

RD Sharma Solutions Class 10 Maths Chapter 5 Exercise 5.2: Chapter 5, Exercise 5.2 in RD Sharma's Class 10 Maths book covers Trigonometric Ratios, focusing on understanding and calculating the ratios of angles in right-angled triangles. Trigonometric ratios—sine, cosine, tangent, cotangent, secant, and cosecant—are introduced based on the triangle's side lengths (opposite, adjacent, and hypotenuse).

This exercise emphasizes the relationships among these ratios, such as how tangent is the ratio of sine to cosine, and how secant and cosecant are reciprocals of cosine and sine, respectively. Through examples, students learn to apply these ratios to solve problems involving triangle side lengths and angle measures, building a foundation for advanced trigonometry.

RD Sharma Solutions Class 10 Maths Chapter 5 Exercise 5.2 Overview

Chapter 5, Exercise 5.2 in RD Sharma's Class 10 Maths focuses on Trigonometric Ratios, which are fundamental in understanding the relationships between the angles and sides of a right triangle.

This exercise emphasizes calculations involving sine, cosine, and tangent ratios, allowing students to grasp the basics of trigonometry. Practicing these problems builds a solid foundation for solving real-life problems, such as measuring heights and distances, and understanding angles in various fields, like architecture and physics. Mastery of trigonometric ratios in this exercise is essential for tackling advanced trigonometry concepts and applications in higher classes.

RD Sharma Solutions Class 10 Maths Chapter 5 Exercise 5.2 Trigonometric Ratios

Below is the RD Sharma Solutions Class 10 Maths Chapter 5 Exercise 5.2 Trigonometric Ratios

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Evaluate each of the following:

1. $\sin 45^\circ \sin 30^\circ + \cos 45^\circ \cos 30^\circ$

Solution:

$$\sin 45^\circ \sin 30^\circ + \cos 45^\circ \cos 30^\circ$$

Value of trigonometric ratios are:

$$\sin 45^\circ = \frac{1}{\sqrt{2}} \quad \sin 30^\circ = \frac{1}{2}$$

$$\cos 45^\circ = \frac{1}{\sqrt{2}} \quad \cos 30^\circ = \frac{\sqrt{3}}{2}$$

Substituting in the given equation, we get

$$\begin{aligned} & \frac{1}{\sqrt{2}} \cdot \frac{1}{2} + \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{3}}{2} \\ &= \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{3}}{2\sqrt{2}} \\ &= \frac{\sqrt{3}+1}{2\sqrt{2}} \end{aligned}$$

2. $\sin 60^\circ \cos 30^\circ + \cos 60^\circ \sin 30^\circ$

Solution:

$$\sin 60^\circ \cos 30^\circ + \cos 60^\circ \sin 30^\circ$$

By trigonometric ratios we have ,

$$\sin 60^\circ = \frac{\sqrt{3}}{2} \quad \sin 30^\circ = \frac{1}{2}$$

$$\cos 30^\circ = \frac{\sqrt{3}}{2} \quad \cos 60^\circ = \frac{1}{2}$$

Substituting the values in given equation

$$\begin{aligned} &= \frac{\sqrt{3}}{2} \cdot \frac{\sqrt{3}}{2} + \frac{1}{2} \cdot \frac{1}{2} \\ &= \frac{3}{4} + \frac{1}{4} = \frac{4}{4} = 1 \end{aligned}$$

3. $\cos 60^\circ \cos 45^\circ - \sin 60^\circ \sin 45^\circ$

Solution:

$$\cos 60^\circ \cos 45^\circ - \sin 60^\circ \sin 45^\circ$$

We know that by trigonometric ratios

$$\cos 60^\circ = \frac{1}{2} \quad \cos 45^\circ = \frac{1}{\sqrt{2}}$$

$$\sin 60^\circ = \frac{\sqrt{3}}{2} \quad \sin 45^\circ = \frac{1}{\sqrt{2}}$$

Substituting the values in given equation

$$\begin{aligned} & \frac{1}{2} \cdot \frac{1}{\sqrt{2}} - \frac{\sqrt{3}}{2} \cdot \frac{1}{\sqrt{2}} \\ &= \frac{1-\sqrt{3}}{2\sqrt{2}} \end{aligned}$$

4. $\sin^2 30^\circ + \sin^2 45^\circ + \sin^2 60^\circ + \sin^2 90^\circ$

Solution:

$$\sin^2 30^\circ + \sin^2 45^\circ + \sin^2 60^\circ + \sin^2 90^\circ$$

We know that by trigonometric ratios

$$\sin 30^\circ = \frac{1}{2} \quad \sin 45^\circ = \frac{1}{\sqrt{2}}$$

$$\sin 60^\circ = \frac{\sqrt{3}}{2} \quad \sin 90^\circ = 1$$

Substituting the values in given equation, we get

$$\begin{aligned} &= \left[\frac{1}{2}\right]^2 + \left[\frac{1}{\sqrt{2}}\right]^2 + \left[\frac{\sqrt{3}}{2}\right]^2 + 1 \\ &= \frac{1}{4} + \frac{1}{2} + \frac{3}{4} + 1 \\ &= \frac{5}{2} \end{aligned}$$

5. $\cos^2 30^\circ + \cos^2 45^\circ + \cos^2 60^\circ + \cos^2 90^\circ$

Solution:

$$\cos^2 30^\circ + \cos^2 45^\circ + \cos^2 60^\circ + \cos^2 90^\circ$$

We know that by trigonometric ratios

$$\cos 30^\circ = \frac{\sqrt{3}}{2} \quad \cos 45^\circ = \frac{1}{\sqrt{2}}$$

$$\cos 60^\circ = \frac{1}{2} \quad \cos 90^\circ = 0$$

Substituting the values in given equation

$$\begin{aligned} & \left[\frac{\sqrt{3}}{2} \right]^2 + \left[\frac{1}{\sqrt{2}} \right]^2 + \left[\frac{1}{2} \right]^2 + 0 \\ &= \frac{3}{4} + \frac{1}{2} + \frac{1}{4} \\ &= \frac{3}{2} \end{aligned}$$

6. $\tan^2 30^\circ + \tan^2 45^\circ + \tan^2 60^\circ$

Solution:

$$\tan^2 30^\circ + \tan^2 45^\circ + \tan^2 60^\circ$$

We know that by trigonometric ratios

$$\tan 30^\circ = \frac{1}{\sqrt{3}} \quad \tan 60^\circ = \sqrt{3}$$

$$\tan 45^\circ = 1$$

Substituting the values in given equation

$$\begin{aligned} & \left[\frac{1}{\sqrt{3}} \right]^2 + [\sqrt{3}]^2 + 1 \\ &= \frac{1}{3} + 3 + 1 \\ &= \frac{13}{3} \end{aligned}$$

7. $2\sin^2 30^\circ - 3\cos^2 45^\circ + \tan^2 60^\circ$

Solution:

$$2\sin^2 30^\circ - 3\cos^2 45^\circ + \tan^2 60^\circ$$

We know that by trigonometric ratios

$$\sin 30^\circ = \frac{1}{2} \quad \cos 45^\circ = \frac{1}{\sqrt{2}}$$

$$\tan 60^\circ = \sqrt{3}$$

Substituting the values in given equation

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

$$= 2\left(\frac{1}{4}\right) - 3\left(\frac{1}{2}\right) + 3$$

$$= \frac{1-3+6}{2}$$

$$= 2$$

$$8. \sin^2 30^\circ \cos^2 45^\circ + 4\tan^2 30^\circ + (1/2) \sin^2 90^\circ - 2\cos^2 90^\circ + (1/24) \cos 20^\circ$$

Solution:

$$\sin^2 30^\circ \cos^2 45^\circ + 4 \tan^2 30^\circ + \frac{1}{2} \sin^2 90^\circ - 2 \cos^2 90^\circ + \frac{1}{24} \cos^2 0^\circ$$

We know that by trigonometric ratios

$$\sin 30^\circ = \frac{1}{2}$$

$$\cos 45^\circ = \frac{1}{\sqrt{2}}$$

$$\tan 30^\circ = \frac{1}{\sqrt{3}}$$

$$\sin 90^\circ = 1$$

$$\cos 90^\circ = 0$$

$$\cos 0^\circ = 1$$

Substituting the values in given equation

$$\left[\frac{1}{2}\right]^2 \cdot \left[\frac{1}{\sqrt{2}}\right]^2 + 4 \left[\frac{1}{\sqrt{3}}\right]^2 + \frac{1}{2} [1]^2 - 2 [0]^2 + \frac{1}{24} [1]^2$$

$$= \frac{1}{8} + \frac{4}{3} + \frac{1}{2} + \frac{1}{24}$$

$$= \frac{48}{24}$$

$$= 2$$

$$\sin^2 30^\circ \cos^2 45^\circ + 4 \tan^2 30^\circ + \frac{1}{2} \sin^2 90^\circ - 2 \cos^2 90^\circ + \frac{1}{24} \cos^2 0^\circ$$

We know that by trigonometric ratios

$$\sin 30^\circ = \frac{1}{2}$$

$$\cos 45^\circ = \frac{1}{\sqrt{2}}$$

$$\tan 30^\circ = \frac{1}{\sqrt{3}}$$

$$\sin 90^\circ = 1$$

$$\cos 90^\circ = 0$$

$$\cos 0^\circ = 1$$

Substituting the values in given equation

$$\left[\frac{1}{2}\right]^2 \cdot \left[\frac{1}{\sqrt{2}}\right]^2 + 4 \left[\frac{1}{\sqrt{3}}\right]^2 + \frac{1}{2} [1]^2 - 2 [0]^2 + \frac{1}{24} [1]^2$$

$$= \frac{1}{8} + \frac{4}{3} + \frac{1}{2} + \frac{1}{24}$$

$$= \frac{48}{24}$$

$$= 2$$

$$9. 4(\sin^4 60^\circ + \cos^4 30^\circ) - 3(\tan^2 60^\circ - \tan^2 45^\circ) + 5\cos^2 45^\circ$$

Solution:

$$4 (\sin^4 60^\circ + \cos^4 30^\circ) - 3 (\tan^2 60^\circ - \tan^2 45^\circ) + 5\cos^2 45^\circ$$

We know that by trigonometric ratios we have ,

$$\sin 60^\circ = \frac{\sqrt{3}}{2} \quad \cos 45^\circ = \frac{1}{\sqrt{2}}$$

$$\tan 60^\circ = \sqrt{3} \quad \cos 30^\circ = \frac{\sqrt{3}}{2}$$

Substituting the values in given equation

$$= 4 \cdot \frac{18}{16} - 6 + \frac{5}{2}$$

$$= \frac{1}{4} - 6 + \frac{5}{2}$$

$$= \frac{14}{2} - 6 = 7 - 6 = 1$$

$$10. (\operatorname{cosec}^2 45^\circ \sec^2 30^\circ)(\sin^2 30^\circ + 4\cot^2 45^\circ - \sec^2 60^\circ)$$

Solution:

$$(\operatorname{cosec}^2 45^\circ \sec^2 30^\circ) (\sin^2 30^\circ + 4\cot^2 45^\circ - \sec^2 60^\circ)$$

We know that by trigonometric ratios,

$$\operatorname{cosec} 45^\circ = \sqrt{2} \quad \sec 30^\circ = \frac{2}{\sqrt{3}}$$

$$\sin 30^\circ = \frac{1}{2} \quad \cot 45^\circ = 1$$

$$\sec 60^\circ = 2$$

Substituting the values in given equation

$$\left([\sqrt{2}]^2 \cdot \left[\frac{2}{\sqrt{3}} \right]^2 \right) \left(\left[\frac{1}{2} \right]^2 + 4(1) - (2)^2 \right)$$

$$= (2 \cdot (4/3)) [(1/4) + 4 - 4] = (8/3) \cdot (1/4)$$

$$= \frac{2}{3}$$

$$11. \operatorname{cosec}^3 30^\circ \cos 60^\circ \tan^3 45^\circ \sin^2 90^\circ \sec^2 45^\circ \cot 30^\circ$$

Solution:

$$\operatorname{cosec}^3 30^\circ \cos 60^\circ \tan^3 45^\circ \sin^2 90^\circ \sec^2 45^\circ \cot 30^\circ$$

Using trigonometric values, we have

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

$$= 8 \times \left(\frac{1}{2}\right) \times (1) \times (1) \times (2) \times (\sqrt{3})$$

$$= 8\sqrt{3}$$

$$12. \cot^2 30^\circ - 2\cos^2 60^\circ - \left(\frac{3}{4}\right)\sec^2 45^\circ - 4\sec^2 30^\circ$$

Solution:

Using trigonometric values, we have

$$\cot^2 30^\circ - 2\cos^2 60^\circ - \frac{3}{4}\sec^2 45^\circ - 4\sec^2 30^\circ$$

$$= (\sqrt{3}^2) - 2\left(\frac{1}{2}\right)^2 - \left(\frac{3}{4} \times \sqrt{2}^2\right) - \left(4 \times \left(\frac{2}{\sqrt{3}}\right)^2\right)$$

$$= 3 - \frac{1}{2} - \frac{3}{2} - \frac{16}{3}$$

$$= \frac{-13}{3}$$

$$13. (\cos 0^\circ + \sin 45^\circ + \sin 30^\circ)(\sin 90^\circ - \cos 45^\circ + \cos 60^\circ)$$

Solution:

$$(\cos 0^\circ + \sin 45^\circ + \sin 30^\circ)(\sin 90^\circ - \cos 45^\circ + \cos 60^\circ)$$

Using trigonometric values, we have

$$\begin{aligned}
&= \left(1 + \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}}\right) \left(1 - \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}}\right) \\
&= \left(\frac{3}{2} + \frac{1}{\sqrt{2}}\right) \left(\frac{3}{2} - \frac{1}{\sqrt{2}}\right) \\
&= \left(\left(\frac{3}{2}\right)^2 - \left(\frac{1}{\sqrt{2}}\right)^2\right) \\
&= \frac{9}{4} - \frac{1}{2} \\
&= \frac{7}{4}
\end{aligned}$$

$$14. \frac{\sin 30^\circ - \sin 90^\circ + 2 \cos 0^\circ}{\tan 30^\circ \tan 60^\circ}$$

Solution:

Given,

$$\frac{\sin 30^\circ - \sin 90^\circ + 2 \cos 0^\circ}{\tan 30^\circ \tan 60^\circ}$$

Using trigonometric values, we have

$$\begin{aligned}
&= \frac{\frac{1}{2} - 1 + 2}{\frac{1}{\sqrt{3}} \times \sqrt{3}} \\
&= \frac{3}{2}
\end{aligned}$$

$$15. 4/\cot^2 30^\circ + 1/\sin^2 60^\circ - \cos^2 45^\circ$$

Solution:

$$\begin{aligned}
& \frac{4}{\cot^2 30^\circ} + \frac{1}{\sin^2 60^\circ} - \cos^2 45^\circ \\
&= \frac{4}{(\sqrt{3})^2} + \frac{1}{\left(\frac{\sqrt{3}}{2}\right)^2} - \left(\frac{1}{\sqrt{2}}\right)^2 \\
&= \frac{4}{3} + \frac{4}{3} - \frac{1}{2} \\
&= \frac{16-3}{6} \\
&= \frac{13}{6}
\end{aligned}$$

16. $4(\sin^4 30^\circ + \cos^2 60^\circ) - 3(\cos^2 45^\circ - \sin^2 90^\circ) - \sin^2 60^\circ$

Solution:

Using trigonometric values, we have

$$\begin{aligned}
& 4(\sin^4 30^\circ + \cos^2 60^\circ) - 3(\cos^2 45^\circ - \sin^2 90^\circ) - \sin^2 60^\circ \\
&= 4\left(\left(\frac{1}{2}\right)^4 + \left(\frac{1}{2}\right)^2\right) - 3\left(\left(\frac{1}{\sqrt{2}}\right)^2 - 1\right) - \left(\frac{\sqrt{3}}{2}\right)^2 \\
&= 4\left(\frac{1}{16} + \frac{1}{4}\right) + \frac{3}{2} - \frac{3}{4} \\
&= \frac{8}{4} = 2
\end{aligned}$$

$$\frac{\tan^2 60^\circ + 4\cos^2 45^\circ + 3\sec^2 30^\circ + 5\cos^2 90^\circ}{\operatorname{cosec} 30^\circ + \sec 60^\circ - \cot^2 30^\circ}$$

17.

Solution:

Using trigonometric values, we have

$$\begin{aligned}
& \frac{\tan^2 60^\circ + 4\cos^2 45^\circ + 3\sec^2 30^\circ + 5\cos^2 90^\circ}{\operatorname{cosec} 30^\circ + \sec 60^\circ - \cot^2 30^\circ} \\
&= \frac{(\sqrt{3})^2 + 4\left(\frac{1}{\sqrt{2}}\right)^2 + 3\left(\frac{2}{\sqrt{3}}\right)^2 + 5(0)}{2 + 2 - (\sqrt{3})^2} \\
&= 3 + 2 + 4 \\
&= 9
\end{aligned}$$

$$\frac{\sin 30^\circ}{\sin 45^\circ} + \frac{\tan 45^\circ}{\sec 60^\circ} - \frac{\sin 60^\circ}{\cot 45^\circ} - \frac{\cos 30^\circ}{\sin 90^\circ}$$

18.

Solution:

Using trigonometric values, we have

$$\begin{aligned}
& \frac{\sin 30^\circ}{\sin 45^\circ} + \frac{\tan 45^\circ}{\sec 60^\circ} - \frac{\sin 60^\circ}{\cot 45^\circ} - \frac{\cos 30^\circ}{\sin 90^\circ} \\
&= \frac{\frac{1}{2}}{\frac{1}{\sqrt{2}}} + \frac{1}{2} - \frac{\frac{\sqrt{3}}{2}}{1} - \frac{\frac{\sqrt{3}}{2}}{1} \\
&= \frac{\sqrt{2}}{2} + \frac{1}{2} - \frac{\sqrt{3}}{2} - \frac{\sqrt{3}}{2} \\
&= \frac{\sqrt{2} + 1 - 2\sqrt{3}}{2}
\end{aligned}$$

$$\frac{\tan 45^\circ}{\operatorname{cosec} 30^\circ} + \frac{\sec 60^\circ}{\cot 45^\circ} - \frac{5\sin 90^\circ}{2\cos 0^\circ}$$

19.

Solution:

Using trigonometric values, we have

$$\begin{aligned} & \frac{\tan 45^\circ}{\operatorname{cosec} 30^\circ} + \frac{\sec 60^\circ}{\cot 45^\circ} - \frac{5 \sin 90^\circ}{2 \cos 0^\circ} \\ &= \frac{1}{2} + \frac{2}{1} - \frac{5(1)}{2(1)} \\ &= \frac{5}{2} - \frac{5}{2} \\ &= 0 \end{aligned}$$

Find the value of x in each of the following: (20-25)

20. $2 \sin 3x = \sqrt{3}$

Solution:

Given,

$$2 \sin 3x = \sqrt{3}$$

$$\sin 3x = \sqrt{3}/2$$

$$\sin 3x = \sin 60^\circ$$

$$3x = 60^\circ$$

$$x = 20^\circ$$

Benefits of Solving RD Sharma Solutions Class 10 Maths Chapter 5 Exercise 5.2

Solving RD Sharma solutions for Class 10 Maths Chapter 5, Exercise 5.2 on Trigonometric Ratios offers several benefits for students:

Strengthens Conceptual Understanding: Trigonometric ratios are foundational concepts in trigonometry. Solving RD Sharma problems helps reinforce understanding of these ratios (sine, cosine, tangent, etc.) and how they relate to angles in right triangles.

Builds Problem-Solving Skills: RD Sharma exercises provide a variety of problems with different levels of difficulty, encouraging students to apply concepts in multiple ways. This enhances problem-solving abilities and analytical thinking.

Improves Accuracy and Speed: By practicing repeatedly, students become more accurate in their calculations and improve their speed in identifying which trigonometric ratios to use in different scenarios.

Exam-Oriented Practice: RD Sharma solutions are aligned with the CBSE syllabus, making them an excellent resource for exam preparation. Practicing these solutions familiarizes students with question patterns they might encounter in exams.

Boosts Confidence: Solving exercises successfully builds confidence, especially in a subject like trigonometry that students often find challenging. With regular practice, students become more comfortable tackling complex trigonometric problems.