(17)

Trigonometry Ratio

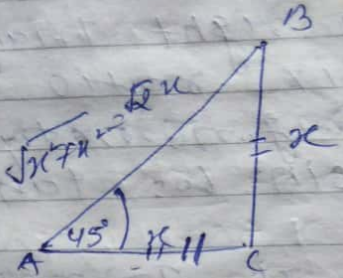
The three sides as P, b, and h of a right triangle makes six ratio is called Trigonometry ratio
sin, cos, tan cot sec cosec

Note The Tri ratio is depends ~~upo.~~ on only the value of angle. not the side

Example In right Δ ABC $\angle B = 90^\circ$
If $\tan A = \frac{1}{\sqrt{3}}$ then find
$\sin A \cdot \cos C + \cos A \cdot \sin C$
=

Value of (1) 45° (2) 30° (3) 60° (4) 0° (5) 90°

For 45°



Here $\angle C = 90°$

$\angle A = 45°$

$AC = BC = x$

$\sin 45° = \frac{x}{\cancel{x}\sqrt{2}} = \frac{1}{\sqrt{2}}$ Ans

$\cos 45° =$

$\tan 45° =$

~~isoscles~~ acuti

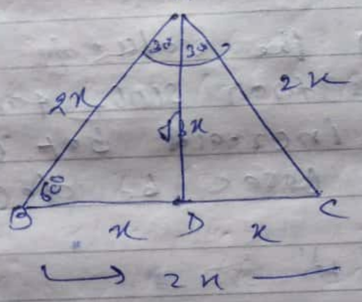
right triang

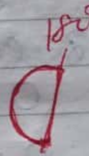
isosceles

for 30° and 60°

let ABC is equilateral triangle

$\angle A = \angle B = \angle C = 60^\circ$





$BC = 2x$

$BD = x,\ DC = x$

$AB^2 = BD^2 + AD^2$

$(2x)^2 = x^2 + (AD)^2$

$4x^2 - x^2 = (AD)^2$

$\Rightarrow 3x^2 = (AD)^2$

$\therefore AD = (\sqrt{3}x)^2 = \sqrt{3}x$

sin30°	sin60
cos30°	cos60°
tan30°	tan60°

for θ°

we take θ is acute.

Note When the value of θ is increases then sinθ, tanθ and secθ be increases but cosθ cot and cosec be decreases.

sin θ case 4°

0 30 45 60 90

$0 \to \frac{1}{2} \to \frac{1}{\sqrt{2}} \to \sqrt{3}/2 \to 1$

Q $\sin 40° > \sin 30°$. Yes

$\tan 62 < \tan 26°$. No

Q Arrange tan70 tan27 tan57 tan73 tan47°

tan27°, tan47 tan57 tan70 tan73°

Identities

An equation involving with trig. ratio of an angle which are true for the triangle is called trig. identities. 0°, 30°, 45 60°, 90,

Ex $\sin^2\theta + \cos^2\theta = 1$

If we put θ = any values then always we get 1

So this eqn is a Trigonometrical identities.

But $\sin\theta + \cos\theta = 1$

If we put $\theta = 0°$ and $90°$ then it is true but 45°, 30, 60° be fail

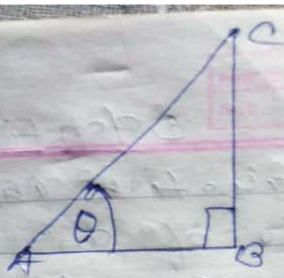
So it is not identities

Theorem:- show that $\sin^2\theta + \cos^2\theta = 1$

Soln:- For this we apply Pathagorus theorem.

(ii) Here, $AC^2 = AB^2 + BC^2$

$\Rightarrow 1 = \dfrac{AB^2 + BC^2}{AC^2}$



$\Rightarrow 1 = \dfrac{AB^2}{AC^2} + \dfrac{BC^2}{AC^2}$

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

(A). $\sin^2\theta + \cos^2\theta = 1$

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

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

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

$\tan^2\theta = \sec^2 - 1$

$\sec^2\theta - \tan^2\theta = 1$

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

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

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

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

$\Rightarrow \frac{2}{1-\sin^2\theta} = \frac{2}{\cos^2\theta}$ R.H.S

Q. $\frac{\cos\theta - \sin\theta + 1}{\cos\theta + \sin\theta - 1} = \operatorname{cosec}\theta + \cot\theta$

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

Q. $\frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta} = \tan\theta$

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

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

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

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

$$= \tan\theta \cdot \frac{\cancel{(2\cos^2\theta-1)}}{2\cos^2\theta-1} = \tan\theta \text{ R.H.S}$$

Proved