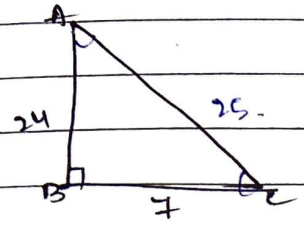
Exercise 6.1

Q1.



$\therefore AC = \sqrt{(24)^2 + (7)^2}$

$= \sqrt{576 + 49}$

$= \sqrt{625} = 25.$

(i) Sin A, Cos A.

$\Rightarrow \sin A = \frac{BC}{AC} = \frac{7}{25}.$

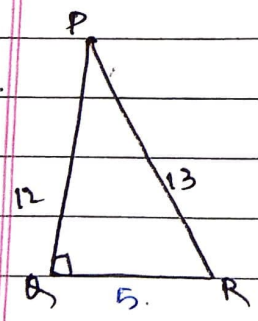
$\Rightarrow \cos A = \frac{AB}{AC} = \frac{24}{25}$

(ii) Sin C, Cos C

$\Rightarrow \sin C = \frac{AB}{AC} = \frac{24}{25}.$

$\Rightarrow \cos C = \frac{BC}{AC} = \frac{7}{25}$

Q2.



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

$= \sqrt{169 - 144}$

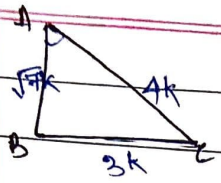
$= \sqrt{25} = 5.$

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

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

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

Q3.



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

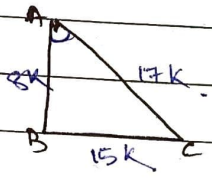
$$AB = \sqrt{4k^2 - 3k^2}$$
$$= \sqrt{16k - 9k}$$
$$= \sqrt{7k}$$

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

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

Q4. $15 \cot A = 8$.

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

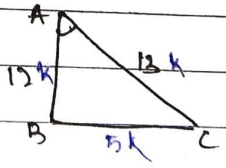


$$AC = \sqrt{8k^2 + 15k^2}$$
$$= \sqrt{64k + 225k}$$
$$= \sqrt{289k} = 17k$$

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

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

Q5. $\sec \theta = \frac{13}{12}$



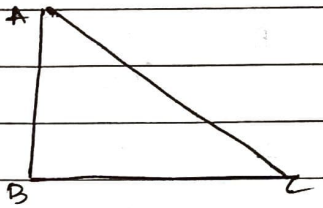
$$BC = \sqrt{(13k)^2 - (12k)^2}$$
$$= \sqrt{169k - 144k}$$
$$= \sqrt{25k} = 5k$$

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

$\cos\theta = \frac{AB}{AC} = \frac{12K}{13K} = \frac{12}{13}$ $\left\{ \sec\theta = \frac{AC}{AB} = \frac{13K}{12K} = \frac{13}{12} \right.$

$\tan\theta = \frac{BC}{AB} = \frac{5K}{12K} = \frac{5}{12}$ $\left\{ \cot\theta = \frac{AB}{BC} = \frac{12K}{5K} = \frac{12}{5} \right.$

Q6 $\cos A = \frac{AB}{AC}$, $\cos B = \frac{BC}{AC}$.



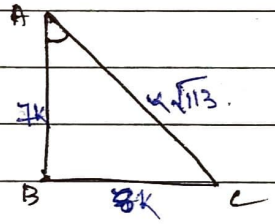
for $\cos A = \cos B$.

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

$\Rightarrow AB = BC$

$\therefore \angle A = \angle B$.

Q7. $\cot\theta = \frac{7}{8}$.



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

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

$= \sqrt{113k}$

$= K\sqrt{113}$.

$\sin\theta = \frac{BC}{AC} = \frac{8K}{K\sqrt{113}} = \frac{8}{\sqrt{113}}$.

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

$\cot\theta = \frac{AB}{BC} = \frac{7K}{8K} = \frac{7}{8}$.

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

$= \frac{(K\sin\theta)^2}{(K\cos\theta)^2} = \frac{(\sin\theta)^2}{(\cos\theta)^2}$

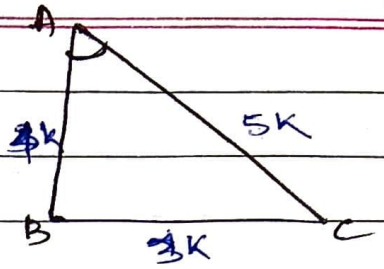
$\Rightarrow \frac{\left(\frac{8}{\sqrt{113}}\right)^2}{\left(\frac{7}{\sqrt{113}}\right)^2} = \frac{\left(\frac{64}{\sqrt{113}}\right)}{\left(\frac{49}{\sqrt{113}}\right)} = \frac{64}{\sqrt{113}} \times \frac{\sqrt{113}}{49} = \frac{64}{49}$.

$\frac{BC}{AC} = \frac{13K}{5K} = \frac{13}{5}$

(ii) $\cot^2\theta = \left(\frac{7}{8}\right)^2 = \frac{49}{64}$.

Q8. $3 \cot A = 4$.

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



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

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

$= \sqrt{25k}$

$= 5k$

$\tan A = \frac{BC}{AB} = \frac{3k}{4k} = \frac{4}{3}$.

$\cos A = \frac{AB}{AC} = \frac{4k}{5k} = \frac{4}{5}$.

$\sin A = \frac{BC}{AC} = \frac{3k}{5k} = \frac{3}{5}$.

$\Rightarrow \left(\frac{1 - \tan^2 A}{1 + \tan^2 A}\right) = \cos^2 A - \sin^2 A$.

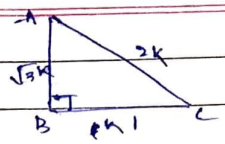
$= \frac{\left(1 - \frac{4}{3}\right)^2}{\left(1 + \frac{4}{3}\right)^2} = \left(\frac{4}{5}\right)^2 - \left(\frac{3}{5}\right)^2$

$= \frac{\left(\frac{16}{9}\right)}{\left(\frac{16}{9}\right)} = \left(\frac{16}{25}\right) - \left(\frac{9}{25}\right)$

$= \frac{9 - 16}{9 + 16} = \left(\frac{16 - 9}{25}\right)$

$= \frac{7}{25} = \frac{7}{25}$ [Yes]

Q9. $\tan A = \frac{BC}{AB} = \frac{1}{\sqrt{3}}$



$\frac{BC}{AB} = \frac{1}{\sqrt{3}}$

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

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

$= \sqrt{k^2 + \sqrt{3}}$

$= \sqrt{4k} = 2k$

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

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

$\sin C = \frac{AB}{AC} = \frac{\sqrt{3}k}{2k} = \frac{\sqrt{3}}{2}$.

$\cos C = \frac{BC}{AC} = \frac{1k}{2k} = \frac{1}{2}$.

(i) $\sin A \cos C + \cos A \sin C$.

$= \frac{1}{2} \times \frac{1}{2} + \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2}$

$= \frac{1}{4} + \frac{3}{4} = \frac{4}{4} = 1$.

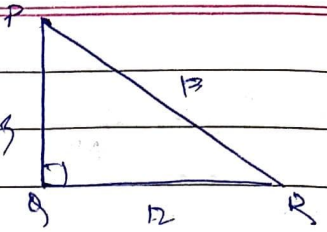
(ii) $\cos A \cos C - \sin A \sin C$.

$\frac{\sqrt{3}}{2} \times \frac{1}{2} - \frac{1}{2} \times \frac{\sqrt{3}}{2}$

$= \frac{\sqrt{3}}{4} - \frac{\sqrt{3}}{4} = 0$

Q10. $PR + QR = 25$.

$PQ = 5$.



$\Rightarrow PR^2 = PQ^2 + QR^2$.

$= PQ^2 = PR^2 - QR^2$

$= (5)^2 = \frac{PR + QR}{PR - QR}$

$= 25 = 25(PR - QR)$

$= \frac{25}{25} = (PR - QR)$

$= (PR - QR) = 1$.

$= PR - QR = 1$. , $PR + QR = 25$.

$\Rightarrow 2PR = 26 \Rightarrow PR = \frac{26}{2} = 13$.

$PR = 13$,

$QR = 12$.

$\sin P = \frac{QR}{PR} = \frac{12}{13}$.

$\cos P = \frac{PQ}{PR} = \frac{5}{13}$

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

Q11. i) False

ii) True.

iii) False.

iv) False.

(v) False

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Q. In $\triangle OPQ$, right angled at P, $OP = 7$

$OQ - PQ = 1$

Find $\sin Q$ and $\cos Q$.

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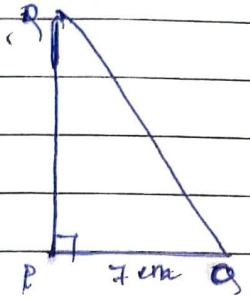

$OQ^2 = QP^2 + PO^2$

$(1 + PQ)^2 = OP^2 + PQ^2$

$1 + PQ^2 + 2PQ = OP^2 + PQ^2$

$1 + 2PQ = 7^2$

$PQ = 24\text{ cm}$, $OQ = 1 + PQ = 25\text{ cm}$.

$\sin Q = \frac{7}{25}$, $\cos Q = \frac{24}{25}$.

TRIGONOMETRIC RATIOS.

$\angle A$	0°	30°	45°	60°	90°
$\sin\theta$	0	$1/2$	$1/\sqrt{2}$	$\sqrt{3}/2$	1
$\operatorname{cosec}\theta$	Not D.	2	$\sqrt{2}$	$2/\sqrt{3}$	1
$\cos\theta$	1	$\sqrt{3}/2$	$1/\sqrt{2}$	$1/2$	0
$\sec\theta$	1	$2/\sqrt{3}$	$\sqrt{2}$	2	Not D
$\tan\theta$	0	$1/\sqrt{3}$	1	$\sqrt{3}$	Not D.
$\cot\theta$	Not D.	$\sqrt{3}$	1	$1/\sqrt{3}$	0