NCERT Solutions For Class 10 Chapter 8 Introduction to Trigonometry Exercise 8.1

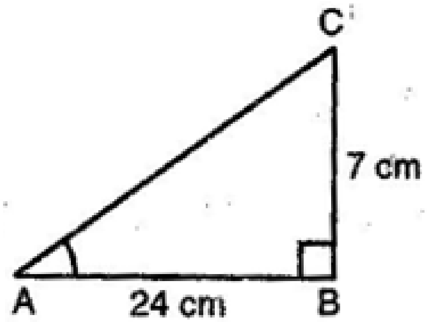
Q1. In $\triangle$ABC, right angled at B, AB = 24 cm, BC = 7 cm. Determine:

(i) $\sin A \cos A$

(ii) $\sin C \cos C$

Ans: Let us draw a right angled triangle ABC, right angled at B.

Using Pythagoras theorem,



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

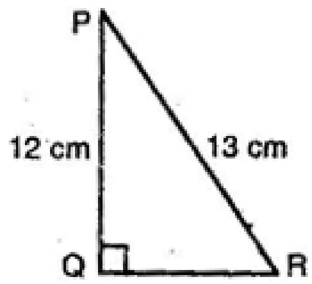
$= (24)^2 + (7)^2 = 576 + 49 = 625$

$\Rightarrow$ AC = 25 cm

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

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

Q2. In adjoining figure, find $\tan P - \cot R$:



Ans: Using Pythagoras theorem,

$PR^2 = PQ^2 + QR^2$

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

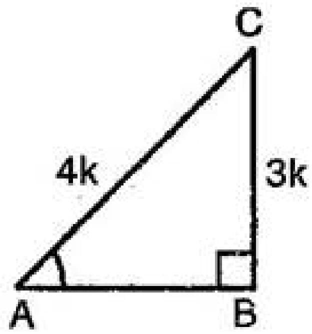
$\Rightarrow QR^2 = 169 - 144 = 25$

$\Rightarrow$ QR = 5 cm

$\therefore \tan P - \cot R = \frac{QR}{PQ} - \frac{QR}{PQ} = \frac{5}{13} - \frac{5}{13} = 0$

Q3. If $\sin A = \frac{3}{4}$, calculate $\cos A$ and $\tan A$.

Ans: Given: A triangle ABC in which $\angle$ B = 90°



Let BC = $3k$ and AC = $4k$

Then, Using Pythagoras theorem,

AB = $\sqrt{(AC)^2 - (BC)^2} = \sqrt{(4k)^2 - (3k)^2}$

$= \sqrt{16k^2 - 9k^2} = k\sqrt{7}$

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

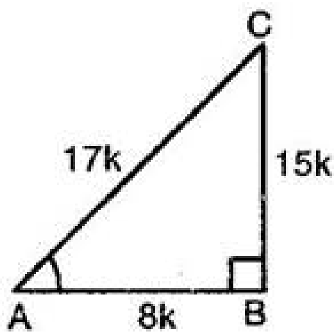
$\tan A = \frac{BC}{AB} = \frac{3k}{k\sqrt{7}} = \frac{3}{\sqrt{7}}$

Q4. Given $15 \cot A = 8$, find $\sin A$ and $\sec A$

Ans: Given: A triangle ABC in which $\angle$ B = 90°

$15 \cot A = 8$

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



Let AB = $8k$ and BC = $15k$

Then using Pythagoras theorem,

AC = $\sqrt{(AB)^2 + (BC)^2}$

$\sqrt{(8k)^2 + (15k)^2}$

$$= \sqrt{(8k) \quad + (15k)}$$

$= \sqrt{64k^2 + 225k^2}$

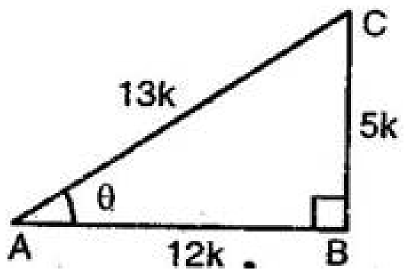
$= \sqrt{289k^2} = 17k$

$\therefore \sin A = \dfrac{BC}{AC} = \dfrac{15k}{17k} = \dfrac{15}{17}$

$\sec A = \dfrac{AC}{AB} = \dfrac{17k}{8k} = \dfrac{17}{8}$

Q5. Given $\sec\theta = \dfrac{13}{12}$, calculate all other trigonometric ratios.

Ans: Consider a triangle ABC in which $\angle A = \theta$ and $\angle B = 90^\circ$



Let AB = $12k$ and BC = $5k$

Then, using Pythagoras theorem,

BC = $\sqrt{(AC)^2 - (AB)^2}$

$= \sqrt{(13k)^2 - (12k)^2}$

$= \sqrt{169k^2 - 144k^2}$

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

$\therefore \sin\theta = \dfrac{BC}{AC} = \dfrac{5k}{13k} = \dfrac{5}{13}$

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

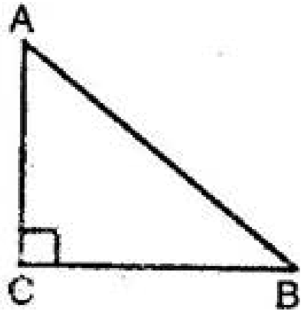
$\tan\theta = \dfrac{BC}{AB} = \dfrac{5k}{12k} = \dfrac{5}{12}$

$\cot\theta = \dfrac{AB}{BC} = \dfrac{12k}{5k} = \dfrac{12}{5}$

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

Q6. If $\angle$ And $\angle$ B are acute angles such that $\cos A = \cos B$, then show that $\angle A = \angle B$.

Ans: In right triangle ABC,



$\cos A = \frac{AC}{AB}$ and $\cos B = \frac{BC}{AB}$

But $\cos A = \cos B$ [Given]

$\Rightarrow \frac{AC}{AB} = \frac{BC}{AB}$

$\Rightarrow AC = BC$

$\Rightarrow \angle A = \angle B$

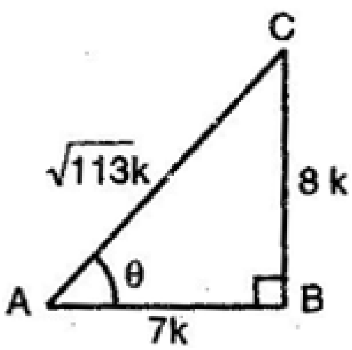
[Angles opposite to equal sides are equal]

Q7. If $\cot\theta = \frac{7}{8}$, evaluate:

(i) $\frac{(1+\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(1-\cos\theta)}$

(ii) $\cot^2\theta$

Ans: Consider a triangle ABC in which $\angle A = \theta$ and $\angle B = 90^\circ$



Let AB = $7k$ and BC = $8k$

Then, using Pythagoras theorem,

AC = $\sqrt{(BC)^2 + (AB)^2}$

$= \sqrt{(8k)^2 + (7k)^2}$

$= \sqrt{64k^2 + 49k^2}$

$= \sqrt{113k^2} = \sqrt{113}k$

$\therefore \sin\theta = \frac{BC}{AC} = \frac{8k}{\sqrt{113}k} = \frac{8}{\sqrt{113}}$

$\cos\theta = \frac{AB}{AC} = \frac{7k}{\sqrt{113}k} = \frac{7}{\sqrt{113}}$

(i) $\frac{(1+\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(1-\cos\theta)} = \frac{1-\sin^2\theta}{1-\cos^2\theta}$

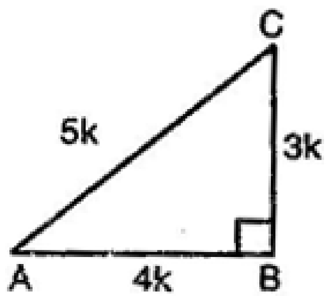
$= \frac{1-\frac{64}{113}}{1-\frac{49}{113}} = \frac{113-64}{113-49} = \frac{49}{64}$

(ii) $\cot^2\theta = \frac{\cos^2\theta}{\sin^2\theta} = \frac{49/113}{64/113} = \frac{49}{64}$

Q8. If $3\cot A = 4$, check whether

$\frac{1-\tan^2 A}{1+\tan^2 A} = \cos^2 A - \sin^2 A$ or not.

Ans: Consider a triangle ABC in which $\angle$ B = 90°.



And $3\cot A = 4$

$\Rightarrow \cot A = \frac{4}{3}$

Let AB = $4k$ and BC = $3k$.

Then, using Pythagoras theorem,

AC = $\sqrt{(BC)^2 + (AB)^2}$

$\sqrt{(3k)^2 + (4k)^2}$

$$= \sqrt{(3k) + (4k)}$$

$$= \sqrt{16k^2 + 9k^2}$$

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