

Unit 6

Math

Ex 6.3

$$\tan \theta = \frac{\sin \theta}{\cos \theta}$$

Q1								
	0°	30°	45°	60°	90°	180°	270°	360°
$\sin \theta$	$\frac{0}{2}$ 0	$\frac{\sqrt{1}}{2}$ $\frac{1}{2}$	$\frac{\sqrt{2}}{2}$ $\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{4}}{2}$ 1	0	-1	0
$\cos \theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0	-1	0	-1
$\tan \theta$	$\frac{0}{1}$ 0	$\frac{1/2}{\sqrt{3}/2}$ $\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	$\frac{1}{0}$ ∞	0	∞	0
$\operatorname{cosec} \theta$	$\frac{0}{1} \div \frac{1}{0}$ ∞	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1	∞	-1	∞
$\sec \theta$	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	∞	-1	∞	-1
$\cot \theta$	∞	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	$\frac{0}{1} \div \frac{1}{0}$ 0	∞	0	∞

Q2

$$i) \sin 60^\circ - \cos 30^\circ$$

$$= \frac{\sqrt{3}}{2} - \frac{\sqrt{3}}{2}$$

= 0 Ans.

$$ii) \sec 45^\circ \operatorname{cosec} 45^\circ - \sin 30^\circ \cos 60^\circ$$

$$\left[\frac{2}{\sqrt{2}} \right] \left[\frac{2}{\sqrt{2}} \right] - \left[\frac{1}{2} \right] \left[\frac{1}{2} \right]$$

$$\frac{4}{2} - \frac{1}{4}$$

$$\frac{2(4)-1}{4}$$

$$\frac{8-1}{4} = \frac{7}{4} \text{ Ans.}$$

$$iii) \frac{\tan \frac{\pi}{3} - \tan \frac{\pi}{6}}{1 + \tan \frac{\pi}{3} \tan \frac{\pi}{6}}$$

$$= \frac{\tan 60^\circ - \tan 30^\circ}{1 + \tan 60^\circ \tan 30^\circ}$$

$$= \frac{\sqrt{3} - \frac{1}{\sqrt{3}}}{1 + 1}$$

$$\frac{\sqrt{3} - \frac{1}{\sqrt{3}}}{2} = \frac{\sqrt{3}^2 - 1}{2\sqrt{3}}$$

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

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

$$= \frac{1}{\sqrt{3}} \text{ Ans.}$$

$$\cos^2 \frac{\pi}{3} - \sin^2 \frac{\pi}{3}$$

$$= \cos^2 180^\circ - \sin^2 180^\circ$$

$$= \cos^2 60^\circ - \sin^2 60^\circ$$

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

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

$$= \frac{1-3}{4} = \frac{-2}{4} = -\frac{1}{2}$$

$$= -\frac{1}{2} \text{ Ans.}$$

$$v) \sin \frac{\pi}{2} \cos \frac{\pi}{3} - \cos \frac{\pi}{2} \sin \frac{\pi}{3}$$

$$\sin 180^\circ \cos 180^\circ - \cos 180^\circ \sin 180^\circ$$

$$\sin 90^\circ = \cos 60^\circ - \cos 60^\circ \sin 60^\circ$$

$$(1) \cdot \left(\frac{1}{2} \right) - 0 \cdot \left(\frac{\sqrt{3}}{2} \right)$$

$$\frac{1}{2} - 0$$

$$= \frac{1}{2} \text{ Ans.}$$

Q3 $\theta = \frac{\pi}{6}$ verify the following statement,

$$i) \tan 2\theta = \frac{2 \tan \theta}{1 - \tan^2 \theta}$$

$$\tan 2\theta = \frac{2 \tan(30^\circ)}{1 - \tan^2(30^\circ)}$$

$$\tan 60^\circ = \frac{2\left(\frac{1}{\sqrt{3}}\right)}{1 - \left(\frac{1}{\sqrt{3}}\right)^2}$$

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

$$\sqrt{3} = \frac{2}{\sqrt{3}} \div \frac{2}{3}$$

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

$$\sqrt{3} = \frac{3}{\sqrt{3}} = \frac{(\sqrt{3})^2}{\sqrt{3}} = \sqrt{3} \text{ Ans.}$$

$$\sqrt{3} = \sqrt{3} \text{ Ans.}$$

$$\text{L.H.S} = \text{R.H.S.}$$

$$\theta = \frac{\pi}{6}$$

$$\theta = \frac{180}{6} = 30^\circ$$

$$ii) \sin 3\theta = 3\sin\theta - 4\sin^3\theta$$

$$\sin 3(30^\circ) = 3\sin(30^\circ) - 4\sin^3(30^\circ)$$

$$\sin 90^\circ = 3\left(\frac{1}{2}\right) - 4\left(\frac{1}{2}\right)^3$$

$$1 = \frac{3}{2} - \frac{4}{8}$$

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

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

$$1 = 1 \text{ Ans.}$$

$$L.H.S = R.H.S.$$

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

$$\cos 2(30^\circ) = 1 - 2\sin^2(30^\circ)$$

$$\cos 60^\circ = 1 - 2\left(\frac{1}{2}\right)^2$$

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

$$\frac{1}{2} = 1 - \frac{1}{2}$$

$$\frac{1}{2} = \frac{1}{2} \text{ Ans.}$$

$$L.H.S = R.H.S.$$

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

$$\sec^2(30^\circ) - \tan^2(30^\circ) = 1$$

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

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

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

$$1 = 1$$

$$L.H.S = R.H.S.$$

$$v) \operatorname{Cosec}^2\theta = 1 + \cot^2\theta$$

$$\operatorname{Cosec}^2(30^\circ) = 1 + \cot^2(30^\circ)$$

$$(2)^2 = 1 + (\sqrt{3})^2$$

$$4 = 1 + 3$$

$$4 = 4$$

$$L.H.S = R.H.S.$$

Q4

i) $\sin \theta = \frac{\sqrt{2}}{2}$

$\theta = \sin^{-1} \frac{\sqrt{2}}{2}$

$\theta = 45^\circ$

$\theta = 45^\circ$ Ans.

ii) $\operatorname{Cosec} \theta = -1$

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

$\theta = 270^\circ$ Ans.

iii) $\tan \theta = 1$

$\theta = \tan^{-1} 1$

$\theta = 45^\circ$ Ans.

iv) $\sec \theta = \frac{\sqrt{12}}{3}$

$\theta = \sec^{-1} \frac{\sqrt{12}}{3}$

$\theta = \sec^{-1} \frac{2\sqrt{3}}{3}$

$\theta = \sec^{-1} 2$

$\theta = \sec^{-1} 2$

$\theta = 30^\circ$ Ans.

✓ $\cos \theta = 0$

$\theta = \cos^{-1} 0$

$\theta = 90^\circ$ or 270° Ans.

Q5 is the

Important.

Some people have
Curly brown hair
through proper brushing



S, P, H

C, B, H

T, P, B.

$S = \sin \theta = \frac{P}{H}$

$\therefore P = \text{perpendicular}$

$\therefore B = \text{Base}$

$\therefore H = \text{Hypothenuse}$

$C = \cos \theta = \frac{B}{H}$

$T = \tan \theta = \frac{P}{B}$

The reciprocal of $\sin \theta$ is $\operatorname{Cosec} \theta$ so

$\operatorname{Cosec} = \frac{H}{P}$

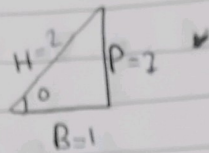
The reciprocal of $\cos \theta$ is $\sec \theta$ so

$\sec = \frac{H}{B}$

The reciprocal of $\tan \theta$ is $\cot \theta$ so

$\cot = \frac{B}{P}$

Q5 $\cos \theta = \frac{1}{2}$



$$\cos \theta = \frac{1}{2} = \frac{B}{H}$$

$$H^2 = B^2 + P^2$$

$$(2)^2 = (1)^2 + P^2$$

$$4 = 1 + P^2$$

$$4 - 1 = P^2$$

$$3 = P^2$$

Taking square root

$$\sqrt{3} = \sqrt{P^2}$$

$$P = \sqrt{3}$$

$$\sin \theta = \frac{P}{H}, \quad \operatorname{Cosec} \theta = \frac{H}{P}$$

$$\cos \theta = \frac{B}{H}, \quad \sec \theta = \frac{H}{B}$$

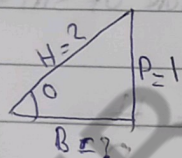
$$\tan \theta = \frac{P}{B}, \quad \cot \theta = \frac{B}{P}$$

$$\sin \theta = \frac{\sqrt{3}}{2}, \quad \operatorname{Cosec} \theta = \frac{2}{\sqrt{3}}$$

$$\cos \theta = \frac{1}{2}, \quad \sec \theta = \frac{2}{1}$$

$$\tan \theta = \frac{\sqrt{3}}{1}, \quad \cot \theta = \frac{1}{\sqrt{3}}$$

Q6 $\operatorname{Cosec} \theta = 2$



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

$$H^2 = B^2 + P^2$$

$$(2)^2 = (1)^2 + P^2$$

$$4 = 1 + P^2$$

$$4 - 1 = P^2$$

$$3 = P^2$$

$$\sqrt{3} = P$$

$$H^2 = B^2 + P^2$$

$$(2)^2 = B^2 + (1)^2$$

$$4 = B^2 + 1$$

$$4 - 1 = B^2$$

$$3 = B^2$$

$$\sqrt{3} = B$$

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

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

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

i) $\cos \theta$

$$i) \cos \theta \left(\frac{\sin^2 \theta - \cos^2 \theta}{\sin^2 \theta + \cos^2 \theta} \right)$$

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

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

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

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

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

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

$$\frac{\sqrt{3}}{1} \text{ Ans}$$