NCERT Solutions Class 10 Maths
Chapter 9: Some Applications of Trigonometry
Exercise 9.1

Document Information:
Class: 10 | **Subject:** Mathematics | **Chapter:** 9 | **Exercise:** 9.1
Total Questions: 15 | **Academic Year:** 2025-26
Source: www.ncertbooks.net | **Generated:** February 21, 2026

Quick Summary: In NCERT Solutions Class 10 Maths Chapter 9 Exercise 9.1, students learn to solve real-world height and distance problems using trigonometric ratios. This exercise covers practical applications of sine, cosine, and tangent functions in right-angled triangles, which are essential for CBSE board exams and form the foundation for advanced trigonometry concepts.

Key Takeaways:

- Use tangent ratio \tan θ = \textheight\textdistance to find heights of poles, towers, and buildings
- Apply angles of elevation and depression concepts to solve problems involving broken trees and inclined objects
- Calculate lengths using sine function \sin θ = \textopposite\texthypotenuse for slides and ladder problems
- Master the technique of forming right-angled triangles from given information to identify correct trigonometric ratios

Complete Solutions

Question 1

QUESTION

A circus artist is climbing a 20 m long rope, which is tightly stretched and tied from the top of a vertical pole to the ground. Find the height of the pole, if the angle made by the rope with the ground level is 30° (see Fig. 9.11).

SOLUTION

This question tests our understanding of trigonometric ratios in the context of a right-angled triangle. We need to find the height of the pole using the given length of the rope and the angle of elevation.

Step 1: Draw a diagram and label the sides

Imagine a right-angled triangle where:

- The pole is the perpendicular (opposite side to the angle).
- The rope is the hypotenuse.
- The ground is the base.

Let the height of the pole be meters. The length of the rope is given as 20 m, and the angle between the rope and the ground is 30°.

Step 2: Identify the relevant trigonometric ratio

We know the hypotenuse and we want to find the perpendicular (opposite side). The trigonometric ratio that relates these two sides is the sine function:

Step 3: Apply the trigonometric ratio

In our case, , Opposite = , and Hypotenuse = 20 m. So:

Step 4: Recall the value of sin(30°)

We know that . Therefore:

Step 5: Solve for h

Multiply both sides of the equation by 20:

Final Answer: The height of the pole is 10 m.

Conclusion: By correctly identifying the trigonometric ratio and substituting the given values, we found the height of the pole. A common mistake is using the wrong trigonometric ratio or not remembering the standard trigonometric values.

ANSWER

10 m

Question 2

QUESTION

A tree breaks due to storm and the broken part bends so that the top of the tree touches the ground making an angle 30° with it. The distance between the foot of the tree to the point where the top touches the ground is 8 m. Find the height of the tree.

SOLUTION

This question involves finding the original height of a tree that broke due to a storm, using trigonometric ratios. We'll use the given angle of elevation and the distance from the foot of the tree to where the top touches the ground to determine the lengths of the broken parts and then sum them to find the original height.

Step 1: Draw a diagram and label the parts

Let AB be the original height of the tree. Suppose it breaks at point C such that the broken part CB touches the ground at D, making an angle of 30° with the ground. We are given that AD = 8 m.

Step 2: Identify the trigonometric ratios to use

We need to find the lengths of AC and CD (which is equal to CB). In right triangle , we have:

and

Step 3: Calculate AC

We know m and . So,

Therefore, m.

Step 4: Calculate CD

We know m and . So,

Therefore, m.

Step 5: Find the original height of the tree

The original height of the tree is . So,

m.

Step 6: Rationalize the denominator

To rationalize the denominator, multiply the numerator and denominator by :

m.

Final Answer: The height of the tree is m.

ANSWER

$8\sqrt{3}$ m

Question 3

QUESTION

A contractor plans to install two slides for the children to play in a park. For the children below the age of 5 years, she prefers to have a slide whose top is at a height of 1.5 m, and is inclined at an angle of 30° to the ground, whereas for elder children, she wants to have a steep slide at a height of 3 m, and inclined at an angle of 60° to the ground. What should be the length of the slide in each case?

SOLUTION

This question involves finding the lengths of two slides using trigonometric ratios, specifically the sine function. We will analyze each case separately.

(i) For children below 5 years:

Step 1: Draw a diagram and identify the given information.

Imagine a right-angled triangle where the slide is the hypotenuse, the height of the slide is the perpendicular, and the ground is the base. We are given the height (perpendicular) as 1.5 m and the angle of inclination as 30°.

Step 2: Choose the appropriate trigonometric ratio.

We know the perpendicular and need to find the hypotenuse. The sine function relates these two:

Step 3: Apply the sine function.

Let the length of the slide be . Then:

Step 4: Solve for .

We know that . Therefore:

So, the length of the slide for younger children is 3 m.

(ii) For elder children:

Step 1: Draw a diagram and identify the given information.

Again, we have a right-angled triangle. The height (perpendicular) is 3 m, and the angle of inclination is 60°.

Step 2: Choose the appropriate trigonometric ratio.

We use the sine function again:

Step 3: Apply the sine function.

Let the length of the slide be . Then:

Step 4: Solve for .

We know that . Therefore:

Step 5: Rationalize the denominator.

So, the length of the slide for elder children is m.

Final Answer: The length of the slide for children below 5 years is 3 m, and for elder children, it is m.

ANSWER

3 m, 2√3 m

Question 4

QUESTION

The angle of elevation of the top of a tower from a point on the ground, which is 30 m away from the foot of the tower, is 30°. Find the height of the tower.

SOLUTION

This question tests our understanding of angles of elevation and how to apply trigonometric ratios to find the height of an object.

Step 1: Draw a diagram

Let AB be the tower and C be the point on the ground 30 m away from the foot of the tower. So, BC = 30 m. The angle of elevation of the top of the tower (A) from point C is 30°. Therefore, .

Step 2: Identify the relevant trigonometric ratio

We need to find the height of the tower, AB. In the right-angled triangle ABC, we know the base (BC) and the angle . We want to find the perpendicular (AB). The trigonometric ratio that relates the perpendicular and the base is the tangent.

In our case, , Perpendicular = AB, and Base = BC.

Step 3: Apply the trigonometric ratio

We know that and BC = 30 m. Substituting these values, we get:

Step 4: Solve for AB

Multiply both sides by 30 to isolate AB:

To rationalize the denominator, multiply the numerator and denominator by :

Step 5: State the final answer

The height of the tower is m.

ANSWER

$10\sqrt{3}$ m

Question 5

QUESTION

A kite is flying at a height of 60 m above the ground. The string attached to the kite is temporarily tied to a point on the ground. The inclination of the string with the ground is 60°. Find the length of the string, assuming that there is no slack in the string.

SOLUTION

This question tests our understanding of trigonometric ratios in a right-angled triangle, specifically how to apply them to solve problems involving heights and distances. We need to find the length of the kite string given the height of the kite and the angle of elevation.

Step 1: Draw a diagram and label the known values

Imagine a right-angled triangle where:

- The height of the kite (60 m) is the perpendicular side.
- The length of the string is the hypotenuse (what we need to find).
- The angle of elevation (60°) is the angle between the string and the ground.

Step 2: Identify the relevant trigonometric ratio

We know the perpendicular (opposite side) and we want to find the hypotenuse. The trigonometric ratio that relates these two sides is the sine function:

Step 3: Apply the trigonometric ratio

In our case, , Perpendicular = 60 m, and Hypotenuse = length of the string (let's call it). So:

Step 4: Recall the value of sin(60°)

We know that . Therefore:

Step 5: Solve for

Cross-multiply to solve for :

Step 6: Rationalize the denominator

To rationalize the denominator, multiply both the numerator and denominator by :

Step 7: Simplify

Final Answer: The length of the string is m.

ANSWER

40√3 m

Question 6

QUESTION

A 1.5 m tall boy is standing at some distance from a 30 m tall building. The angle of elevation from his eyes to the top of the building increases from 30° to 60° as he walks towards the building. Find the distance he walked towards the building.

SOLUTION

This problem involves finding the distance a boy walks towards a building, given the angles of elevation from his eyes to the top of the building at two different positions. We will use trigonometric ratios (specifically, tangent) to solve this problem.

Step 1: Draw a diagram and label the given information

Let AB be the height of the building (30 m), and CD be the initial position of the boy (1.5 m tall). Let EF be the final position of the boy after walking towards the building. Let the angle of elevation from C to A be 30°, and from E to A be 60°. We need to find the distance DE, which the boy walked.

Step 2: Calculate the height of the building from the boy's eye level

The height of the building from the boy's eye level is m. Let's denote this height as AH, where H is a point on AB such that AH is perpendicular to the ground. So, m.

Step 3: Use the tangent function to find the distances

In triangle AHE, we have . Since , we get:

In triangle AHC, we have . Since , we get:

Step 4: Find the distance the boy walked (DE)

Since , we have:

Final Answer: The distance the boy walked towards the building is m.

ANSWER

19√3 m

Question 7

QUESTION

From a point on the ground, the angles of elevation of the bottom and the top of a transmission tower fixed at the top of a 20 m high building are 45° and 60° respectively. Find the height of the tower.

SOLUTION

This question involves finding the height of a transmission tower using angles of elevation from a point on the ground. We will use trigonometric ratios, specifically the tangent function, to solve this problem.

Step 1: Draw a diagram and label the parts

Let AB be the building of height 20 m. Let BC be the transmission tower of height h. Let D be the point on the ground from where the angles of elevation are measured. The angle of elevation of the bottom of the tower (point B) is 45°, and the angle of elevation of the top of the tower (point C) is 60°. So, and .

Step 2: Use the tangent function for the angle of elevation of the building

In right triangle ABD, we have:

Since and m, we get:

Therefore, m.

Step 3: Use the tangent function for the angle of elevation of the top of the tower

In right triangle ACD, we have:

Since and , we get:

Step 4: Solve for h

Multiply both sides by 20:

Subtract 20 from both sides:

Factor out 20:

Final Answer: The height of the tower is m.

ANSWER

$20(\sqrt{3} - 1)$ m

Question 8

QUESTION

A statue, 1.6 m tall, stands on the top of a pedestal. From a point on the ground, the angle of elevation of the top of the statue is 60° and from the same point the angle of elevation of the top of the pedestal is 45°. Find the height of the pedestal.

SOLUTION

This question involves finding the height of a pedestal given the height of a statue on top of it and the angles of elevation from a point on the ground. It tests the application of trigonometric ratios, specifically tangent, in solving height and distance problems.

Step 1: Draw a diagram and label the parts

Let AB be the height of the statue (1.6 m), BC be the height of the pedestal (which we need to find), and D be the point on the ground from which the angles of elevation are measured. Let the angle of elevation of the top of the statue (A) be 60°, and the angle of elevation of the top of the pedestal (B) be 45°. Let CD = and BC = .

Step 2: Set up trigonometric equations using the tangent function

In right triangle BCD, we have:

Therefore, ---(1)

In right triangle ACD, we have:

---(2)

Step 3: Solve for h

Substitute from equation (1) into equation (2):

Step 4: Rationalize the denominator

Multiply the numerator and denominator by the conjugate of the denominator, :

Final Answer: The height of the pedestal is m.

ANSWER

0.8(√3 + 1) m

Question 9

QUESTION

The angle of elevation of the top of a building from the foot of a tower is 30° and the angle of elevation of the top of the tower from the foot of the building is 60°. If the tower is 50 m high, find the height of the building.

SOLUTION

This question involves finding the height of a building using angles of elevation and the height of a tower. It tests the application of trigonometric ratios (specifically tangent) in real-world scenarios.

Step 1: Draw a diagram and label the given information

Let AB be the building and CD be the tower. We are given that CD = 50 m. Let the height of the building AB be meters. The angle of elevation of the top of the building from the foot of the tower is 30°, so . The angle of elevation of the top of the tower from the foot of the building is 60°, so . Let the distance between the foot of the building and the foot of the tower be meters, i.e., BC = .

Step 2: Apply the tangent function to triangle DBC

In right triangle DBC, we have:

We know that and CD = 50 m. Therefore:

Solving for :

Step 3: Apply the tangent function to triangle ABC

In right triangle ABC, we have:

We know that and AB = . Therefore:

Substituting the value of from Step 2:

Step 4: Solve for h

Final Answer: The height of the building is m.

ANSWER

16 2/3 m

Question 10

QUESTION

Two poles of equal heights are standing opposite each other on either side of the road, which is 80 m wide. From a point between them on the road, the angles of elevation of the top of the poles are 60° and 30°, respectively. Find the height of the poles and the distances of the point from the poles.

SOLUTION

This question involves finding the height of two poles and the distances of an observation point from each pole, using angles of elevation and trigonometric ratios.

Step 1: Draw a diagram and label the unknowns

Let the height of each pole be meters. Let the distance of the point from the first pole be meters. Since the road is 80 m wide, the distance of the point from the second pole is meters.

Step 2: Set up trigonometric equations

Let's denote the first pole as AB and the second pole as CD. Let the point on the road be O. We have two right triangles: and .

In , we have . Since , we get:

In , we have . Since , we get:

Step 3: Solve the equations

Equate equations (1) and (2):

Multiply both sides by :

So, the distance from the first pole is 20 m.

The distance from the second pole is m.

Now, substitute into equation (1) to find the height :

Final Answer: Height of each pole = m; distances from the point are 20 m and 60 m.

ANSWER

Height of each pole = $20\sqrt{3}$ m; distances from the point are 20 m and 60 m.

Question 11

QUESTION

A TV tower stands vertically on a bank of a canal. From a point on the other bank directly opposite the tower, the angle of elevation of the top of the tower is 60°. From another point 20 m away from this point on the line joining this point to the foot of the tower, the angle of elevation of the top of the tower is 30° (see Fig. 9.12). Find the height of the tower and the width of the canal.

SOLUTION

This question involves finding the height of a TV tower and the width of a canal using angles of elevation and trigonometric ratios (specifically, tangent).

Step 1: Draw a diagram and label the points

Let AB be the height of the TV tower, BC be the width of the canal, and C and D be the two points on the bank of the canal. We are given that CD = 20 m. Let BC = m and AB = m.

Step 2: Identify the two right-angled triangles

We have two right-angled triangles: triangle ABC and triangle ABD.

Step 3: Apply the tangent function to triangle ABC

In triangle ABC, we have:

Therefore, --- (1)

Step 4: Apply the tangent function to triangle ABD

In triangle ABD, we have:

Therefore, --- (2)

Step 5: Equate the two expressions for h

From equations (1) and (2), we have:

Multiplying both sides by , we get:

Step 6: Find the height of the tower

Substitute into equation (1):

Step 7: State the final answer

Height of tower = m; width of canal = 10 m.

ANSWER

Height of tower = $10\sqrt{3}$ m; width of canal = 10 m.

Question 12

QUESTION

From the top of a 7 m high building, the angle of elevation of the top of a cable tower is 60° and the angle of depression of its foot is 45°. Determine the height of the tower.

SOLUTION

This question involves finding the height of a cable tower using angles of elevation and depression from the top of a building. We will use trigonometric ratios (tan) to solve this problem.

Step 1: Draw a diagram and label the points

Let AB be the building of height 7 m. Let CD be the cable tower. Let E be a point on CD such that AE is parallel to the ground. The angle of elevation of the top of the tower (∠DAE) is 60°, and the angle of depression of the foot of the tower (∠BAC) is 45°.

Step 2: Analyze the angles and sides

Since AE is parallel to BC, ∠ACB = ∠CAE = 45°. Also, AB = EC = 7 m. We need to find the length of DE, which we'll call .

Step 3: Use the tangent function in triangle ABC

In right triangle ABC, we have:

Since , we get:

Therefore, m.

Step 4: Use the tangent function in triangle ADE

In right triangle ADE, we have:

Since and m, we get:

Therefore, m.

Step 5: Calculate the height of the tower

The height of the tower CD is given by:

m.

Final Answer: The height of the tower is m.

ANSWER

$7(\sqrt{3} + 1)$ m

Question 13

QUESTION

As observed from the top of a 75 m high lighthouse from the sea-level, the angles of depression of two ships are 30° and 45°. If one ship is exactly behind the other on the same side of the lighthouse, find the distance between the two ships.

SOLUTION

This question involves finding the distance between two ships using angles of depression from a lighthouse. It tests your understanding of trigonometric ratios (tan) and their application in solving height and distance problems.

Step 1: Draw a diagram and label the points

Let AB be the lighthouse of height 75 m. Let C and D be the positions of the two ships, with D being closer to the lighthouse. The angles of depression from A to D is 45° and from A to C is 30°. Therefore, and . We need to find the distance CD.

Step 2: Analyze triangle ABD

In right-angled triangle ABD, we have . Therefore,

Since , we get:

Therefore, m.

Step 3: Analyze triangle ABC

In right-angled triangle ABC, we have . Therefore,

Since , we get:

Therefore, m.

Step 4: Find the distance CD

We know that . Therefore,

m.

Final Answer: The distance between the two ships is m.

ANSWER

$75(\sqrt{3} - 1)$ m

Question 14

QUESTION

A 1.2 m tall girl spots a balloon moving with the wind in a horizontal line at a height of 88.2 m from the ground. The angle of elevation of the balloon from the eyes of the girl at any instant is 60°. After some time, the angle of elevation reduces to 30° (see Fig. 9.13). Find the distance travelled by the balloon during the interval.

SOLUTION

This question involves finding the distance traveled by a balloon using angles of elevation and trigonometry. We'll use the tangent function to relate the angles to the distances.

Step 1: Draw a diagram and label the points

Imagine the girl as point A, the initial position of the balloon as point B, and the final position as point C. Let D and E be the points on the ground directly below B and C, respectively. Let F and G be the points at the girl's eye level directly below B and C, respectively. Then AF = DG and AG = DE. The height of the balloon from the ground is BD = CE = 88.2 m, and the height of the girl is AF = AG = 1.2 m.

Step 2: Calculate the vertical distances BF and CG

BF = BD - FD = 88.2 m - 1.2 m = 87 m

CG = CE - GE = 88.2 m - 1.2 m = 87 m

Step 3: Apply the tangent function to triangle AFB

In triangle AFB, . Since , we have . Therefore, m.

Step 4: Apply the tangent function to triangle AGC

In triangle AGC, . Since , we have . Therefore, m.

Step 5: Calculate the distance traveled by the balloon, which is DE = AG - AF

The distance traveled by the balloon is m.

Final Answer: The distance traveled by the balloon during the interval is m.

ANSWER

58√3 m

Question 15

QUESTION

A straight highway leads to the foot of a tower. A man standing at the top of the tower observes a car at an angle of depression of 30°, which is approaching the foot of the tower with a uniform speed. Six seconds later, the angle of depression of the car is found to be 60°. Find the time taken by the car to reach the foot of the tower from this point.

SOLUTION

This question involves finding the time taken by a car to reach the foot of a tower, using angles of depression and uniform speed. It tests your understanding of trigonometric ratios and their application in real-world scenarios.

Step 1: Draw a diagram and label the points

Let AB be the tower. Let C be the initial position of the car and D be the position of the car after 6 seconds. Let the angle of depression from A to C be 30° and from A to D be 60°. Let the distance BD be and the distance CD be . Let the height of the tower AB be .

Step 2: Use trigonometric ratios to form equations

In right triangle ABD, we have:

In right triangle ABC, we have:

Step 3: Equate the expressions for h and solve for y

From equations (1) and (2), we have:

Step 4: Relate distance and time using uniform speed

Since the car is moving at a uniform speed, the time taken to travel a certain distance is proportional to the distance. The car travels distance in 6 seconds, and distance in seconds (which we want to find).

Final Answer: The time taken by the car to reach the foot of the tower from point D is 3 seconds.

ANSWER

3 seconds

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📌 Key Formulas

Important Formulas for Exercise 9.1

Formula / Concept	Description
Line of Sight	The imaginary line drawn from the eye of an observer to the object being viewed.
Angle of Elevation	The angle formed by the line of sight with the horizontal when the point being viewed is above the horizontal level.
Angle of Depression	The angle formed by the line of sight with the horizontal when the point being viewed is below the horizontal level.
Trigonometric Ratios	
\sin(θ) = \textOpposite\textHypotenuse	The ratio of the length of the side opposite the angle to the length of the hypotenuse in a right-angled triangle.
\cos(θ) = \textAdjacent\textHypotenuse	The ratio of the length of the adjacent side to the length of the hypotenuse in a right-angled triangle.
\tan(θ) = \textOpposite\textAdjacent	The ratio of the length of the side opposite the angle to the length of the adjacent side in a right-angled triangle.
\cosec(θ) = \textHypotenuse\textOpposite	The reciprocal of sine, also (1)/(\sin(θ)).
\sec(θ) = \textHypotenuse\textAdjacent	The reciprocal of cosine, also (1)/(\cos(θ)).
\cot(θ) = \textAdjacent\textOpposite	The reciprocal of tangent, also (1)/(\tan(θ)).
Trigonometric Ratios of Specific Angles	
\sin(30^\circ) = (1)/(2) \cos(30^\circ) = √32 \tan(30^\circ) = (1)/(√3)	Values for the 30-degree angle.
\sin(45^\circ) = (1)/(√2) \cos(45^\circ) = (1)/(√2) \tan(45^\circ) = 1	Values for the 45-degree angle.

Formula / Concept	Description
\sin(60^\circ) = √32 \cos(60^\circ) = (1)/(2) \tan(60^\circ) = √3	Values for the 60-degree angle.

Top FAQs

Q1. How many questions are in NCERT Solutions Class 10 Maths Chapter 9 Some Applications of Trigonometry Exercise 9.1?

NCERT Solutions Class 10 Maths Chapter 9 Some Applications of Trigonometry Exercise 9.1 contains exactly 15 questions. These questions focus on practical applications of trigonometry, specifically height and distance problems. All 15 questions are important for CBSE board exam 2025-26 preparation and require step by step solutions for better understanding.

Q2. Where can I download free PDF of NCERT Solutions for Class 10 Maths Chapter 9 Some Applications of Trigonometry Exercise 9.1?

You can download free PDF of NCERT Solutions for Class 10 Maths Chapter 9 Some Applications of Trigonometry Exercise 9.1 from the official NCERT website or various educational portals offering CBSE study materials. These PDFs contain step by step solutions for all 15 questions and are updated as per the 2025-26 syllabus. The free PDF download includes detailed explanations for height and distance problems with diagrams.

Q3. How many marks does Some Applications of Trigonometry carry in CBSE Class 10 Maths board exam 2025-26?

Some Applications of Trigonometry typically carries 4 marks in CBSE Class 10 Maths board exam 2025-26 as part of Unit IV - Trigonometry. This weightage is shared with other trigonometry concepts in the unit. Students should thoroughly practice NCERT Solutions for Class 10 Maths Chapter 9 Exercise 9.1 to secure these marks in height and distance problems.

Q4. Which is the most difficult question in NCERT Solutions for Class 10 Maths Chapter 9 Some Applications of Trigonometry Exercise 9.1?

Questions 14 and 15 in NCERT Solutions for Class 10 Maths Chapter 9 Exercise 9.1 are considered the most difficult as they involve complex height and distance problems with multiple angles of elevation or depression. These questions require strong conceptual understanding and careful application of trigonometric ratios. Step by step solutions help students master these challenging problems for CBSE board exam 2025-26.

Q5. What is Height and Distance Problems in NCERT Class 10 Maths Chapter 9 Some Applications of Trigonometry Exercise 9.1?

Height and Distance Problems in NCERT Class 10 Maths Chapter 9 Exercise 9.1 involve practical applications of trigonometry to calculate heights of buildings, towers, or distances using angles of elevation and depression. These problems use trigonometric ratios (sin, cos, tan) to solve real-world scenarios. NCERT Solutions for Class 10 Maths Chapter 9 provide step by step solutions to help students understand these concepts for CBSE board exam 2025-26.

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