Trigonometric Ratios

Note

→ At 10th level, the trigonometry we study is only for $\boxed{\text{right angled } \Delta s.}$

→ The angles discussed (represented by $\angle A, \angle X, \theta, \alpha, \beta, \gamma, \delta$) are

$\boxed{0^\circ \leq \text{Angle} \leq 90^\circ}$ → mostly acute.

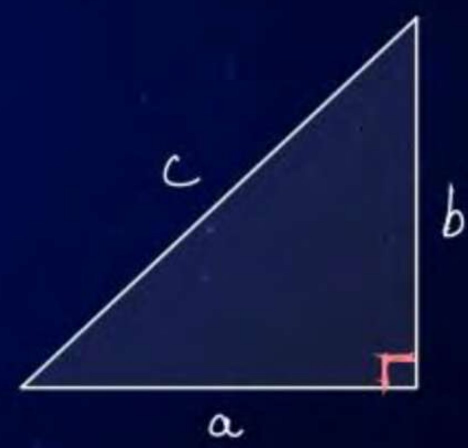
→ Trigo is the only concept in maths that connects $\boxed{\text{sides \& angles}}$ both.

Trigonometric Ratios

→ As the name suggests Trigonometric Ratios (T ratios) is the ratio of sides of a right angled $\triangle$.

$$\left(\frac{a}{b}, \frac{b}{a}, \frac{b}{c}, \frac{c}{b}, \frac{a}{c}, \frac{c}{a} \right)$$

Since, 6 possibilities, hence 6 T ratios.

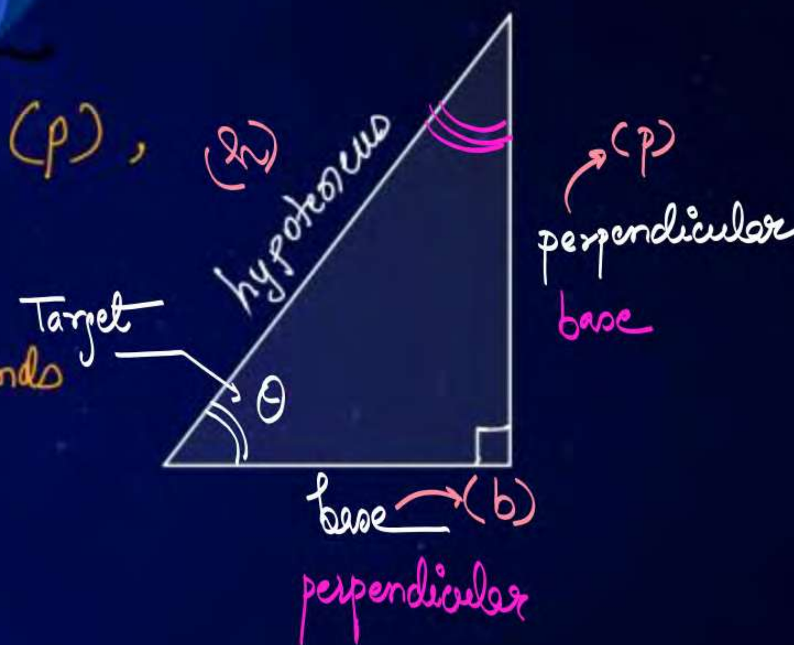


→ T ratios are unitless.

Trigonometric Ratios

→ The sides are called perpendicular (p), base (b) & hypoteneus (h).

→ 'h' is fixed, but 'p' & 'b' depends on the selection of 'θ'.



Trigonometric Ratios

* first we decide target angle & then we work :-

reciprocals

sine	✓ $\sin\theta$	p/h
cosine	✓ $\cos\theta$	b/h
tangent	✓ $\tan\theta$	p/b
cotangent	✓ $\cot\theta$	b/p
cosecant	✓ $\operatorname{cosec}\theta$	h/p
secant	✓ $\sec\theta$	h/b

(p) pandit	(b) badri	(p) prasad
(h) har	(h) har	(b) bole
sin sb	cos shup	tan then

Trigonometric Ratios

* Some important points

* $\sin\theta \longleftrightarrow$ sine of angle 'θ' ✓

$\sin \times \theta$ ✗

* $$(\sin\theta)^3 = \sin^3\theta$$
$$(\sin\theta)^2 = \sin^2\theta$$
$$(\sin\theta)^m = \sin^m\theta$$

$\longrightarrow$ This is how powers are tackled.

Trigonometric Ratios

sin ⇌ cosec
cos ⇌ sec
tan ⇌ cot

* Some important formulas

	e) $\tan\theta = \frac{1}{\cot\theta}$
a) $\sin\theta = \frac{1}{\text{cosec}\,\theta}$	f) $\cot\theta = \frac{1}{\tan\theta}$
b) $\text{cosec}\,\theta = \frac{1}{\sin\theta}$	g) $\sin\theta \times \text{cosec}\,\theta = 1$
c) $\cos\theta = \frac{1}{\sec\theta}$	h) $\cos\theta \times \sec\theta = 1$
d) $\sec\theta = \frac{1}{\cos\theta}$	i) $\tan\theta \times \cot\theta = 1$

Trigonometric Ratios

$\sin\angle A = \frac{4}{5}$

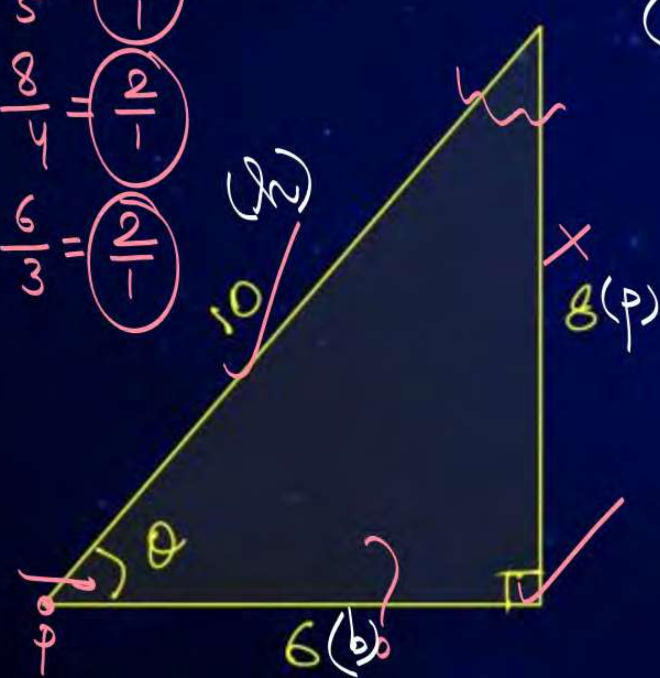
$\sin\angle P = \frac{\cancel{8}^{4}}{\cancel{10}_{5}} = \frac{4}{5}$

* For similar Δs, value of T-ratios will be same.

$\frac{10}{5} = \frac{2}{1}$

$\frac{8}{4} = \frac{2}{1}$

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

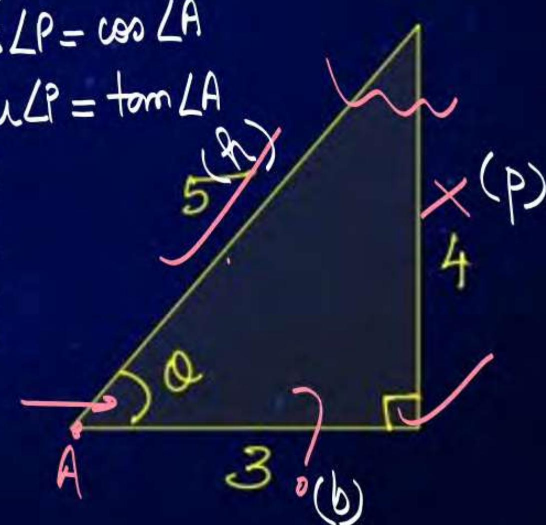


$\angle P = \angle A$

$\sin\angle P = \sin\angle A$

$\cos\angle P = \cos\angle A$

$\tan\angle P = \tan\angle A$



QUESTION

In ΔABC, right-angled at B, AB = 24 cm, BC = 7 cm. Determine:

(i) sin A, cos A

(ii) sin C, cos C

$\boxed{\text{Sol}^n}$

(i) $\sin A = \dfrac{p}{h} = \dfrac{7\cancel{cm}}{25\cancel{cm}} = \dfrac{7}{25}$

$\cos A = \dfrac{b}{h} = \dfrac{24\cancel{cm}}{25\cancel{cm}} = \dfrac{24}{25}$

(ii) $\sin C = \dfrac{24}{25}$

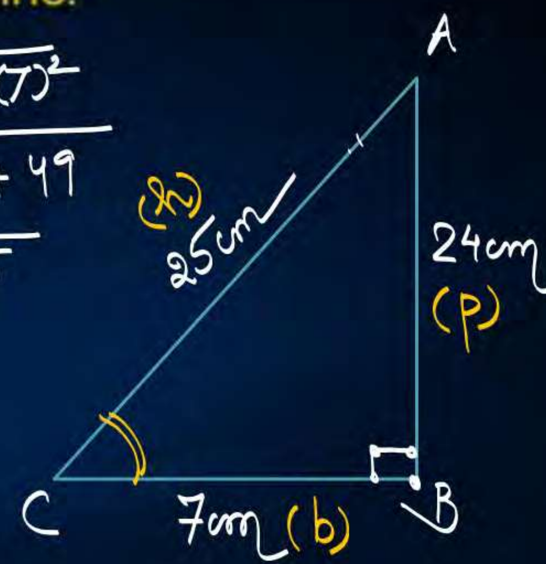
$\cos C = \dfrac{7}{25}$

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

$= \sqrt{576 + 49}$

$= \sqrt{625}$

$= 25$



QUESTION

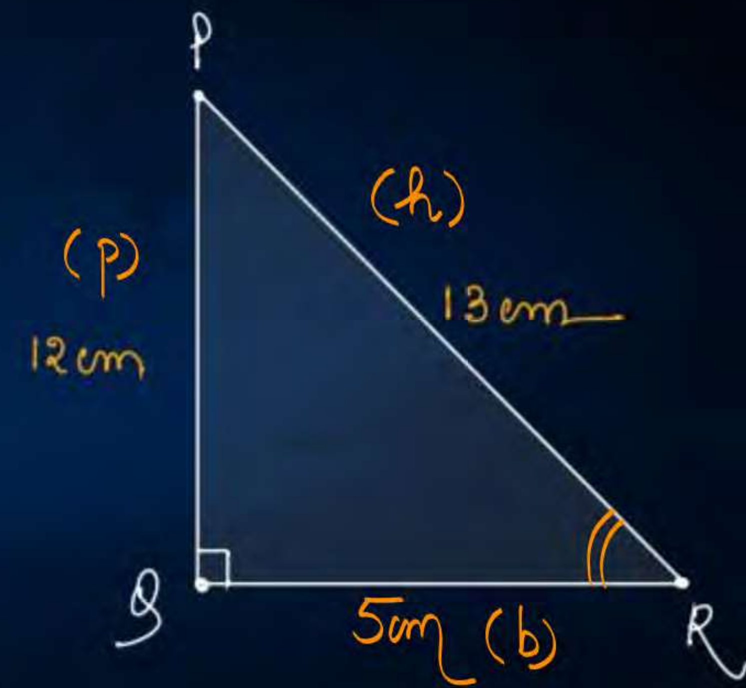
In Fig. find tan P - cot R. $\rightarrow \frac{5}{12} - \frac{5}{12}$

$= \boxed{0}$

Sol^n

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

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



QUESTION

5

Given sec θ = 13/12, calculate all other trigonometric ratios.

$\boxed{\text{Sol}^n}$

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

$\Rightarrow \boxed{\frac{h}{b} = \frac{13}{12}}$

$h = 13x$ units

$b = 12x$ units

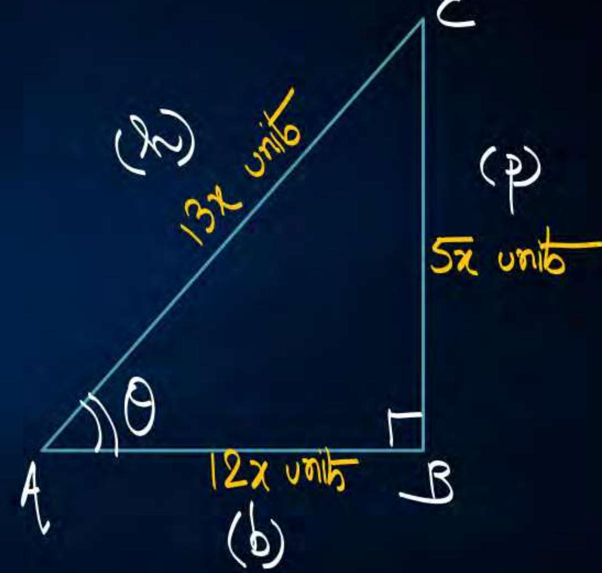
$\sin\theta = \frac{5}{13}$

$\cos\theta = \frac{12}{13}$

$\tan\theta = \frac{5}{12}$

$\cot\theta = 12/5$

$\text{cosec}\,\theta = \frac{13}{5}$



QUESTION

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

$\boxed{Sol^n}$

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

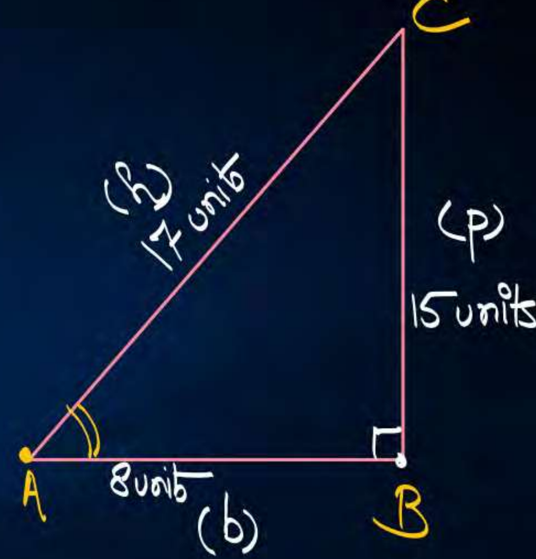
$$\boxed{\frac{b}{p} = \frac{8}{15}}$$

$b = 8$ units

$p = 15$ units

$$\sin A = \frac{15}{17}$$

$$\sec A = \frac{17}{8}$$



QUESTION

$$k = \frac{YX}{QP}$$

If ∠A and ∠B are acute angles such that cos A = cos B, then show that ∠A = ∠B.

Sol^n

$$\cos A = \cos B$$

$$\frac{AX}{AY} = \frac{BP}{BQ}$$

$$\boxed{\frac{YX}{QP} = \frac{AX}{BP} = \frac{AY}{BQ}} = k$$

$$\Rightarrow AX = k\,BP$$

$$\Rightarrow AY = k\,BQ$$

$$YX = \sqrt{(AY)^2 - (AX)^2}$$

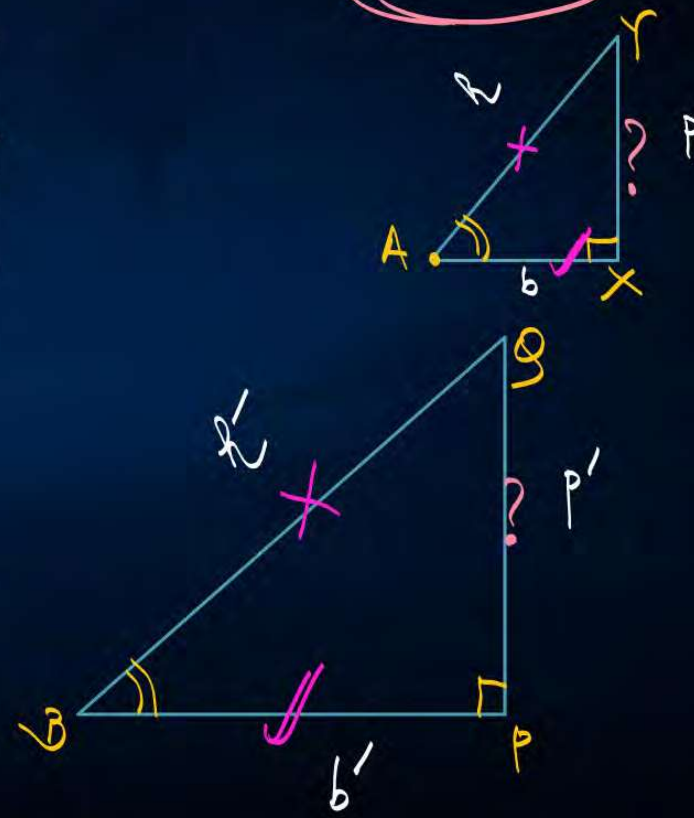
$$= \sqrt{(k\,BQ)^2 - (k\,BP)^2}$$

$$= \sqrt{k^2 \cdot BQ^2 - k^2 \cdot BP^2}$$

$$= \sqrt{k^2(BQ^2 - BP^2)}$$

$$= k\sqrt{BQ^2 - BP^2} \rightarrow QP$$

$$\Rightarrow YX = k\,QP$$



QUESTION

If cot θ = 7/8, evaluate:

(i) [(1 + sin θ) (1 - sin θ)]/[(1 + cos θ) (1 - cos θ)],*
(ii) cot² θ

$\sin\theta = \frac{8}{\sqrt{113}}$

$\cos\theta = \frac{7}{\sqrt{113}}$

$\sqrt{8^2+7^2}$

$\sqrt{64+49}$

$\sqrt{113}$

ii) $(\cot\theta)^2$

$\Rightarrow \left(\frac{7}{8}\right)^2 = \boxed{\frac{49}{64}}$ *

Sol^n

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

$\Rightarrow \frac{b}{p} = \frac{7}{8}$

$\Rightarrow b = 7$

$\Rightarrow p = 8$

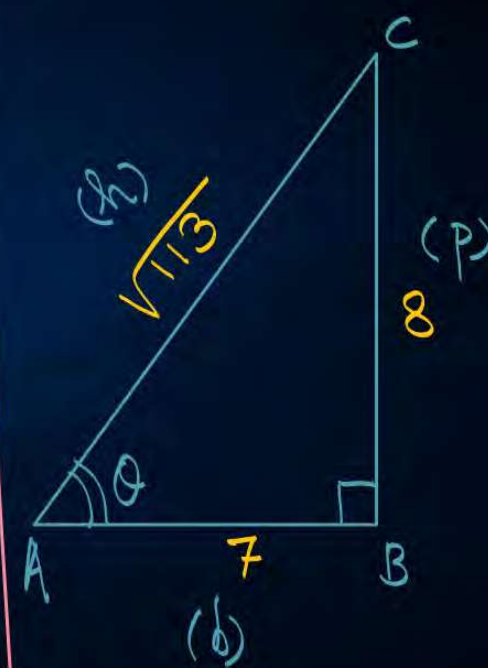
i) $\frac{(1+\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(1-\cos\theta)}$

$\Rightarrow \frac{1-(\sin\theta)^2}{1-(\cos\theta)^2}$

$\Rightarrow \frac{1-\left(\frac{8}{\sqrt{113}}\right)^2}{1-\left(\frac{7}{\sqrt{113}}\right)^2}$

$\frac{\left(1-\frac{64}{113}\right)}{\left(1-\frac{49}{113}\right)}$

$\boxed{\frac{49}{64}}$ *



QUESTION

If $3 \cot A = 4$, check whether $(1 - \tan^2 A)/(1 + \tan^2 A) = (\cos^2 A - \sin^2 A)$ or not.

$\boxed{3, 4, 5}$

* $\boxed{\frac{4}{3} / \frac{3}{4}}$ concept

$\sin\theta = \frac{4}{5}$

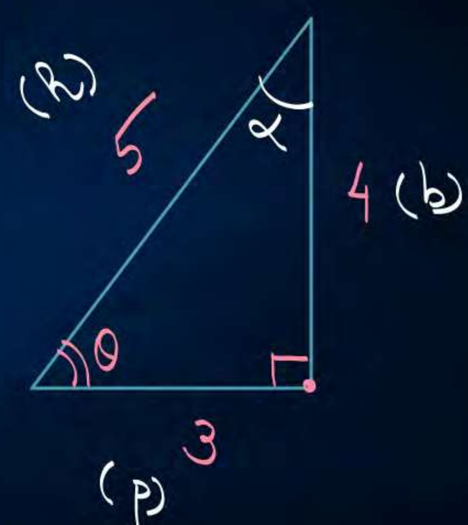
$\cos\theta = \frac{3}{5}$

$\tan\theta = \frac{4}{3}$

$\sin\alpha = \frac{3}{5}$

$\cos\alpha = \frac{4}{5}$

$\tan\alpha = \frac{3}{4}$



QUESTION

If 3 cot A = 4, check whether $(1 - \tan^2 A)/(1 + \tan^2 A) = (\cos^2 A - \sin^2 A)$ or not.

* $\boxed{\frac{4}{3} \Big/ \frac{3}{4}}$ concept

$\boxed{\text{Sol}^n}$

$3\cot A = 4$

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

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

$\sin A = \frac{3}{5}$

$\cos A = \frac{4}{5}$

$$L.H.S = \frac{1-\tan^2 A}{1+\tan^2 A}$$

$$= \frac{1-(\tan A)^2}{1+(\tan A)^2}$$

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

$$= \frac{\left(1-\frac{9}{16}\right)}{\left(1+\frac{9}{16}\right)}$$

$$\frac{7}{25} \quad \text{— (i)}$$

$$RHS = \cos^2 A - \sin^2 A$$

$$= (\cos A)^2 - (\sin A)^2$$

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

$$= \frac{16}{25} - \frac{9}{25} = \frac{7}{25} \quad \text{— (ii)}$$

QUESTION

In triangle ABC, right-angled at B, if tan A = 1/√3, find the value of:

(i) sin A cos C + cos A sin C → 1

(ii) cos A cos C - sin A sin C → 0

$\sqrt{1+3}$

$\sqrt{4} = 2$

Solⁿ

$\tan A = \frac{1}{\sqrt{3}}$

$\Rightarrow \frac{p}{b} = \frac{1}{\sqrt{3}}$

$\Rightarrow p = 1$

$\Rightarrow b = \sqrt{3}$

$\sin A = \frac{1}{2}$

$\cos A = \frac{\sqrt{3}}{2}$

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

$\cos C = \frac{1}{2}$

i) $\sin A \cdot \cos C + \cos A \cdot \sin C$

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

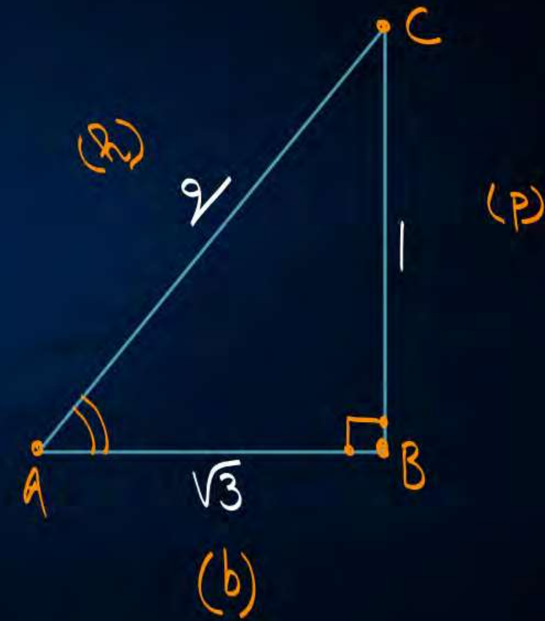
$= \frac{1}{4} + \frac{3}{4}$

$= 1$ Ans

$\cos A \cdot \cos C - \sin A \cdot \sin C$

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

$= 0$



QUESTION

In ΔPQR, right-angled at Q. PR + QR = 25 cm and PQ = 5 cm. Determine the values of sin P, cos P and tan P.

$QR = 25 - x$

$PR = x$

$\boxed{\text{Sol}^n}$ $x^2 = (25-x)^2 + 25$

$\Rightarrow x^2 - (25-x)^2 = 25$

$\Rightarrow \cancel{25} \times (2x - 25) = \cancel{25}\ 1$

$\Rightarrow 2x - 25 = 1$

$\Rightarrow \cancel{2}x = \cancel{26}\ 13$

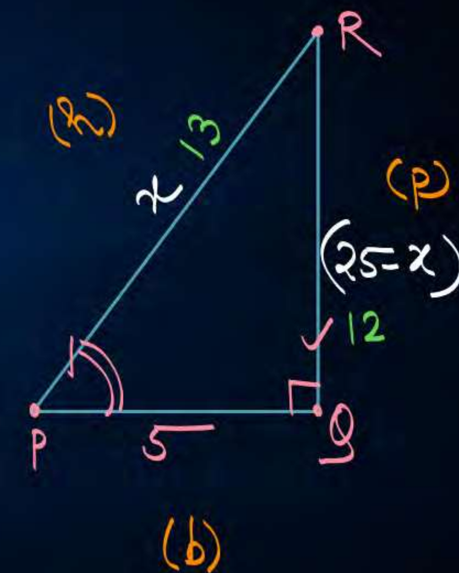
$\Rightarrow x = 13$

$\sin P = \frac{12}{13}$

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

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

$$\boxed{\begin{aligned} \tan\theta &= \frac{\sin\theta}{\cos\theta} \\ \cot\theta &= \frac{\cos\theta}{\sin\theta} \end{aligned}}$$



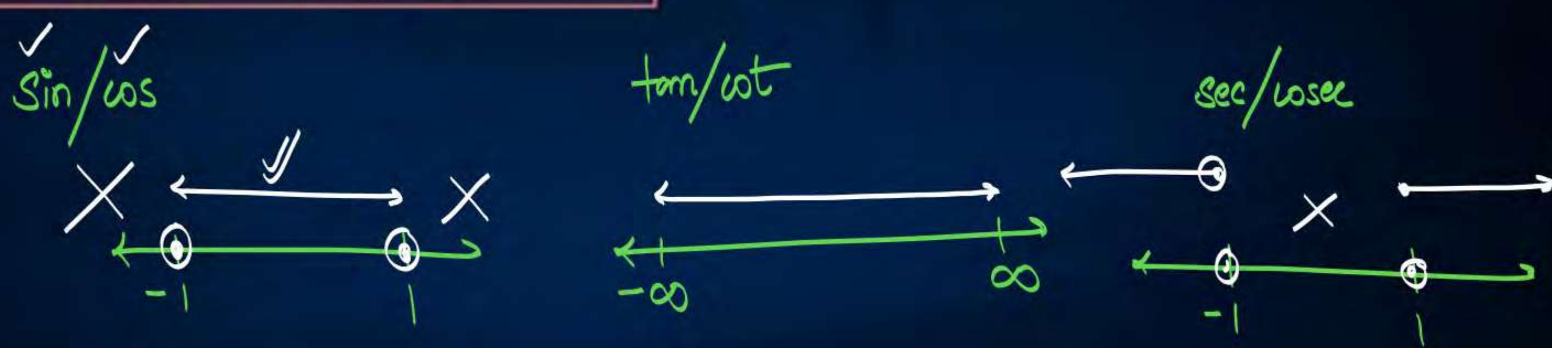
QUESTION

State whether the following are true or false. Justify your answer.

(i) The value of tan A is always less than 1. (×)

* Ranges of sin/cos/tan/sec/cosec/cot

Sol^n



QUESTION

State whether the following are true or false. Justify your answer.

(ii) $\sec A = 12/5$ for some value of angle A. (✓)

Soln

$\boxed{\sec A = 2.4}$

QUESTION

State whether the following are true or false. Justify your answer.

(iii) cos A is the abbreviation used for the $\underbrace{\text{cosecant of angle A}}_{\text{cosec A}}$. (×)

Sol^n

QUESTION

State whether the following are true or false. Justify your answer.

(iv) cot A is the product of cot and A. (✗)

Sol^n

$\cot A = \cot \times A$ ✗

QUESTION

State whether the following are true or false. Justify your answer.
(v) $\sin\theta = 4/3$ for some angle θ. ($\times$)

Sol^n $\boxed{\sin\theta = 1.3}$

Trigonometric Ratios

$0^\circ \quad 30^\circ \quad 45^\circ \quad 60^\circ \quad 90^\circ$

* When we write our T-ratios for any angle 'θ'

$$\boxed{0^\circ \leq \theta \leq 90^\circ}$$

$\sin\theta$, $\cos\theta$, $\tan\theta$, $\operatorname{cosec}\theta$, $\sec\theta$, $\cot\theta$

$\theta \to$ acute ??? $\longrightarrow$ $(30^\circ, 45^\circ \,\&\, 60^\circ)$

✓ $\theta \to 0^\circ$ ✓

✓ $\theta \to 90^\circ$ ✓

Trigonometric Ratios

0°	30°	45°	60°	90°
$\sqrt{\frac{0}{4}}$	$\sqrt{\frac{1}{4}}$	$\sqrt{\frac{2}{4}}$	$\sqrt{\frac{3}{4}}$	$\sqrt{\frac{4}{4}}$

Ratio / θ	0°	30°	45°	60°	90°
$\sin\theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
$\cos\theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
$\tan\theta$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	undefined $\left(\frac{1}{0}\right)$
$\operatorname{cosec}\theta$	$\left(\frac{1}{0}\right)$ Undefined	2	$\sqrt{2}$	$2/\sqrt{3}$	1
$\sec\theta$	1	$2/\sqrt{3}$	$\sqrt{2}$	2	$\left(\frac{1}{0}\right)$ Undefined
$\cot\theta$	Undefined $\left(\frac{1}{0}\right)$	$\sqrt{3}$	1	$1/\sqrt{3}$	0

QUESTION

Evaluate the following:

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

Soln $2(\tan 45°)^2 + (\cos 30°)^2 - (\sin 60°)^2$

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

$= \boxed{2}$ Ans

QUESTION

Evaluate the following:
(sin 30° + tan 45° - cosec 60°)/(sec 30° + cos 60° + cot 45°)

$\boxed{\text{Sol}^n}$

$$\frac{(\sin 30^\circ + \tan 45^\circ - \operatorname{cosec} 60^\circ)}{(\sec 30^\circ + \cos 60^\circ + \cot 45^\circ)}$$

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

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

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

$$= \frac{(3\sqrt{3} - 4)}{(3\sqrt{3} + 4)} \times \frac{(3\sqrt{3} - 4)}{(3\sqrt{3} - 4)}$$

$$= \frac{(3\sqrt{3} - 4)^2}{(27 - 16)}$$

$$\frac{(27 + 16 - 24\sqrt{3})}{11}$$

$$\boxed{\frac{43 - 24\sqrt{3}}{11}}$$

QUESTION

Evaluate the following:

$(5\cos^2 60° + 4\sec^2 30° - \tan^2 45°)/(\sin^2 30° + \cos^2 30°)$ *

Soln

$$\frac{5\cdot(\cos 60°)^2 + 4(\sec 30°)^2 - (\tan 45°)^2}{(\sin 30°)^2 + (\cos 30°)^2}$$

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

$$= \left(\frac{5}{4} + \frac{16}{3} - 1\right)$$

$$\frac{15 + 64 - 12}{12}$$

$$= \frac{15 + 52}{12}$$

$$= \frac{67}{12} \text{ Ans}$$

QUESTION

Choose the correct option and justify your choice:

(i) $2 \tan 30° / (1 + \tan^2 30°) =$

(A) $\sin 60°$

(B) $\cos 60°$

(C) $\tan 60°$

(D) $\sin 30°$

$\boxed{\text{Sol}^n}$ $\dfrac{2 \tan 30°}{\left(1 + (\tan 30°)^2\right)}$

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

$= \dfrac{\left(\frac{2}{\sqrt{3}}\right)}{\left(\frac{4}{3}\right)} \rightarrow \dfrac{\cancel{2}}{\cancel{\sqrt{3}}} \times \dfrac{(\sqrt{3})^{\cancel{2}}}{\cancel{4}_2} = \dfrac{\sqrt{3}}{2}$

QUESTION

(ii) $(1 - \tan^2 45°)/(1 + \tan^2 45°) =$

(A) $\tan 90°$

(B) 1

(C) $\sin 45°$

(D) 0

Sol^n $\dfrac{(1-(\tan 45°)^2)}{(1+(\tan 45°)^2)}$

$= \dfrac{1-(1)^2}{1+(1)^2}$

$= \dfrac{0}{2} = 0$

QUESTION

(iii) $\sin 2A = 2 \sin A$ is true when $A =$

(A) $0°$

(B) $30°$

(C) $45°$

(D) $60°$

Sol^n

$\sin 2A = 2 \sin A$

$= \sin 0°$	$2 \times \sin 0°$
$= 0$	2×0
	$= 0$
$\sin 60°$	$2 \times \sin 30°$
$= \frac{\sqrt{3}}{2}$	$2 \times \frac{1}{2} = 1$

QUESTION

(iv) $2\tan 30° / (1 - \tan^2 30°) =$

A cos 60°

B sin 60°

C tan 60°

D sin 30°

Sol^n $\dfrac{2\tan 30°}{(1-\tan^2 30°)}$

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

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

$\dfrac{\cancel{2}}{\cancel{\sqrt{3}}}\times\dfrac{(\sqrt{3})^{\cancel{2}}}{\cancel{2}}$

$= \sqrt{3}$

QUESTION

If tan (A + B) = √3 and tan (A − B) = 1/√3 ; 0° < A + B ≤ 90°, A > B, find A and B.

Sol^n

$\tan(A+B) = \sqrt{3}$

$\boxed{A+B = 60^\circ}$

$\tan(A-B) = \frac{1}{\sqrt{3}}$

$\boxed{A-B = 30^\circ}$

$\cancel{2}A = \cancel{90}\ 45$

$\boxed{A = 45^\circ}$

$B = 60^\circ - 45^\circ$

$\boxed{B = 15^\circ}$

QUESTION

$A = 0^\circ$, $B = 90^\circ$ $\left.\right\}$ $60^\circ, 30^\circ$

$A = 60^\circ$
$B = 30^\circ$

State whether the following are true or false. Justify your answer.

(i) sin (A + B) = sin A + sin B. ($\times$)

$\boxed{\text{Sol}^n}$

$$\begin{aligned} L.H.S &= \sin(A+B) \\ &= \sin(0^\circ + 90^\circ) \\ &= \sin 90^\circ \\ &= 1 \text{ --- (i)} \end{aligned}$$

$$\begin{aligned} R.H.S &= \sin A + \sin B \\ &= \sin 0^\circ + \sin 90^\circ \\ &= 0 + 1 \\ &= 1 \text{ --- (ii)} \end{aligned}$$

$$\begin{aligned} L.H.S &= \sin(A+B) \\ &= \sin(60^\circ + 30^\circ) \\ &= \sin 90^\circ \\ &= 1 \text{ --- (i)} \times \end{aligned}$$

$$\begin{aligned} R.H.S &\Rightarrow \sin A + \sin B \\ &= \sin 60^\circ + \sin 30^\circ \\ &= \frac{\sqrt{3}}{2} + \frac{1}{2} \\ &= \left(\frac{\sqrt{3}+1}{2}\right) \text{ --- (ii)} \times \end{aligned}$$

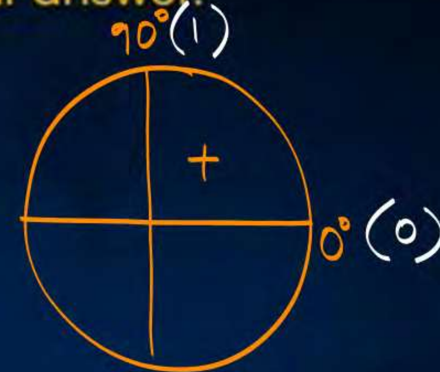
QUESTION

State whether the following are true or false. Justify your answer.

(ii) The value of sin θ increases as θ increases.

* Variation of basic T-ratios

Soln



Trigonometric Ratios

Ratio \ θ	$0°$	$30°$	$45°$	$60°$	$90°$
$\sin\theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
$\cos\theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
$\tan\theta$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	undefined
$\operatorname{cosec}\theta$	Undefined	2	$\sqrt{2}$	$2/\sqrt{3}$	1
$\sec\theta$	1	$2/\sqrt{3}$	$\sqrt{2}$	2	undefined
$\cot\theta$	Undefined	$\sqrt{3}$	1	$1/\sqrt{3}$	0

$\theta\uparrow$, $\sin\theta\uparrow$

$\theta\uparrow$, $\cos\theta\downarrow$

$\theta\uparrow$, $\tan\theta\uparrow$

QUESTION

State whether the following are true or false. Justify your answer.
(ii) The value of sin θ increases as θ increases. (✓)

* Variation of basic T-ratios

Soln

QUESTION

State whether the following are true or false. Justify your answer.
(iii) The value of cos θ increases as θ increases. (✗)

Sol^n

QUESTION

State whether the following are true or false. Justify your answer.

(iv) $\sin\theta = \cos\theta$ for all values of θ. (×)

$\boxed{\text{Sol}^n}$

QUESTION

State whether the following are true or false. Justify your answer.
(v) cot A is not defined for A = 0°. (✓)

Sol^n

Trigonometric Identities

(Related to Trigonometry) (Spl. type of equation)

* **Identity** :

→ Its a type of equation which is true for any value of variable/variables involved.

$$\boxed{(x^2-16) = (x+4)(x-4)}$$

$$\boxed{(x+y)^2 = x^2+y^2+2xy}$$

True for any 'x'.

(Hence, these eq^{n}s are called identities.)

Trigonometric Identities

Whereas, $\boxed{x^2 - 5 = 20}$ → Its true for some 'x', not for all 'x'.
Hence, its an equation but not an identity.

Hence, every identity is an eq^n but every equation is not an identity.

Trigonometric Identities

* Trigonometric Identity :-

→ An equation involving T-Ratios for some angle $(\theta, \alpha, \beta, \ldots)$ is called a trigonometric Identity if its satisfied for all values of angle/s for which occuring T-ratios are defined.

Eg : → $\boxed{\sin^2\theta + \cos^2\theta = 1}$

$$\boxed{\left(\cos^2\theta - \frac{1}{4}\cos\theta\right) = \cos\theta\left(\cos\theta - \frac{1}{4}\right)}$$

— defined for all 'θ'.

Trigonometric Identities

$\boxed{1+\tan^2\theta = \sec^2\theta}$ $\longrightarrow$ defined for all 'θ' except 90°

$\boxed{\operatorname{cosec}\theta = \dfrac{1}{\sin\theta}}$ $\longrightarrow$ defined for all 'θ' except 0°.

* Hence, these are all identities.

$\boxed{2\tan^2 x - 3\tan x = -1}$ $\longrightarrow$??

Trigonometric Identities

* So, there can be many T-identities but out of them the 3 main as per class 10th are :-

$$\boxed{\sin^2\theta + \cos^2\theta = 1}$$

King of Trigonometry

$$\boxed{1 + \tan^2\theta = \sec^2\theta}$$

Queens of Trigonometry

$$\boxed{1 + \cot^2\theta = \operatorname{cosec}^2\theta}$$

Trigonometric Identities

$\boxed{0^\circ \leq \theta \leq 90^\circ}$ → acute, 0°, 90°

* Proof :-

$\sin^2 \boxed{\ } + \cos^2 \boxed{\ } = 1$

$$\boxed{\sin^2\theta + \cos^2\theta = 1}$$

Case I $p^2+b^2=h^2$

$LHS = \sin^2\theta + \cos^2\theta$

$= (\sin\theta)^2 + (\cos\theta)^2$

$= \left(\frac{p}{h}\right)^2 + \left(\frac{b}{h}\right)^2$

$= \frac{p^2}{h^2} + \frac{b^2}{h^2} = \frac{p^2+b^2}{h^2} = \frac{\cancel{h^2}}{\cancel{h^2}} = 1$

$R.H.S = 1$

Case II

$\theta = 0^\circ$

$L.H.S = \sin^2\theta + \cos^2\theta$

$= (\sin 0^\circ)^2 + (\cos 0^\circ)^2$

$= 0 + 1 = 1$

$R.H.S = 1$

Case III

$\theta = 90^\circ$

$L.H.S = \sin^2\theta + \cos^2\theta$

$= (\sin 90^\circ)^2 + (\cos 90^\circ)^2$

$= 1 + 0$

$= 1$

$R.H.S = 1$

Trigonometric Identities

Note :

$$\sin^2\theta \xrightarrow{\checkmark} (\sin\theta)^2$$

$$\sin^2\theta \xrightarrow{\times} \sin^2 \times \theta$$

* Likewise for other T-ratios

Trigonometric Identities

KOT

$$\boxed{\sin^2\theta + \cos^2\theta = 1}$$

* $\boxed{\cos^2\theta = 1 - \sin^2\theta}$

$$\cos\theta \times \cos\theta = (1)^2 - (\sin\theta)^2$$

$$\cos\theta \times \cos\theta = (1+\sin\theta)(1-\sin\theta)$$

$$\sin\theta \times \sin\theta = (1)^2 - (\cos\theta)^2$$

$$\sin\theta \times \sin\theta = (1+\cos\theta)(1-\cos\theta)$$

* $\boxed{\sin^2\theta = 1 - \cos^2\theta}$

$$\frac{1 \quad \sin}{\cos} = \frac{\cos}{1 \quad \sin}$$

$$\boxed{\frac{\cos\theta}{1+\sin\theta} = \frac{1-\sin\theta}{\cos\theta}}$$

$$\boxed{\frac{1+\sin\theta}{\cos\theta} = \frac{\cos\theta}{1-\sin\theta}}$$

$$\frac{1 \quad \cos}{\sin} = \frac{\sin}{1 \quad \cos}$$

$$\boxed{\frac{\sin\theta}{1+\cos\theta} = \frac{1-\cos\theta}{\sin\theta}}$$

$$\frac{1+\cos\theta}{\sin\theta} = \frac{\sin\theta}{1-\cos\theta}$$

Trigonometric Identities

* Queens

$$\boxed{1 + \tan^2\theta = \sec^2\theta}$$

$$\boxed{1 + \cot^2\theta = \operatorname{cosec}^2\theta}$$

Trigonometric Identities

$$\boxed{0^\circ \leq \theta \leq 90^\circ} \rightarrow \begin{cases} \text{acute} \\ 0^\circ \\ 90^\circ \end{cases}$$

0° 90°

* $\boxed{1 + \tan^2\theta = \sec^2\theta}$

Proof :

Case – I

acute

Case – II

$\theta = 0^\circ$

Case – III

Trigonometric Identities

$$\frac{\sin^2\theta}{\cos^2\theta} + \frac{\cos^2\theta}{\cos^2\theta} = \frac{1}{\cos^2\theta}$$

$$\boxed{\tan^2\theta + 1 = \sec^2\theta}$$

$$\boxed{1 + \tan^2\theta = \sec^2\theta}$$

$$\boxed{\tan^2\theta = (\sec^2\theta - 1)}$$

$$(\sec\theta + 1)(\sec\theta - 1) = \tan^2\theta$$

$$\frac{\tan\theta}{(\sec\theta + 1)} = \frac{(\sec\theta - 1)}{\tan\theta}$$

$$\frac{\tan\theta}{(\sec\theta - 1)} = \frac{(\sec\theta + 1)}{\tan\theta}$$

$$\frac{\sec \quad 1}{\tan} = \frac{\tan}{\sec \quad 1}$$

$$(\sec + \tan) \rightleftharpoons (\sec - \tan)$$

$$\boxed{(\sec^2\theta - \tan^2\theta) = 1}$$

$$* \quad (\sec\theta + \tan\theta)(\sec\theta - \tan\theta) = 1$$

$$(\sec\theta + \tan\theta) = \frac{1}{(\sec\theta - \tan\theta)}$$

$$(\sec\theta - \tan\theta) = \frac{1}{(\sec\theta + \tan\theta)}$$

Trigonometric Identities

$0^\circ \leq \theta \leq 90^\circ$ → acute, 0°, 90°

* Queen : II

θ 90°

$$\boxed{1 + \cot^2\theta = \operatorname{cosec}^2\theta}$$

* **Proof** :-

Case - I

Case - II

$\theta = 0^\circ$

Case - III

$\theta = 90^\circ$

Trigonometric Identities

$$1+\cot^2\theta = \operatorname{cosec}^2\theta$$

$$\cot^2\theta = (\operatorname{cosec}^2\theta - 1)$$

$$\frac{\operatorname{cosec}}{\cot} \;\; \frac{1}{} = \frac{\cot}{\operatorname{cosec} \;\; 1}$$

$$\operatorname{cosec}^2\theta - \cot^2\theta = 1$$

$$\cot^2\theta = (\operatorname{cosec}\theta + 1)(\operatorname{cosec}\theta - 1)$$

$$\frac{\cot\theta}{(\operatorname{cosec}\theta + 1)} = \frac{(\operatorname{cosec}\theta - 1)}{\cot\theta}$$

$$\frac{\cot\theta}{(\operatorname{cosec}\theta - 1)} = \frac{(\operatorname{cosec}\theta + 1)}{\cot\theta}$$

$$(\operatorname{cosec} + \cot)(\operatorname{cosec} - \cot)$$

* $$(\operatorname{cosec}\theta + \cot\theta)(\operatorname{cosec}\theta - \cot\theta) = 1$$

$$\operatorname{cosec}\theta + \cot\theta = \frac{1}{(\operatorname{cosec}\theta - \cot\theta)}$$

$$\operatorname{cosec}\theta - \cot\theta = \frac{1}{(\operatorname{cosec}\theta + \cot\theta)}$$

Trigonometric Identities

* How to approach Qs of T-identities :—

i) If one observes the use of any T-identity / algebraic formula, do apply it.

ii) Taking common usually helps

iii) When proving follow Complicated Side → Easy Side

Trigonometric Identities

* In some situations

$\rightarrow$ LHS $\xrightarrow{X}$ RHS

$\rightarrow$ RHS $\xrightarrow{X}$ LHS

$\rightarrow$ LHS RHS

Common Gnd

Equal

Trigonometric Identities

$\sqrt{\frac{N}{D}}$, $\frac{a+b}{a-b}$, $\frac{a-b}{a+b}$

* In situations of $\left(\frac{a \pm b}{a \mp b}\right)$ format, dividing/Multiplying Num & Den by same thing helps.

* In $\sqrt{\frac{N}{D}}$ format or $\frac{N}{(a \pm b)}$ format $\longrightarrow$ Rationalisation helps.

(cos $(a+b)(a-b) = a^2 - b^2$ helps)

Trigonometric Identities

BRAHMASTRA

* Kuch samajh me nai aa raha ho to puri duniya sin/cos me badal do aur simplify krte jao.

* Kaun si identity kahan lgegi, uska jo logic seekha hai, usko hmesha dimag me rakho.

* sin/cos ke saath aur bhi different identities hain to puri duniya sin/cos me badal do.

QUESTION

$(\ )^2 = \square$

$(\ ) = \pm\sqrt{\ }$

Express the ratios cos A, tan A and sec A in terms of sin A.

Sol^n

$$\boxed{\cos A = \sqrt{1 - \sin^2 A}}$$

$$\boxed{\tan A = \frac{\sin A}{\cos A} = \frac{\sin A}{\sqrt{1 - \sin^2 A}}}$$

$$\boxed{\sec A = \frac{1}{\sqrt{1 - \sin^2 A}}}$$

$$\sin^2 A + \cos^2 A = 1$$

$$\cos^2 A = 1 - \sin^2 A$$

$$\cos A = \sqrt{1 - \sin^2 A}$$

QUESTION

Prove that sec A (1 - sin A)(sec A + tan A) = 1.

$\boxed{\text{Sol}^n}$

$$L.H.S = \sec A(1-\sin A)(\sec A+\tan A)$$

$$\Rightarrow \frac{(1-\sin A)}{\cos A}\times(\sec A+\tan A)$$

$$\Rightarrow (\sec A-\tan A)(\sec A+\tan A)$$

$$\Rightarrow \sec^2 A-\tan^2 A$$

$$\Rightarrow 1 = R.H.S$$

$$L.H.S = \frac{1}{\cos A}\times(1-\sin A)\times\left(\frac{1}{\cos A}+\frac{\sin A}{\cos A}\right)$$

$$= \frac{1}{\cos A}\times(1-\sin A)\times\frac{(1+\sin A)}{\cos A}$$

$$= \frac{(1-\sin^2 A)}{\cos^2 A}$$

$$= \frac{\cancel{\cos^2 A}}{\cancel{\cos^2 A}} = 1 = R.H.S$$

QUESTION

Prove that (cot A - cos A)/(cot A + cos A)= (cosec A – 1)/(cosec A + 1)

$\underline{Sol^n}$

$$LHS = \frac{(\cot A - \cos A)}{(\cot A + \cos A)}$$

$$= \frac{\left(\frac{\cos A}{\sin A} - \cos A\right)}{\left(\frac{\cos A}{\sin A} + \cos A\right)}$$

$$= \frac{\cancel{\cos A}\left(\frac{1}{\sin A} - 1\right)}{\cancel{\cos A}\left(\frac{1}{\sin A} + 1\right)}$$

$$\frac{\left(\frac{1}{\sin A} - 1\right)}{\left(\frac{1}{\sin A} + 1\right)}$$

$$\frac{(\operatorname{cosec} A - 1)}{(\operatorname{cosec} A + 1)} = R.H.S$$

QUESTION

Prove that $(\sin\theta - \cos\theta + 1)/(\sin\theta + \cos\theta - 1) = 1/(\sec\theta - \tan\theta)$, using ~~the identity $\sec^2\theta = 1 + \tan^2\theta$.~~

$\boxed{\text{Sol}^n}$

$$L.H.S = \frac{(\sin\theta - \cos\theta + 1)}{(\sin\theta + \cos\theta - 1)}$$

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

$$= \frac{[\sin\theta - (\cos\theta - 1)] \times [\sin\theta - (\cos\theta - 1)]}{[\sin\theta + (\cos\theta - 1)] \times [\sin\theta - (\cos\theta - 1)]}$$

$$\frac{[\sin\theta - (\cos\theta - 1)]^2}{\sin^2\theta - (\cos\theta - 1)^2}$$

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

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

$$\frac{\cancel{(\cos\theta - 1)}[-1 - \cancel{\cos\theta} + \cancel{\cos\theta} - 1 - 2\sin\theta]}{\cancel{(\cos\theta - 1)}[\cancel{-1} - \cos\theta - \cos\theta + \cancel{1}]}$$

$$\frac{1 \quad \sin}{\cos} \quad \frac{\cos}{1 \quad \sin}$$

$$\Rightarrow \frac{\cancel{+2}(1+\sin\theta)}{\cancel{+2}\cos\theta}$$

$$(\sec\theta + \tan\theta) \leftarrow \Rightarrow \boxed{\frac{1+\sin\theta}{\cos\theta}}$$

$$\Rightarrow \frac{\cos\theta}{1-\sin\theta}$$

$$\Rightarrow \frac{1}{\frac{(1-\sin\theta)}{\cos\theta}} \rightarrow \frac{1}{(\sec\theta - \tan\theta)}$$

QUESTION

Write all the other trigonometric ratios of $\angle A$ in terms of sec A.

Sol^n

$$\sin A = \sqrt{1-\cos^2 A} = \sqrt{1-\frac{1}{\sec^2 A}} = \sqrt{\frac{\sec^2 A - 1}{\sec^2 A}} = \frac{\sqrt{\sec^2 A - 1}}{\sec A}$$

$$\cos A = \frac{1}{\sec A}$$

$$\tan A = \sqrt{\sec^2 A - 1}$$

$$\cot A = \frac{1}{\sqrt{\sec^2 A - 1}}$$

$$\operatorname{cosec} A = \frac{\sec A}{\sqrt{\sec^2 A - 1}}$$

$$1+\tan^2 A = \sec^2 A$$

$$\tan^2 A = (\sec^2 A - 1)$$

$$\tan A = \sqrt{\sec^2 A - 1}$$

QUESTION

Choose the correct option. Justify your choice.

(i) $9\sec^2 A - 9\tan^2 A =$

A 1

B 9

C 8

D 0

$\boxed{\text{Sol}^n}$ $= 9\sec^2 A - 9\tan^2 A$

$= 9(\sec^2 A - \tan^2 A)$

$= 9 \times 1$

$= 9$

QUESTION

(ii) $(1 + \tan\theta + \sec\theta)(1 + \cot\theta - \csc\theta) =$

A 0

B 1

C 2

D -1

Sol^n

$$\left(1+\frac{\sin\theta}{\cos\theta}+\frac{1}{\cos\theta}\right)\times\left(1+\frac{\cos\theta}{\sin\theta}-\frac{1}{\sin\theta}\right)$$

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

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

$$=\frac{2\cancel{\sin\theta}\cancel{\cos\theta}}{\cancel{\sin\theta}\cancel{\cos\theta}}$$

$$=2$$

QUESTION

(iii) (sec A + tan A) (1 - sin A) =

A sec A

B sin A

C cosec A

D cos A

Sol^n

$$(\sec A + \tan A)(1 - \sin A)$$

$$= \left(\frac{1}{\cos A} + \frac{\sin A}{\cos A}\right)(1 - \sin A)$$

$$= \frac{(1 + \sin A)}{\cos A} \times (1 - \sin A)$$

$$= \frac{1 - \sin^2 A}{\cos A}$$

$$= \frac{\cos^2 A}{\cancel{\cos A}} = \cos A$$

QUESTION

(iv) $(1 + \tan^2 A) / (1 + \cot^2 A) =$

$\tan \rightarrow \frac{\sin}{\cos} \rightarrow \frac{\sec}{\operatorname{cosec}}$

$\frac{\operatorname{cosec}}{\sec} \rightarrow \cot$

(A) $\sec^2 A$

(B) -1

(C) $\cot^2 A$

(D) $\tan^2 A$

$\boxed{\text{Sol}^n}$

$$\frac{(1+\tan^2 A)}{(1+\cot^2 A)}$$

$$= \frac{\sec^2 A}{\operatorname{cosec}^2 A}$$

$$= \tan^2 A$$

QUESTION

Prove the following identities, where the angles involved are acute angles for which the expressions are defined.

(i) $(\operatorname{cosec}\theta - \cot\theta)^2 = (1 - \cos\theta)/(1 + \cos\theta)$

Sol^n

$$L.H.S = (\operatorname{cosec}\theta - \cot\theta)^2$$

$$= \left(\frac{1}{\sin\theta} - \frac{\cos\theta}{\sin\theta}\right)^2$$

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

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

$$\frac{(1-\cos\theta)^{\cancel{2}}}{(1+\cos\theta)\cancel{(1-\cos\theta)}}$$

$$\frac{(1-\cos\theta)}{(1+\cos\theta)} = R$$

QUESTION

$$\frac{\cos}{1 \quad \sin}$$

Prove the following identities, where the angles involved are acute angles for which the expressions are defined.

(ii) cos A/(1 + sin A) +(1 + sin A)/cosA = 2 sec A

$\boxed{\text{Sol}^n}$

$$L.H.S = \frac{\cos A}{(1+\sin A)} + \frac{1+\sin A}{\cos A}$$

$$= \frac{\cos^2 A + (1+\sin A)^2}{\cos A(1+\sin A)}$$

$$= \frac{\cos^2 A + 1 + \sin^2 A + 2\sin A}{\cos A(1+\sin A)}$$

$$= \frac{2\cancel{(1+\sin A)}}{\cos A\cancel{(1+\sin A)}} = 2\sec A$$

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

$$\frac{1-\cancel{\sin A}+1+\cancel{\sin A}}{\cos A}$$

$$\frac{2}{\cos A}$$

$$2\sec A$$

QUESTION

Prove the following identities, where the angles involved are acute angles for which the expressions are defined.

(iii) tan θ/(1 - cot θ) + cotθ/(1 - tanθ)= (1 + sec θ cosec θ)

Sol^n $L.H.S = \dfrac{\tan\theta}{(1-\cot\theta)} + \dfrac{\cot\theta}{(1-\tan\theta)}$

$$= \frac{\left(\frac{\sin\theta}{\cos\theta}\right)}{\left(1-\frac{\cos\theta}{\sin\theta}\right)} + \frac{\left(\frac{\cos\theta}{\sin\theta}\right)}{\left(1-\frac{\sin\theta}{\cos\theta}\right)}$$

$$= \frac{\sin\theta}{\cos\theta}\times\frac{\sin\theta}{(\sin\theta-\cos\theta)} + \frac{\cos\theta}{\sin\theta}\times\frac{\cos\theta}{(\sin\theta-\cos\theta)}$$

$$\frac{1}{(\sin\theta-\cos\theta)}\left[\frac{\sin^2\theta}{\cos\theta} - \frac{\cos^2\theta}{\sin\theta}\right]$$

$$\frac{1}{(\sin\theta-\cos\theta)}\left[\frac{(\sin\theta)^3-(\cos\theta)^3}{\sin\theta\cdot\cos\theta}\right]$$

$$\frac{\cancel{(\sin\theta-\cos\theta)}(\sin^2\theta+\sin\theta\cos\theta+\cos^2\theta)}{\sin\theta\cos\theta\,\cancel{(\sin\theta-\cos\theta)}}$$

$$\frac{1+\sin\theta\cos\theta}{\sin\theta\cos\theta} = \boxed{1+\operatorname{cosec}\theta\sec\theta}$$

QUESTION

Prove the following identities, where the angles involved are acute angles for which the expressions are defined.

(iv) $(1 + \sec A) / \sec A = \sin^2 A / (1 - \cos A)$

Sol^n

L.H.S $\dfrac{1+\sec A}{\sec A}$

$= \dfrac{\left(1+\frac{1}{\cos A}\right)}{\left(\frac{1}{\cos A}\right)}$

$= (\cos A + 1)$

R.H.S $= \dfrac{\sin^2 A}{(1-\cos A)}$

$= \dfrac{1-\cos^2 A}{(1-\cos A)}$

$= (1+\cos A)$

QUESTION

Prove the following identities, where the angles involved are acute angles for which the expressions are defined.

(v) $(\cos A - \sin A + 1)/(\cos A + \sin A - 1) = (\operatorname{cosec} A + \cot A)$

$\boxed{\text{Sol}^n}$ L.H.S $= \dfrac{\cos A - \sin A + 1}{\cos A + \sin A - 1}$

$$= \frac{[\cos A - (\sin A - 1)]^2}{[\cos A + (\sin A - 1)]\,[\cos A - (\sin A - 1)]}$$

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

$$\frac{(\cancel{\sin A - 1})[-1 - \cancel{\sin A} + \cancel{\sin A} - 1 - 2\cos A]}{(\cancel{\sin A - 1})[\cancel{-1} - \sin A - \sin A + \cancel{1}]}$$

$$\frac{\cancel{-2}(1 + \cos A)}{\cancel{-2}\sin A}$$

$$= \frac{1 + \cos A}{\sin A}$$

$$= \operatorname{cosec} A + \cot A$$

QUESTION

Prove the following identities, where the angles involved are acute angles for which the expressions are defined.

(vi) $\sqrt{[(1 + \sin A)/(1 - \sin A)]} = (\sec A + \tan A)$

Sol^n

$$\text{L.H.S} = \sqrt{\frac{1+\sin A}{1-\sin A}}$$

$$= \sqrt{\frac{(1+\sin A)}{(1-\sin A)} \times \frac{(1+\sin A)}{(1+\sin A)}}$$

$$= \sqrt{\frac{(1+\sin A)^2}{1-\sin^2 A}}$$

$$\sqrt{\frac{(1+\sin A)^2}{(\cos A)^2}}$$

$$\frac{1+\sin A}{\cos A}$$

$$\sec A + \tan A$$

QUESTION

Prove the following identities, where the angles involved are acute angles for which the expressions are defined.

(vii) $(\sin\theta - 2\sin^3\theta)/(2\cos^3\theta - \cos\theta) = \tan\theta$

Soln

$$L.H.S = \frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta}$$

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

$$= \tan A$$

$$\cos^2\theta - \sin^2\theta$$

$$= 2\cos^2\theta - 1$$

$$= 1 - 2\sin^2\theta$$

QUESTION

Prove the following identities, where the angles involved are acute angles for which the expressions are defined.

(viii) $(\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2 = (7 + \tan^2 A + \cot^2 A)$

Sol^n

L.H.S $\Rightarrow (\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2$

$\Rightarrow \sin^2 A + \operatorname{cosec}^2 A + 2 \sin A \operatorname{cosec} A + \cos^2 A + \sec^2 A + 2 \cos A \sec A$

$\Rightarrow 1 + 2 + 2 + \operatorname{cosec}^2 A + \sec^2 A$

$\Rightarrow 5 + 1 + \tan^2 A + 1 + \cot^2 A$

$\Rightarrow 7 + \tan^2 A + \cot^2 A$

QUESTION

Prove the following identities, where the angles involved are acute angles for which the expressions are defined.

(ix) (cosec A - sin A) (sec A - cos A) = 1/(tan A + cot A)

$\boxed{\text{Sol}^n}$

$$LHS \Rightarrow (\text{cosec}A - \sin A)(\sec A - \cos A)$$

$$\Rightarrow \left(\frac{1}{\sin A} - \sin A\right)\left(\frac{1}{\cos A} - \cos A\right)$$

$$\Rightarrow \frac{(1-\sin^2 A)}{\sin A} \times \frac{(1-\cos^2 A)}{\cos A}$$

$$\Rightarrow \frac{\cos^{\cancel{2}} A}{\cancel{\sin A}} \times \frac{\sin^{\cancel{2}} A}{\cancel{\cos A}}$$

$$\Rightarrow \sin A \cdot \cos A$$

$$RHS \Rightarrow \frac{1}{(\tan A + \cot A)}$$

$$\Rightarrow \frac{1}{\left(\frac{\sin A}{\cos A} + \frac{\cos A}{\sin A}\right)}$$

$$\Rightarrow \frac{1}{\left(\frac{1}{\sin A \cos A}\right)}$$

$$= \underline{\sin A \cos A}$$

QUESTION

Prove the following identities, where the angles involved are acute angles for which the expressions are defined.

(x) $(1 + \tan^2 A/1 + \cot^2 A) = (1 - \tan A/1 - \cot A)^2 = \tan^2 A$

Sol^n

H.W