RS Aggarwal Solutions for Class 10 Maths Chapter 5 Exercise 5: RS Aggarwal Solutions for Class 10 Maths Chapter 5, Exercise 5 on Trigonometric Ratios help students learn about sine, cosine, and tangent. The exercise includes problems that ask students to find the values of these trigonometric ratios for specific angles.

Each solution is explained step-by-step, making it easy for students to understand how to solve similar problems on their own. This exercise also teaches students about important concepts like the Pythagorean identity and how different trigonometric functions are related. Working through these solutions helps students build a strong foundation in trigonometry, which is important for higher-level math and exams.

RS Aggarwal Solutions for Class 10 Maths Chapter 5 Exercise 5 Overview

The RS Aggarwal Solutions for Class 10 Maths Chapter 5, Exercise 5, have been prepared by subject experts from Physics Wallah. This exercise focuses on the basics of trigonometric ratios, such as sine, cosine, and tangent. It includes a variety of problems to help students understand these concepts better.

Each solution is explained step-by-step to make it easy for students to follow and learn how to solve similar problems. These solutions help students build a strong understanding of trigonometry, which is important for higher-level math and exams.

RS Aggarwal Solutions for Class 10 Maths Chapter 5 Exercise 5 PDF

The RS Aggarwal Solutions for Class 10 Maths Chapter 5, Exercise 5 PDF is available through the link below. This PDF provides detailed solutions to all the problems in this exercise, focusing on trigonometric ratios like sine, cosine, and tangent.

This resource is valuable for building a strong foundation in trigonometry, essential for success in higher-level mathematics and various competitive exams. You can access the PDF by clicking the link provided below.

RS Aggarwal Solutions for Class 10 Maths Chapter 5 Exercise 5 PDF

Trigonometric Ratios

Trigonometric ratios are mathematical functions that relate the angles of a right triangle to the lengths of its sides. These ratios are fundamental in trigonometry and are used to solve problems involving right-angled triangles. The primary trigonometric ratios are:

Sine (sin): The ratio of the length of the opposite side to the hypotenuse

Cosine (cos): The ratio of the length of the adjacent side to the hypotenuse

Tangent (tan): The ratio of the length of the opposite side to the adjacent side.

Cosecant (csc): The reciprocal of sine.

Secant (sec): The reciprocal of cosine.

Cotangent (cot): The reciprocal of tangent.

RS Aggarwal Solutions for Class 10 Maths Chapter 5 Exercise 5

Below we have provided RS Aggarwal Solutions for Class 10 Maths Chapter 5 Exercise 5 for the ease of the students –

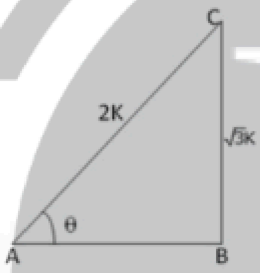
Question 1.

Solution:

Given:

$\sin\theta = \frac{\sqrt{3}}{2}$

Let us draw a ΔABC in which $\angle B = 90°$ and $\angle BAC = \theta$



Then, $\sin\theta = \frac{BC}{AC} = \frac{\sqrt{3}}{2}$

Let $BC = \sqrt{3}k$

and $AC = 2k$,

where k is positive

By pythagoras theorem, we have

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

$\Rightarrow AB^2 = AC^2 - BC^2$

$$AB^2 = \left[(2k)^2 - (\sqrt{3}k)^2\right]$$

$$= (4k^2 - 3k^2)$$

$$\Rightarrow AB = \sqrt{k^2} = k$$

$$\therefore \sin\theta = \frac{BC}{AC} = \frac{\sqrt{3}k}{2k} = \frac{\sqrt{3}}{2},$$

$$\cos\theta = \frac{AB}{AC} = \frac{k}{2k} = \frac{1}{2}$$

$$\tan\theta = \frac{\sin\theta}{\cos\theta} = \left(\frac{\sqrt{3}}{2} \times \frac{2}{1}\right) = \sqrt{3};$$

$$\operatorname{cosec}\theta = \frac{1}{\sin\theta} = \frac{2}{\sqrt{3}},$$

$$\sec\theta = \frac{1}{\cos\theta} = \frac{2}{1} = 2 \quad \text{and}$$

$$\cot\theta = \frac{1}{\tan\theta} = \frac{1}{\sqrt{3}}$$

Question 2.

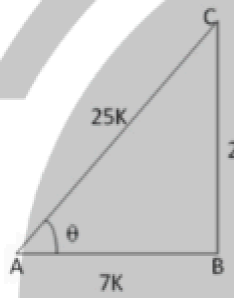
Solution:

Given : $\cos\theta = \frac{7}{25}$

Let $AB = 7k$ and $AC = 25k$,

where k is positive

Let us draw a Δ ABC in which $\angle B = 90°$ and $\angle BAC = \theta$



By Pythagoras theorem, we have

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

$\Rightarrow BC^2 = AC^2 - AB^2$

$BC^2 = \left[(25k)^2 - (7k)^2\right]$

$= (625k^2 - 49k^2)$

$= 576k^2$

$\Rightarrow BC = \sqrt{576k^2} = 24k$

$\therefore \sin\theta = \frac{BC}{AC} = \frac{24k}{25k} = \frac{24}{25}, \cos\theta = \frac{7}{25}$ (given)

$\tan\theta = \frac{\sin\theta}{\cos\theta} = \left(\frac{24}{25} \times \frac{25}{7}\right) = \frac{24}{7}$

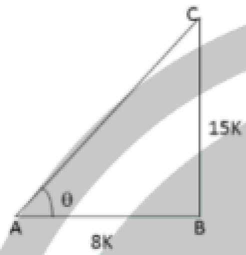
$\text{cosec}\theta = \frac{1}{\sin\theta} = \frac{25}{24}$

$\sec\theta = \frac{1}{\cos\theta} = \frac{25}{7}$

$\cot\theta = \frac{1}{\tan\theta} = \frac{7}{24}$

Question 3.

Solution:



Given : $\tan A = \frac{BC}{AB} = \frac{15}{8}$

Let $BC = 15k$ and $AB = 8k$, where k is positive.

Let us draw a ΔABC in which $\angle B = 90^\circ$ and $\angle BAC = \theta$

By Pythagoras theorem, we have

$AC^2 = AB^2 + BC^2 = (8k)^2 + (15k)^2 = 64k^2 + 225k^2 = 289k^2$

$\Rightarrow AC = 17k$

Thus, we have

$\sin\theta = \frac{BC}{AC} = \frac{15k}{17k} = \frac{15}{17}$

$\cos\theta = \frac{AB}{AC} = \frac{8k}{17k} = \frac{8}{17}$

$\tan\theta = \frac{15}{8}$ (given)

$\operatorname{cosec}\theta = \frac{1}{\sin\theta} = \frac{17}{15}$

$\sec\theta = \frac{1}{\cos\theta} = \frac{17}{8}$

$\cot\theta = \frac{1}{\tan\theta} = \frac{8}{15}$

Question 4.

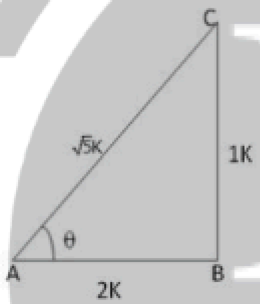
Solution:

Given : $\cot\theta = \frac{AB}{BC} = \frac{2k}{1k}$

Let $AB = 2k$

and $BC = 1k$, where k is positive

Let us draw a ΔABC in which $\angle B = 90^{o}$ and $\angle BAC = \theta$



By Pythagoras theorem, we have

$(AC)^2 = (AB)^2 + (BC)^2 = \left[(2k)^2 + (1k)^2\right]$

$= \left(4k^2 + 1k^2\right) = 5k^2$

$\therefore AC = \sqrt{5k^2} = \sqrt{5}k$

$\therefore \sin\theta = \frac{BC}{AC} = \frac{1k}{\sqrt{5}k} = \frac{1}{\sqrt{5}}$

$\cos\theta = \frac{AB}{AC} = \frac{2k}{\sqrt{5}k} = \frac{2}{\sqrt{5}}$

$\tan\theta = \frac{1}{\cot\theta} = \frac{1}{2}$; $\cot\theta = 2$ (given)

$\text{cosec}\,\theta = \frac{1}{\sin\theta} = \sqrt{5}$

$\sec\theta = \frac{1}{\cos\theta} = \frac{\sqrt{5}}{2}$

Question 5.

Solution:

Given: $\operatorname{cosec}\theta = \frac{AC}{BC} = \frac{\sqrt{10}}{1}$

Let $AC = \sqrt{10}k$

and $BC = 1k$

where k is positive

Let us draw a $\angle ABC$ in which $\angle B = 90°$ and $\angle BAC = \theta$

By pythagoras theorem, we have

$(AC)^2 = (AB)^2 + (BC)^2 \Rightarrow (AB)^2 = (AC)^2 - (BC)^2$

$= \left[(\sqrt{10}k)^2 - (k)^2\right] = (10k^2 - 1k^2)$

$\Rightarrow (AB)^2 = 9k^2$

$\Rightarrow AB = \sqrt{9k^2} = 3k$

$\therefore \sin\theta = \frac{BC}{AC} = \frac{1}{\sqrt{10}}$

$\cos\theta = \frac{AB}{AC} = \frac{3k}{\sqrt{10}k} = \frac{3}{\sqrt{10}}$

$\operatorname{cosec}\theta = \sqrt{10}$ (given)

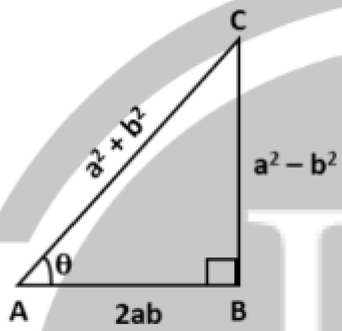
$\sec\theta = \frac{1}{\cos\theta} = \frac{\sqrt{10}}{3}$

$\tan\theta = \frac{\sin\theta}{\cos\theta} = \left(\frac{1}{\sqrt{10}} \times \frac{\sqrt{10}}{3}\right) = \frac{1}{3}$

$\cot\theta = \frac{1}{\tan\theta} = 3$

Question 6.

Solution:



Consider ΔABC where $\angle B = 90^\circ, \angle A = \theta$

Then, $\sin\theta = \frac{\text{Perpendicular}}{\text{Hypotenuse}} = \frac{BC}{AC} = \frac{a^2 - b^2}{a^2 + b^2}$

Let $BC = a^2 - b^2$ and $AC = a^2 + b^2$

Then, by Pythagoras theorem,

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

$\Rightarrow AB^2 = AC^2 - BC^2 = (a^2 + b^2)^2 - (a^2 - b^2)^2 = a^4 + b^4 + 2a^2b^2 - a^4 - b^4 + 2a^2b^2 = 4a^2b^2$

$\Rightarrow AB = 2ab$

Now,

$\cos\theta = \frac{\text{Base}}{\text{Hypotenuse}} = \frac{AB}{AC} = \frac{2ab}{a^2 + b^2}$

$\tan\theta = \frac{\text{Perpendicular}}{\text{Base}} = \frac{BC}{AB} = \frac{a^2 - b^2}{2ab}$

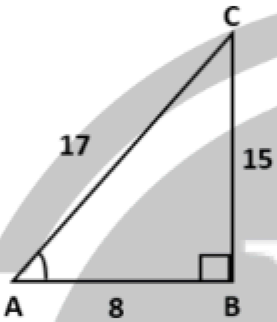
$\cot\theta = \frac{1}{\tan\theta} = \frac{2ab}{a^2 - b^2}$

$\text{cosec}\,\theta = \frac{1}{\sin\theta} = \frac{a^2 + b^2}{a^2 - b^2}$

$\sec\theta = \frac{1}{\cos\theta} = \frac{a^2 + b^2}{2ab}$

Question 7.

Solution:



$15\cot A = 8 \Rightarrow \cot A = \frac{8}{15}$

Consider ΔABC, where $\angle B = 90^\circ$

Then, $\cot A = \frac{\text{Base}}{\text{Perpendicular}} = \frac{AB}{BC} = \frac{8}{15}$

Let AB = 8 and BC = 15

Then, by Pythagoras theorem,

$AC^2 = AB^2 + BC^2 = 8^2 + 15^2 = 64 + 225 = 289$

$\Rightarrow AC = 17$

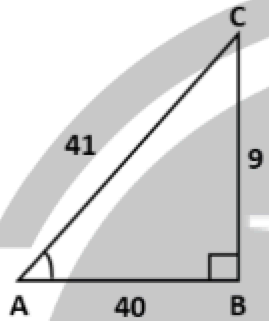
Now,

$\sin A = \frac{\text{Perpendicular}}{\text{Hypotenuse}} = \frac{BC}{AC} = \frac{15}{17}$

$\sec A = \frac{\text{Hypotenuse}}{\text{Base}} = \frac{AC}{AB} = \frac{17}{8}$

Question 8.

Solution:



Consider ΔABC, where $\angle B = 90^\circ$

Then, $\sin A = \dfrac{\text{Perpendicular}}{\text{Hypotenuse}} = \dfrac{BC}{AC} = \dfrac{9}{41}$

Let BC = 9 and AC = 41

Then, by Pythagoras theorem,

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

$\Rightarrow AB^2 = AC^2 - BC^2 = 41^2 - 9^2 = 1681 - 81 = 1600$

$\Rightarrow AB = 40$

Now,

$\cos A = \dfrac{\text{Base}}{\text{Hypotenuse}} = \dfrac{AB}{AC} = \dfrac{40}{41}$

$\tan A = \dfrac{\text{Perpendicular}}{\text{Base}} = \dfrac{BC}{AB} = \dfrac{9}{40}$

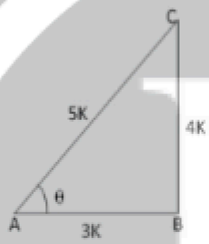
Question 9.

Solution:

Given:

$\cos\theta = 0.6 = \frac{6}{10} = \frac{3}{5}$

Let us draw a triangle ABC in which $\angle B = 90°$ and $\angle A = \theta$



Then, $\cos\theta = \frac{AB}{AC} = \frac{3}{5}$

let $AB = 3k$

and $AC = 5k$,

where k is positive

By Pythagoras theorem, we have

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

$\Rightarrow (BC)^2 = (AC)^2 - (AB)^2$

$= \left[(5k)^2 - (3k)^2\right] = 16k^2$

$\Rightarrow (BC)^2 = 16k^2$

$\Rightarrow BC = 4k$

$\sin\theta = \frac{AB}{AC} = \frac{4k}{5k} = \frac{4}{5}$

$\cos\theta = \frac{3}{5}$

$\tan\theta = \frac{\sin\theta}{\cos\theta} = \left(\frac{4}{5} \times \frac{5}{3}\right) = \frac{4}{3}$

$\Rightarrow (5\sin\theta - 3\tan\theta) = \left(5 \times \frac{4}{5} - 3 \times \frac{4}{3}\right) = 0$

Hence, $(5\sin\theta - 3\tan\theta) = 0$

Question 10.

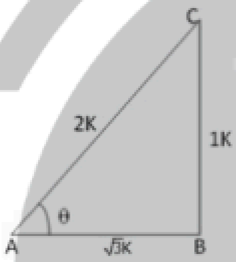
Solution:

Given: $\text{cosec}\theta = \frac{AC}{BC} = \frac{2}{1}$

let $BC = 1k$ and $AC = 2k$

where k is positive

Let us draw a ΔABC in which $\angle B = 90^0$ and $\angle A = \theta$



By Pythagoras theorem, we have

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

$$\Rightarrow (AB)^2 = (AC)^2 - (BC)^2$$

$$= \left[(2k)^2 - (1k)^2\right] = \left(4k^2 - 1k^2\right) = 3k^2$$

$$\Rightarrow (AB) = \sqrt{3}k$$

$$\sin\theta = \frac{BC}{AC} = \frac{1k}{2k} = \frac{1}{2}$$

$$\cos\theta = \frac{AB}{AC} = \frac{\sqrt{3}k}{2k} = \frac{\sqrt{3}}{2}$$

$$\cot\theta = \frac{\cos\theta}{\sin\theta} = \left(\frac{\sqrt{3}}{2} \times \frac{2}{1}\right) = \sqrt{3}$$

$$\Rightarrow \left[\cot\theta + \frac{\sin\theta}{1 + \cos\theta}\right] = \left[\sqrt{3} + \frac{\frac{1}{2}}{1 + \frac{\sqrt{3}}{2}}\right]$$

$$= \left(\sqrt{3} + \frac{1}{2 + \sqrt{3}}\right) = \left(\frac{2\sqrt{3} + 3 + 1}{2 + \sqrt{3}}\right)$$

$$= \left(\frac{2\sqrt{3} + 4}{2 + \sqrt{3}}\right) = 2\left(\frac{\sqrt{3} + 2}{2 + \sqrt{3}}\right) = 2$$

Hence, $\left[\cot\theta + \frac{\sin\theta}{1 + \cos\theta}\right] = 2$

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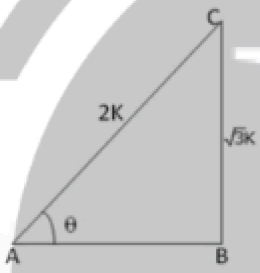
Question 1.

Solution:

Given:

$\sin\theta = \frac{\sqrt{3}}{2}$

Let us draw a ΔABC in which $\angle$B = 90° and $\angle$BAC = θ



Then, $\sin\theta = \frac{BC}{AC} = \frac{\sqrt{3}}{2}$

Let $BC = \sqrt{3}k$

and $AC = 2k$,

where k is positive

By pythagoras theorem, we have

$$AC^2 = \left(AB^2 + BC^2\right)$$

$$\Rightarrow AC^2 = \left[\left(\sqrt{7}k\right)^2 + \left(1k\right)^2\right]$$

$$= 7k^2 + 1k^2 = 8k^2$$

$$\Rightarrow AC = 2\sqrt{2}k$$

$$\operatorname{cosec}\theta = \frac{AC}{BC} = \frac{2\sqrt{2}k}{1k} = 2\sqrt{2}$$

$$\sec\theta = \frac{AC}{AB} = \frac{2\sqrt{2}k}{\sqrt{7}k} = \frac{2\sqrt{2}}{\sqrt{7}}$$

$$\Rightarrow \frac{\left(\operatorname{cosec}^2\theta - \sec^2\theta\right)}{\left(\operatorname{cosec}^2\theta + \sec^2\theta\right)} = \left[\frac{\left(2\sqrt{2}\right)^2 - \left(\frac{2\sqrt{2}}{\sqrt{7}}\right)^2}{\left(2\sqrt{2}\right)^2 + \left(\frac{2\sqrt{2}}{\sqrt{7}}\right)^2}\right]$$

$$= \frac{\left(8 - \frac{8}{7}\right)}{\left(8 + \frac{8}{7}\right)} = \frac{\left(\frac{48}{7}\right)}{\left(\frac{64}{7}\right)} = \frac{48}{64} = \frac{3}{4}$$

Hence, $\left(\frac{\operatorname{cosec}^2\theta - \sec^2\theta}{\operatorname{cosec}^2\theta + \sec^2\theta}\right) = \frac{3}{4}$

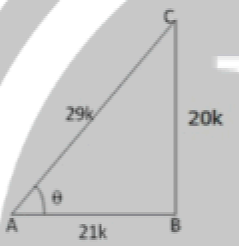
Question 12.

Solution:

Given:

$\tan\theta = \frac{20}{21} = \frac{20k}{21k}$

Let us draw a triangle ABC in which ∠B = 90° and ∠A = θ



By Pythagoras theorem, we have

$$AC^2 = AB^2 + BC^2$$
$$= (21k)^2 + (20k)^2$$
$$= 441k^2 + 400k^2$$
$$= 841k^2$$
$$\therefore \quad AC = 29k$$

$$\sin\theta = \frac{BC}{AC} = \frac{20k}{29k} = \frac{20}{29},\ \cos\theta = \frac{AB}{AC} = \frac{21k}{29k} = \frac{21}{29}$$

$$\text{L.H.S.} = \frac{1-\sin\theta+\cos\theta}{1+\sin\theta+\cos\theta} = \frac{1-\frac{20}{29}+\frac{21}{29}}{1+\frac{20}{29}+\frac{21}{29}} = \frac{\frac{29-20+21}{29}}{\frac{29+20+21}{29}}$$

$$= \frac{30}{70} = \frac{3}{7} = \text{R.H.S}$$

Benefits of RS Aggarwal Solutions for Class 10 Maths Chapter 5 Exercise 5

- **Clarity and Understanding:** The solutions provide clear explanations and step-by-step methods for solving trigonometric ratio problems. This clarity helps students grasp the concepts effectively.

- **Practice:** By working through the exercise, students get ample practice in applying trigonometric ratios to various types of problems, which enhances their problem-solving skills.
- **Concept Reinforcement:** The solutions reinforce fundamental concepts such as sine, cosine, tangent, and their reciprocal functions (cosecant, secant, cotangent), as well as the Pythagorean identity.
- **Exam Preparation:** Solving these exercises prepares students for exams by familiarizing them with the types of questions that may appear. It builds their confidence in tackling trigonometry-related questions.
- **Quality Assurance:** Prepared by subject experts, these solutions ensure accuracy and adherence to the curriculum, providing reliable guidance for students and educators alike.