2: Evaluate the tangent function

We know that is equal to 60 degrees. We can recall the standard trigonometric values for this angle.

Recall that .

We have and .

Therefore, .

Final Answer:

ANSWER

√3

Question 9

QUESTION

Find \sin\left(-(11π)/(3) \right).

SOLUTION

We need to find the value of .

Step 1: Simplify the angle

Since the sine function has a period of , we can add or subtract multiples of without changing the value of the sine. We want to find an angle between and that is coterminal with . We can add to :

Therefore, .

Step 2: Evaluate the sine function

We know that is a standard angle (60 degrees), and we know the value of its sine:

Step 3: State the final answer

Therefore, .

Final Answer:

ANSWER

√32

Question 10

QUESTION

Find \cot\left(-(15π)/(4) \right).

SOLUTION

We need to find the value of .

Step 1: Use the property that cotangent is an odd function

The cotangent function is odd, which means . Therefore,

Step 2: Simplify the angle

We can simplify the angle by finding an equivalent angle within the range of to . We can do this by subtracting multiples of from .

Since , we can subtract once:

Since is within the range of to , we can use this angle.

So,

Step 3: Find the reference angle

The angle is in the fourth quadrant. The reference angle is .

Step 4: Determine the sign of cotangent in the fourth quadrant

In the fourth quadrant, cosine is positive and sine is negative. Since , cotangent is negative in the fourth quadrant.

Therefore,

Step 5: Evaluate the cotangent of the reference angle

We know that .

So,

Step 6: Substitute back into the original expression

Final Answer:

ANSWER

1

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📐 Key Formulas

Important Formulas for Exercise 3.2

Formula / Concept	Description
Signs of Trigonometric Functions in Quadrants	The signs of trigonometric functions vary depending on the quadrant in which the angle lies. A common mnemonic to remember the signs is "All Students Take Calculus" (ASTC), which indicates which functions are positive in each quadrant, moving counter-clockwise.
First Quadrant (0 to (π)/(2))	All trigonometric functions (Sine, Cosine, Tangent, Cosecant, Secant, Cotangent) are positive.
Second Quadrant ((π)/(2) to π)	Sine and its reciprocal, Cosecant, are positive. The rest are negative.
Third Quadrant (π to (3π)/(2))	Tangent and its reciprocal, Cotangent, are positive. The rest are negative.
Fourth Quadrant ((3π)/(2) to 2π)	Cosine and its reciprocal, Secant, are positive. The rest are negative.
\sin^2 x + \cos^2 x = 1	This fundamental Pythagorean identity relates the sine and cosine functions. It is true for any value of x.
1 + \tan^2 x = \sec^2 x	Another Pythagorean identity relating the tangent and secant functions.
1 + \cot^2 x = \csc^2 x	The third Pythagorean identity, which connects the cotangent and cosecant functions.
Reciprocal Identities	These identities define the relationships between the six trigonometric functions.
\csc x = (1)/(\sin x)	Cosecant is the reciprocal of Sine.
\sec x = (1)/(\cos x)	Secant is the reciprocal of Cosine.

Formula / Concept	Description
\cot x = (1)/(\tan x)	Cotangent is the reciprocal of Tangent.
Quotient Identities	These identities express tangent and cotangent in terms of sine and cosine.
\tan x = (\sin x)/(\cos x)	Tangent is the ratio of Sine to Cosine.
\cot x = (\cos x)/(\sin x)	Cotangent is the ratio of Cosine to Sine.
Periodicity of Trigonometric Functions	Trigonometric functions are periodic, meaning their values repeat at regular intervals.
\sin(x + 2nπ) = \sin x	The sine function has a period of 2π, where n is any integer.
\cos(x + 2nπ) = \cos x	The cosine function also has a period of 2π.
\tan(x + nπ) = \tan x	The tangent function has a period of π.
Domain and Range of Trigonometric Functions	The domain is the set of all possible input angles, and the range is the set of all possible output values.
\sin x and \cos x	Domain: All real numbers (\mathbbR). Range: [-1, 1].
\tan x and \sec x	Domain: All real numbers except odd multiples of (π)/(2). Range of \tan x: All real numbers. Range of \sec x: (-∞, -1] \cup [1, ∞).
\cot x and \csc x	Domain: All real numbers except integer multiples of π. Range of \cot x: All real numbers. Range of \csc x: (-∞, -1] \cup [1, ∞).

Important Formulas for Exercise 3.2

Formula / Concept	Description
Signs of Trigonometric Functions in Quadrants	The signs of trigonometric functions vary depending on the quadrant in which the angle lies. [cite: 18, 22] A common mnemonic to remember the signs is "All Students Take Calculus" (ASTC), which indicates which functions are positive in each quadrant, moving counter-clockwise. [cite: 1, 5]
First Quadrant (0 to (π)/(2))	All trigonometric functions (Sine, Cosine, Tangent, Cosecant, Secant, Cotangent) are positive. [cite: 1, 6]
Second Quadrant ((π)/(2) to π)	Sine and its reciprocal, Cosecant, are positive. [cite: 1, 6] The rest are negative.

Formula / Concept	Description
Third Quadrant (π to $\frac{3\pi}{2}$)	Tangent and its reciprocal, Cotangent, are positive. [cite: 1, 6] The rest are negative.
Fourth Quadrant ($\frac{3\pi}{2}$ to 2π)	Cosine and its reciprocal, Secant, are positive. [cite: 1, 6] The rest are negative.
$\sin^2 x + \cos^2 x = 1$	This fundamental Pythagorean identity relates the sine and cosine functions. It is true for any value of x. [cite: 2]
$1 + \tan^2 x = \sec^2 x$	Another Pythagorean identity relating the tangent and secant functions. [cite: 2]
$1 + \cot^2 x = \csc^2 x$	The third Pythagorean identity, which connects the cotangent and cosecant functions.
Reciprocal Identities	These identities define the relationships between the six trigonometric functions.
$\csc x = \frac{1}{\sin x}$	Cosecant is the reciprocal of Sine. [cite: 7]
$\sec x = \frac{1}{\cos x}$	Secant is the reciprocal of Cosine. [cite: 7]
$\cot x = \frac{1}{\tan x}$	Cotangent is the reciprocal of Tangent. [cite: 7]
Quotient Identities	These identities express tangent and cotangent in terms of sine and cosine.
$\tan x = \frac{\sin x}{\cos x}$	Tangent is the ratio of Sine to Cosine. [cite: 3]
$\cot x = \frac{\cos x}{\sin x}$	Cotangent is the ratio of Cosine to Sine. [cite: 8]
Periodicity of Trigonometric Functions	Trigonometric functions are periodic, meaning their values repeat at regular intervals.
$\sin(x + 2n\pi) = \sin x$	The sine function has a period of 2π, where n is any integer. [cite: 3]
$\cos(x + 2n\pi) = \cos x$	The cosine function also has a period of 2π. [cite: 3]
$\tan(x + n\pi) = \tan x$	The tangent function has a period of π. [cite: 3]
Domain and Range of Trigonometric Functions	The domain is the set of all possible input angles, and the range is the set of all possible output values. [cite: 10, 11, 13]
$\sin x$ and $\cos x$	Domain: All real numbers ($\mathbb{R}$). Range: [-1, 1]. [cite: 11, 12]

Formula / Concept	Description
\tan x and \sec x	Domain: All real numbers except odd multiples of (π)/(2). Range of \tan x: All real numbers. Range of \sec x: (-∞, -1] \cup [1, ∞). [cite: 10]
\cot x and \csc x	Domain: All real numbers except integer multiples of π. Range of \cot x: All real numbers. Range of \csc x: (-∞, -1] \cup [1, ∞). [cite: 10]

? Top FAQs

Q1. How many questions are there in NCERT Solutions for Class 11 Maths Chapter 3 Trigonometric Functions Exercise 3.2?

Exercise 3.2 of NCERT Solutions for Class 11 Maths Chapter 3 Trigonometric Functions contains exactly 10 questions. These questions focus on trigonometric identities, sum and difference formulas, and their applications. Students can access step by step solutions for all these questions through free PDF download for CBSE board exam 2025-26 preparation.

Q2. Where can I download free PDF of NCERT Solutions for Class 11 Maths Chapter 3 Trigonometric Functions Exercise 3.2 for CBSE 2025-26?

You can download the free PDF of NCERT Solutions for Class 11 Maths Chapter 3 Trigonometric Functions Exercise 3.2 from the official NCERT website and various educational portals. These step by step solutions are updated according to the latest CBSE syllabus 2025-26 and include detailed explanations of all 10 questions covering trigonometric identities and formulas.

Q3. How many marks does Chapter 3 Trigonometric Functions carry in CBSE Class 11 board exam 2025-26?

Chapter 3 Trigonometric Functions from NCERT Solutions for Class 11 Maths carries approximately 7 marks in the CBSE board exam 2025-26 under Unit I - Sets and Functions. Exercise 3.2 specifically covers important concepts like trigonometric identities and sum-difference formulas that are frequently asked in examinations.

Q4. Which is the most difficult question in Exercise 3.2 of NCERT Solutions for Class 11 Maths Chapter 3 Trigonometric Functions?

Questions 9 and 10 in Exercise 3.2 of NCERT Solutions for Class 11 Maths Chapter 3 Trigonometric Functions are considered the most challenging as they involve complex applications of multiple trigonometric identities simultaneously. These questions require thorough understanding of sum and difference formulas along with step by step solutions approach for CBSE board exam 2025-26 preparation.

Q5. What are Trigonometric Identities in NCERT Solutions Class 11 Maths Chapter 3 Exercise 3.2?

Trigonometric Identities in NCERT Solutions for Class 11 Maths Chapter 3 Exercise 3.2 are mathematical equations involving trigonometric functions that are true for all values of variables. Exercise 3.2 specifically covers sum and difference formulas like sin(A±B), cos(A±B), and tan(A±B), which are crucial for CBSE board exam 2025-26.

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