INTRODUCTION TO TRIGONOMETRY

INTRODUCTION

SUBJECT : MATHEMATICS
CHAPTER NUMBER: 08
CHAPTER NAME : INTRODUCTION TO TRIGONOMETRY

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LEARNING OUTCOME

1. Students will be able to know the meaning of Trigonometry.

2. Students will be able to know some ratios of the sides of a right triangle with respect to its acute angles.

3.Students will be able to know the relations between t- ratios.

4. Students will be able to apply and analyze trigonometry ratios in solving real life problems

Why Trigonometry

https://youtu.be/nf69QEuQ1IM (6.45)

Trigonometric Ratios;
https://youtu.be/LTSEn67gRl4 (9.45)

1.The word ‘trigonometry’ is derived from the Greek words ‘tri’ (meaning three), ‘gon’ (meaning sides) and ‘metron’ (meaning measure). In fact, trigonometry is the study of relationships between the sides and angles of a triangle. The earliest known work on trigonometry was recorded in Egypt and Babylon.

2.Trigonometry is the science of relationships between the sides and angles of a right-angled triangle.

3. Trigonometric ratios : Ratios of the sides of a right triangle with respect to its acute angles, called trigonometric ratios of the angle. However, these ratios can be extended to other angles also. We will also define the trigonometric ratios for angles of measure 0° and 90°. We will calculate trigonometric ratios for some specific angles and establish some identities involving these ratios, called trigonometric identities

Trigonometric Ratios

Trigonometric ratios of an acute angle in a right triangle express the relationship between the angle and the length of its sides.

Let ΔABC be a triangle right angled at B. Then the trigonometric ratios of the angle A in right ΔABC are defined as follows.

$$\text{sine of } \angle A \text{ i.e. } \sin A = \frac{\text{Side opposite to } \angle A}{\text{hypotenuse}} = \frac{BC}{AC}$$

$$\text{cosine of } \angle A \text{ i.e. } \cos A = \frac{\text{Side adjacent to } \angle A}{\text{hypotenuse}} = \frac{AB}{AC}$$

$$\text{tangent of } \angle A \text{ i.e. } \tan A = \frac{\text{Side opposite to } \angle A}{\text{Side adjacent to } \angle A} = \frac{BC}{AB}$$

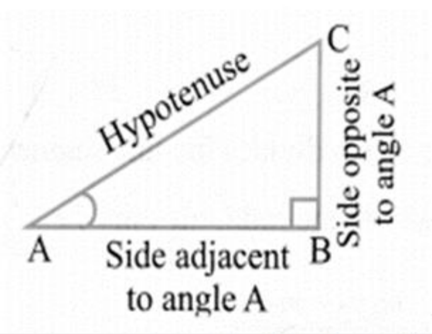
$$\text{cosecant of } \angle A \text{ i.e. } \operatorname{cosec} A = \frac{1}{\text{sine of } \angle A} = \frac{\text{hypotenuse}}{\text{Side opposite to } \angle A} = \frac{AC}{BC}$$

$$\text{secant of } \angle A \text{ i.e. } \sec A = \frac{1}{\text{cosine of } \angle A} = \frac{\text{hypotenuse}}{\text{Side adjacent } \angle A} = \frac{AC}{AB}$$

$$\text{cotangent of } \angle A \text{ i.e. } \cot A = \frac{1}{\text{tangent of } \angle A} = \frac{\text{side adjacent to } \angle A}{\text{Side opposite to } \angle A} = \frac{AB}{BC}$$

(i) $\sin A . \operatorname{cosec} A = 1$ (ii) $\cos A . \sec A = 1$

(iii) $\tan A . \cot A = 1$ (iv) $\tan A = \frac{\sin A}{\cos A}$ (v) $\cot A = \frac{\cos A}{\sin A}$



1.In Δ ABC, right-angled at B, AB = 24 cm, BC = 7 cm. Determine : (i) sin A, cos A (ii) sin C, cos C.

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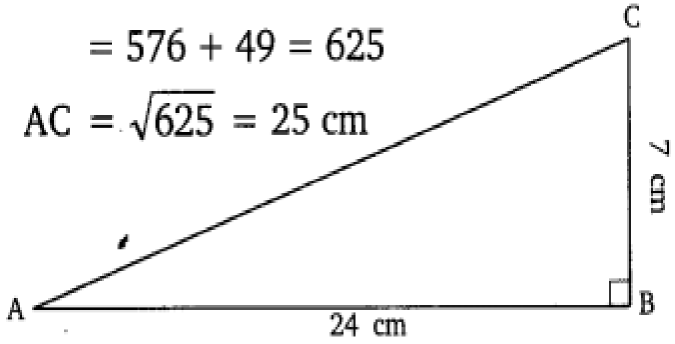
By Pythagoras' Theorem,

$$AC^2 = AB^2 + BC^2 = (24)^2 + (7)^2$$

$$= 576 + 49 = 625$$

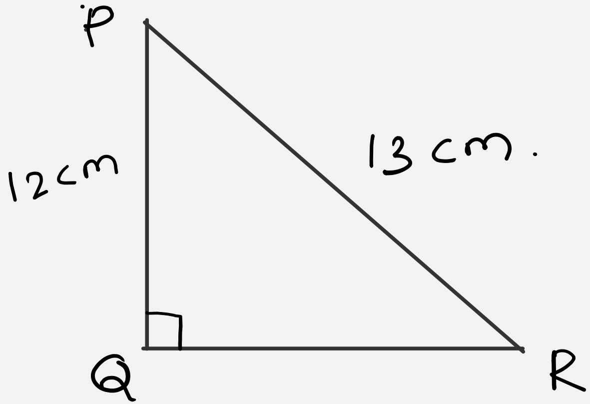
$$\Rightarrow \quad AC = \sqrt{625} = 25 \text{ cm}$$



(i) $\sin A = \dfrac{BC}{AC} = \dfrac{7}{25}$, $\cos A = \dfrac{AB}{AC} = \dfrac{24}{25}$

(ii) $\sin C = \dfrac{AB}{AC} = \dfrac{24}{25}$, $\cos C = \dfrac{BC}{AC} = \dfrac{7}{25}$

2. In Fig, find tan P – cot R.



2. In Fig, find tan P – cot R.

In right angled ΔPQR,

$$PR^2 = PQ^2 + QR^2 \qquad \text{[Pythagoras Theorem]}$$

$$\Rightarrow \quad (13)^2 = (12)^2 + QR^2$$

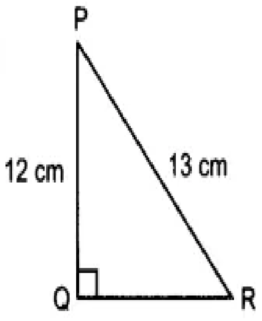
$$\Rightarrow \quad 169 - 144 = QR^2$$

$$\Rightarrow \quad 25 = QR^2 \Rightarrow QR = 5 \text{ cm}$$

$$\tan P = \frac{QR}{PQ} = \frac{5}{12}$$

$$\cot R = \frac{QR}{PQ} = \frac{5}{12}$$

So, $$\tan P - \cot R = \frac{5}{12} - \frac{5}{12} = 0$$



3. If $\sin A = 3 / 4$ calculate $\cos A$ and $\tan A$..

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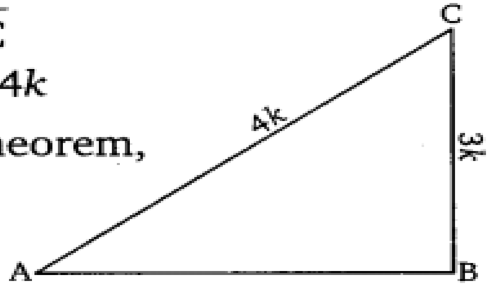
Given: $\sin A = \frac{3}{4} = \frac{BC}{AC}$

Let BC = 3k and AC = 4k

Then by Pythagoras' Theorem,

$$AB^2 = AC^2 - BC^2$$
$$= (4k)^2 - (3k)^2$$
$$= 16k^2 - 9k^2 = 7k^2$$



$$\Rightarrow AB = k\sqrt{7}$$

$$\therefore \cos A = \frac{AB}{AC} = \frac{\sqrt{7}k}{4k} = \frac{\sqrt{7}}{4}$$

$$\text{and } \tan A = \frac{BC}{AB} = \frac{3k}{\sqrt{7}k} = \frac{3}{\sqrt{7}}$$

4. If $\sec\theta = 13/12$, find the values of all the t-ratios.

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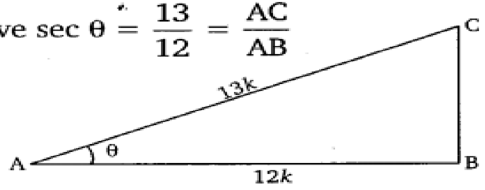
We have $\sec\theta = \frac{13}{12} = \frac{AC}{AB}$



Let AC = 13k and AB = 12k

Then by Pythagoras' Theorem,

$$AC^2 = AB^2 + BC^2 \Rightarrow 169k^2 = 144k^2 + BC^2$$

$$\Rightarrow 169k^2 - 144k^2 = BC^2 \Rightarrow 25k^2 = BC^2$$

$$\Rightarrow BC = \sqrt{25k^2} = 5k$$

$$\sin\theta = \frac{BC}{AC} = \frac{5k}{13k} = \mathbf{\frac{5}{13}}$$

$$\cos\theta = \frac{AB}{AC} = \frac{12k}{13k} = \mathbf{\frac{12}{13}}$$

$$\tan\theta = \frac{BC}{AB} = \frac{5k}{12k} = \mathbf{\frac{5}{12}}$$

$$\operatorname{cosec}\theta = \frac{AC}{BC} = \frac{13k}{5k} = \mathbf{\frac{13}{5}}$$

$$\cot\theta = \frac{AB}{BC} = \frac{12k}{5k} = \mathbf{\frac{12}{5}}.$$

HOME ASSIGNMENT Ex. 8.1 Q. 1 to Q 3

AHA

1. . In a right triangle ABC, right-angled at B, if tan A = 1, then verify that 2 sin A cos A = 1.

THANKING YOU

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