NCERT Solutions Class 11 Maths
Chapter 3: Trigonometric Functions
EXERCISE 3.1

Document Information:
Class: 11 | **Subject:** Mathematics | **Chapter:** 3 | **Exercise:** 3.1
Total Questions: 7 | **Academic Year:** 2025-26
Source: www.ncertbooks.net | **Generated:** February 21, 2026

Quick Summary: In NCERT Solutions Class 11 Maths Chapter 3 Exercise 3.1, students learn the fundamental concepts of angles and their measurement in trigonometry. This exercise covers degree to radian conversions, arc length calculations, and angular motion problems which are essential building blocks for advanced trigonometric concepts in CBSE Class 11 exams.

Key Takeaways:

- Degree to radian conversion formula: \textRadians = (π)/(180°) × \textDegrees
- Arc length relationship: s = rθ where s is arc length, r is radius, and θ is angle in radians
- Angular velocity conversion from revolutions per minute to radians per second using \omega = (2π n)/(60)
- Understanding the relationship between chord length, arc length, and central angle for solving circle geometry problems

Complete Solutions

Question 1

QUESTION

Find the radian measures corresponding to the following degree measures:

(i) 25^\circ (ii) -47^\circ 30' (iii) 240^\circ (iv) 520^\circ

SOLUTION

We need to convert the given degree measures into radian measures. We know that radians. Therefore, radians. We will use this conversion factor to solve each part.

(i)

Step 1: Use the conversion factor.

To convert to radians, we multiply by :

radians

Step 2: Simplify the fraction.

We can simplify the fraction by dividing both numerator and denominator by their greatest common divisor, which is 5.

Step 3: Write the final answer.

Therefore, radians.

Answer:

(ii)

Step 1: Convert minutes to degrees.

We know that , so . Therefore, .

So, .

Step 2: Use the conversion factor.

To convert to radians, we multiply by :

radians

Step 3: Simplify the fraction.

We can simplify the fraction by dividing both numerator and denominator by their greatest common divisor, which is 5.

Step 4: Write the final answer.

Therefore, radians.

Answer:

(iii)

Step 1: Use the conversion factor.

To convert to radians, we multiply by :

radians

Step 2: Simplify the fraction.

We can simplify the fraction by dividing both numerator and denominator by their greatest common divisor, which is 60.

Step 3: Write the final answer.

Therefore, radians.

Answer:

(iv)

Step 1: Use the conversion factor.

To convert to radians, we multiply by :

radians

Step 2: Simplify the fraction.

We can simplify the fraction by dividing both numerator and denominator by their greatest common divisor, which is 20.

Step 3: Write the final answer.

Therefore, radians.

Answer:

ANSWER

(i) (5π)/(36)

(ii) -(19π)/(72)

(iii) (4π)/(3)

(iv) (26π)/(9)

Question 2

QUESTION

Find the degree measures corresponding to the following radian measures (Use π = (22)/(7)):

(i) (11)/(16) (ii) -4 (iii) (5π)/(3) (iv) (7π)/(6)

SOLUTION

We need to convert the given radian measures to degree measures. We know that radians is equal to . Therefore, 1 radian is equal to degrees. We will use this conversion factor for each part.

(i) Convert radians to degrees.

Step 1: Use the conversion factor.

Step 2: Substitute the given radian measure and the value of .

Step 3: Simplify the expression.

Step 4: Convert the improper fraction to a mixed number.

degrees. So we have and .

Step 5: Convert the fractional part of the degree to minutes.

. So we have and .

Step 6: Convert the fractional part of the minute to seconds.

Final Answer:

(ii) Convert radians to degrees.

Step 1: Use the conversion factor.

Step 2: Substitute the given radian measure and the value of .

Step 3: Simplify the expression.

Step 4: Convert the improper fraction to a mixed number.

degrees. So we have and .

Step 5: Convert the fractional part of the degree to minutes.

. So we have and .

Step 6: Convert the fractional part of the minute to seconds.

Final Answer:

(iii) Convert radians to degrees.

Step 1: Use the conversion factor.

Step 2: Substitute the given radian measure.

Step 3: Simplify the expression.

Final Answer:

(iv) Convert radians to degrees.

Step 1: Use the conversion factor.

Step 2: Substitute the given radian measure.

Step 3: Simplify the expression.

Final Answer:

ANSWER

(i) $39^\circ\ 22'\ 30''$

(ii) $-229^\circ\ 5'\ 27''$

(iii) 300°

(iv) 210°

Question 3

QUESTION

A wheel makes 360 revolutions in one minute. Through how many radians does it turn in one second?

SOLUTION

This question tests our understanding of the relationship between revolutions, radians, and time. We need to convert revolutions per minute to radians per second.

Step 1: Convert revolutions per minute to revolutions per second

The wheel makes 360 revolutions in one minute. To find the number of revolutions per second, we divide by 60 (since there are 60 seconds in a minute):

Step 2: Convert revolutions to radians

One complete revolution is equal to radians. Therefore, to convert revolutions to radians, we multiply by :

Step 3: Calculate the total radians turned in one second

Since the wheel makes 6 revolutions in one second, the total radians turned in one second is:

Final Answer: The wheel turns through radians in one second.

ANSWER

12π

Question 4

QUESTION

Find the degree measure of the angle subtended at the centre of a circle of radius 100 cm by an arc of length 22 cm (Use π = (22)/(7)).

SOLUTION

This question tests the relationship between the radius of a circle, the length of an arc, and the angle subtended by the arc at the center, and how to convert radians to degrees and minutes.

Step 1: Recall the formula relating arc length, radius, and angle in radians

The relationship is given by: , or , where is the arc length, is the radius, and is the angle in radians.

Step 2: Substitute the given values

We are given that the radius cm and the arc length cm. Substituting these values into the formula, we get:

Step 3: Solve for the angle in radians

Divide both sides by 100 to isolate :

radians

Simplifying the fraction, we get:

radians

Step 4: Convert radians to degrees

To convert radians to degrees, we use the conversion factor . So,

We are given that , so substitute this value:

Simplify:

degrees

Step 5: Convert the improper fraction to a mixed number

degrees

So,

Step 6: Convert the fractional part of the degree to minutes

Since 1 degree = 60 minutes, we have:

Step 7: State the final answer

Therefore, the angle is .

ANSWER

12^\circ\ 36'

Question 5

QUESTION

In a circle of diameter 40 cm, the length of a chord is 20 cm. Find the length of the minor arc of the chord.

SOLUTION

This question involves finding the length of an arc in a circle, given the diameter and the length of a chord. We'll use the relationship between the radius, chord length, and central angle to find the angle, and then use the formula for arc length.

Step 1: Determine the radius of the circle

The diameter of the circle is given as 40 cm. The radius is half of the diameter.

cm

Step 2: Analyze the triangle formed by the radii and the chord

The chord has a length of 20 cm, which is equal to the radius of the circle (20 cm). This means the triangle formed by the two radii and the chord is an equilateral triangle.

Step 3: Find the central angle subtended by the chord

Since the triangle is equilateral, all its angles are equal to . Therefore, the central angle (in degrees) subtended by the chord is .

Step 4: Convert the central angle to radians

To use the arc length formula, the angle must be in radians. We convert degrees to radians using the conversion factor .

Step 5: Calculate the length of the minor arc

The formula for the arc length is given by , where is the radius and is the central angle in radians.

Final Answer: The length of the minor arc of the chord is cm.

ANSWER

(20π)/(3)

Question 6

QUESTION

If in two circles, arcs of the same length subtend angles 60^\circ and 75^\circ at the centre, find the ratio of their radii.

SOLUTION

This question tests the relationship between the arc length, radius, and angle subtended at the center of a circle.

Step 1: Recall the formula relating arc length, radius, and angle.

The relationship between the arc length (), radius (), and the angle () subtended at the center (in radians) is given by:

Step 2: Convert the given angles from degrees to radians.

We have and . To convert these to radians, we multiply by .

Step 3: Set up the equations for the two circles.

Let and be the radii of the two circles, respectively. Since the arc lengths are the same, let's denote the arc length by .

For the first circle:

For the second circle:

Step 4: Equate the arc lengths and solve for the ratio of the radii.

Since the arc lengths are equal, we have:

Divide both sides by :

Now, we want to find the ratio . Divide both sides by :

Final Answer:

The ratio of their radii is .

ANSWER

5 : 4

Question 7

QUESTION

Find the angle in radian through which a pendulum swings if its length is 75 cm and the tip describes an arc of length:

(i) 10 cm (ii) 15 cm (iii) 21 cm

SOLUTION

This question tests the relationship between the length of an arc, the radius of the circle, and the angle subtended at the center in radians. The formula we'll use is: , or .

Given: The length of the pendulum (radius), cm.

(i) Arc length cm

Step 1: Apply the formula

We have .

Step 2: Solve for

Divide both sides by 75: .

Step 3: Simplify the fraction

Both 10 and 75 are divisible by 5: radians.

Answer: The angle in radians is .

(ii) Arc length cm

Step 1: Apply the formula

We have .

Step 2: Solve for

Divide both sides by 75: .

Step 3: Simplify the fraction

Both 15 and 75 are divisible by 15: radians.

Answer: The angle in radians is .

(iii) Arc length cm

Step 1: Apply the formula

We have .

Step 2: Solve for

Divide both sides by 75: .

Step 3: Simplify the fraction

Both 21 and 75 are divisible by 3: radians.

Answer: The angle in radians is .

ANSWER

(i) (2)/(15)

(ii) (1)/(5)

(iii) (7)/(25)

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Key Formulas

Important Formulas for Exercise 3.1

Formula / Concept	Description
π \text radians = 180^\circ	The fundamental relationship between radians and degrees.
\textRadian Measure = (π)/(180) × \textDegree Measure	Formula to convert an angle from degrees to radians.
\textDegree Measure = (180)/(π) × \textRadian Measure	Formula to convert an angle from radians to degrees.
1^\circ = 60' (60 minutes)	Conversion between degrees and minutes.
1' = 60'' (60 seconds)	Conversion between minutes and seconds.

Formula / Concept	Description
θ = (l)/(r)	Formula relating the angle θ (in radians) subtended by an arc of length l at the center of a circle with radius r.
l = r θ	Formula to calculate the arc length l given the radius r and the central angle θ in radians.
Basic Trigonometric Identities	• \sin^2θ + \cos^2θ = 1 • 1 + \tan^2θ = \sec^2θ • 1 + \cot^2θ = \csc^2θ
Sum and Difference Formulas	• \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

❓ Top FAQs

Q1. How many questions are in NCERT Solutions Class 11 Maths Chapter 3 Trigonometric Functions Exercise 3.1?

NCERT Solutions Class 11 Maths Chapter 3 Trigonometric Functions Exercise 3.1 contains exactly 7 questions. These questions focus on fundamental concepts of angles, trigonometric identities, and their applications. Students can access step by step solutions for all 7 questions to prepare effectively for CBSE board exam 2025-26.

Q2. Where can I download free PDF of NCERT Solutions for Class 11 Maths Chapter 3 Trigonometric Functions Exercise 3.1?

You can download free PDF of NCERT Solutions for Class 11 Maths Chapter 3 Trigonometric Functions Exercise 3.1 from the official NCERT website or various educational platforms. These solutions are updated as per the latest CBSE syllabus 2025-26 and provide step by step explanations. The free PDF download includes detailed solutions to all 7 questions with trigonometric identities and sum and difference formulas clearly explained.

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

Chapter 3 Trigonometric Functions carries approximately 7 marks in CBSE Class 11 board exam 2025-26 under Unit I - Sets and Functions. The weightage is shared with other chapters in this unit, making NCERT Solutions for Class 11 Maths Chapter 3 Exercise 3.1 essential for scoring well. Students should focus on trigonometric identities and sum and difference formulas for maximum marks.

Q4. Which is the most difficult question in Exercise 3.1 of NCERT Solutions Class 11 Maths Chapter 3 Trigonometric Functions?

Questions involving multiple trigonometric identities and sum and difference formulas are typically considered most difficult in Exercise 3.1 of Class 11 Maths Chapter 3 Trigonometric Functions. However, with proper understanding of step by step solutions and regular practice, students can master these problems. The NCERT Solutions for Class 11 Maths Chapter 3 provide detailed explanations for challenging questions to help CBSE board exam 2025-26 preparation.

Q5. What are Trigonometric Identities explained in NCERT Class 11 Maths Chapter 3 Trigonometric Functions Exercise 3.1?

Trigonometric Identities in NCERT Class 11 Maths Chapter 3 Exercise 3.1 are fundamental equations involving trigonometric functions that hold true for all values of variables. These include basic identities like $\sin^2\theta + \cos^2\theta = 1$, sum and difference formulas, and angle transformation formulas. Understanding these identities is crucial for solving Exercise 3.1 problems and scoring well in CBSE board exam 2025-26.

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