Nishant Jindal

Fundamentals of Mathematics

Q $|x-4|+|x-3|=7$

Q $|x-1|+|x-3|=4$

Q $|2x-1|+|x|=3$

$x=\frac{4}{3}, -\frac{2}{3}$

A) $x>\frac{1}{2}$ $\quad x=1$ $\quad |2x-1|+|1|$ (+) (+)

$2x-1+x=3$

$3x=4 \Rightarrow x=\frac{4}{3}$ ✓

B) $0 \le x \le \frac{1}{2}$ $\quad x=\frac{1}{4}$ $\quad |2x\frac{1}{4}-1|+|\frac{1}{4}|$ (−) (+)

$-(2x-1)+|x|=3$

$-x=2 \Rightarrow x=-2 \notin [0, 1/2]$ (✗)

C) $x<0$ $\quad x=-1$ $\quad |2x-1-1|+|-1|$ (−) (−)

$-(2x-1)-x=3$

$-3x=2$

$x=-\frac{2}{3}$ ✓

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Modulus Eqn.

APProach 1

Q $|x-1| = 4$ find x.

$x-1 = 4, -4$

$x = 5, -3$

Q $||x-2|-3| = 4$.

$|x-2|-3 = 4, \quad -4$

$|x-2| = 4+3, \quad -4+3$

$|x-2| = 7, \quad -1$ (X)

$|x-2| = 7 \Rightarrow x-2 = 7, \quad -7$ $\boxed{x = 9, -5}$

APP2 $|x|^2 = x^2$

Q $x^2 + 7|x| + 10 = 0$ find x?

$|x|^2 + 7|x| + 10 = 0$

$t^2 + 7t + 10 = 0$

$(t+2)(t+5) = 0$

$t = -2$ or $t = -5$

$|x| = -2$ or $|x| = -5$

(+) +-ve (X) (+) (-ve) (X)

$x = \phi$

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APP-3

$|f(x)| = f(x) \Rightarrow f(x) \geq 0$

$|f(x)| = -f(x) \Rightarrow f(x) \leq 0$

Q $|x+2| = -(x+2)$ find x

$x+2 \leq 0$

$x \leq -2$

$x \in (-\infty, -2]$

$$|x| = \begin{cases} x & x \geq 0 \\ -x & x < 0 \end{cases}$$

Q $|x+4| = (x+4)$

As it is

$\Rightarrow x+4 \geq 0$

$x \geq -4$

$x \in [-4, \infty)$

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Q $\left|\frac{x^2-3x+2}{x^2-9x+20}\right| = -\left(\frac{x^2-3x+2}{x^2-9x+20}\right)$ find x

Adv

$\rightarrow$ Minus K Sath.

$\frac{x^2-3x+2}{x^2-9x+20} \leq 0$

$\frac{(x-1)(x-2)}{(x-4)(x-5)} \leq 0$

$x \in (-\infty,1] \cup [2,4) \cup (4,5)$

Apply $|a+b| = |a|+|b|$ then $a \cdot b \geq 0$

Adv

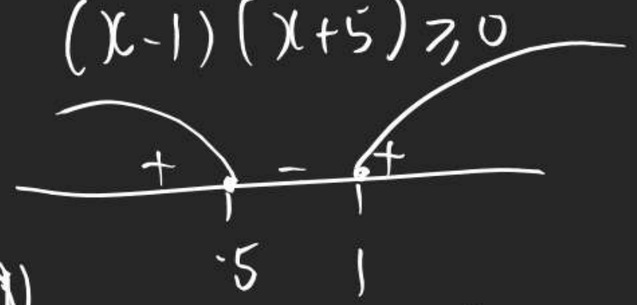
Q $|x-1|+|x+5| = |2x+4|$

$|a|+|b| = |(x-1)+(x+5)|$

$|a+b|$

$\Rightarrow a \cdot b \geq 0$

$(x-1)(x+5) \geq 0$



$x \in (-\infty,-5] \cup [1,\infty)$

$|3|+|5| = |3+5|$

$3+5 = |8| = 8$

$|-3|+|-5| = |-3-5|$

$3+5 = |-8| = 8$

$|3|+|-5| = |3+(-5)|$

$3+5 = |-2| = 2$

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Trigo Phase 1

Angle Measurement

A) Sexagesimal System [Degree]

In this System we divide a Rt. angle in 90 equal Parts. & each part is known as 1°.

B) Centesimal System [Grade]

In this system we have divided a Rt. angle into 100 equal Parts. each part is known as "Grade"

C) Circular System [Radian]

1 Radian is defined by an angle subtended at centre of a circle by an arc equal to its Radius.

$$\text{Angle} = \frac{\text{Arc}}{\text{Radius}}$$

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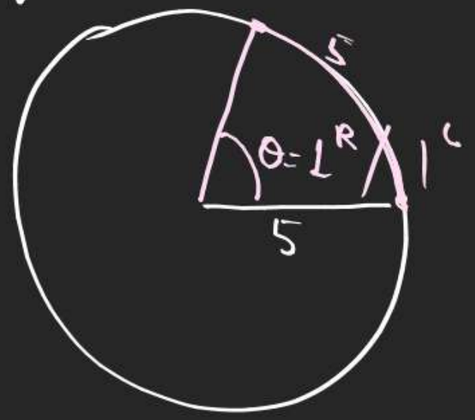
When Arc = Radius

$\Rightarrow \theta = \text{angle} = \frac{\text{Arc}}{\text{Rad}} = 1^R$

$\Rightarrow$ If circle is of rad = 5

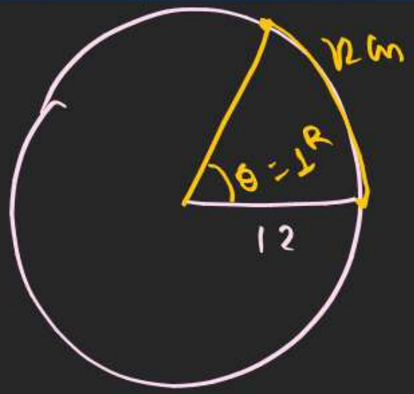
then angle Projected by Arc of 5 is 1 Rad.

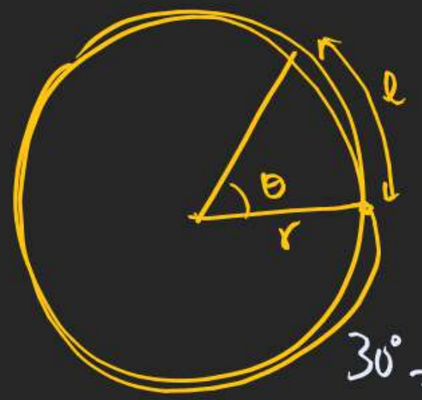


$1^c \simeq 57^\circ$

$\pi^c = 180^\circ$

$2\pi^c = 360^\circ$





$\theta = \frac{l}{r} \Rightarrow \boxed{l = r\theta}$

$30^\circ = \frac{\pi^c}{180} \times 30 = \frac{\pi^c}{6}$

$1^\circ = \frac{\pi^c}{180}$

$30^\circ = \frac{\pi}{6}$

When 1 Complete Rotation is done

$l = 2\pi r$

$\theta = \frac{l}{r} = \frac{2\pi r}{r} = 2\pi^R = 360^\circ$

$\pi^c = 180^\circ \Rightarrow 1^c = \frac{180^\circ}{\pi} = \frac{180^\circ}{3.14} \simeq 57^\circ$

$\boxed{1^c \simeq 57^\circ}$

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Q) Convert from deg to Rad?

$45^\circ \rightarrow 45 \times \frac{\pi^c}{180_4} = \frac{\pi}{4}$

$30^\circ \rightarrow 30 \times \frac{\pi}{180_6} = \frac{\pi}{6}$

$60^\circ \rightarrow 60 \times \frac{\pi}{180_3} = \frac{\pi}{3}$

$90^\circ \rightarrow 90 \times \frac{\pi}{180_2} = \frac{\pi}{2}$

$120^\circ \rightarrow 120^{2} \times \frac{\pi}{180_3} = \frac{2\pi}{3}$

$150^\circ \rightarrow 150^{5} \times \frac{\pi}{180_{12}} = \frac{5\pi}{6}$

$180^\circ \rightarrow \pi$

$135^\circ \rightarrow 135^{3} \times \frac{\pi}{180_{4}} = \frac{3\pi}{4}$

$215^\circ \rightarrow 215^{43} \times \frac{\pi}{180_{36}} = \frac{43\pi}{36}$

$300^\circ \rightarrow 300^{5} \times \frac{\pi}{180_{3}} = \frac{5\pi}{3}$

$330^\circ \rightarrow 330^{11} \times \frac{\pi}{180_{6}} = \frac{11\pi}{6}$

$360^\circ \rightarrow 2\pi$

Degree to Radian = Multiply by $\frac{\pi}{180^\circ}$

Radian to Degree = Multiply by $\frac{180^\circ}{\pi}$

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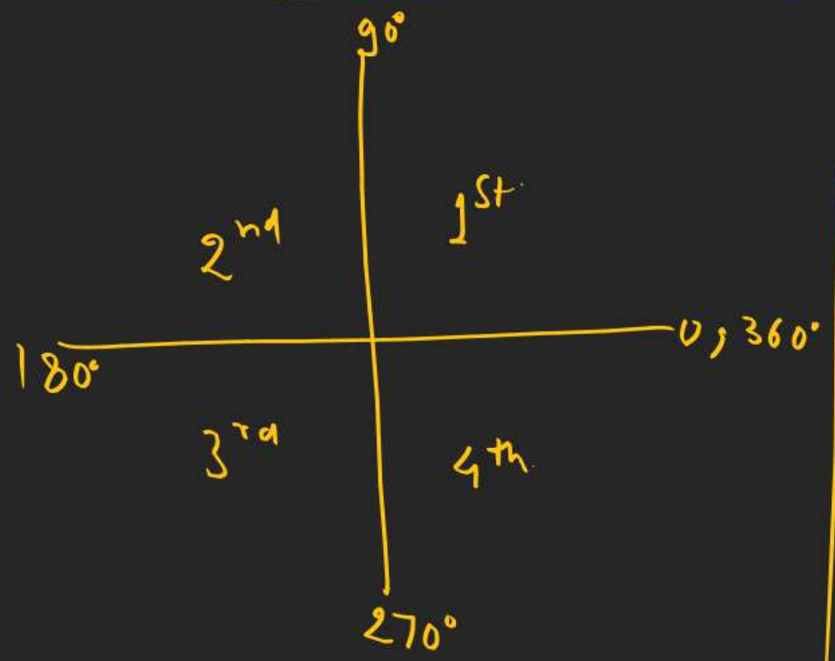
Trigo Ph 1

Some Imprtmt Deg & Rad.



1 Quad	2nd Quad	3rd Quad
$30° \to \frac{\pi}{6}$	$120° \to \frac{2\pi}{3}$	$210° - \frac{7\pi}{6}$
$45° \to \frac{\pi}{4}$	$135° \to \frac{3\pi}{4}$	$225° - \frac{5\pi}{4}$
$60° \to \frac{\pi}{3}$	$150° \to \frac{5\pi}{6}$	$240° - \frac{4\pi}{3}$
$75 \to \frac{5\pi}{12}$	$180° \to \pi$	$270° \to \frac{3\pi}{2}$
$90 \to \frac{\pi}{2}$		

4th Quad

$360° \to \frac{5\pi}{3}$

$315° \to \frac{7\pi}{4}$

$330° \to \frac{11\pi}{6}$

$366 \to 2\pi$

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13 Lec

10th Class

Imp Identities.

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

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

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

C) $\operatorname{Sec}^2\theta - \tan^2\theta = 1$

$$\operatorname{Sec}\theta - \tan\theta = \frac{1}{\operatorname{Sec}\theta + \tan\theta}$$

(D) $\cot^2\theta - \cos^2\theta = \cot^2\theta \cdot \cos^2\theta \rightarrow$ P.T. Qs

(E) $\tan^2\theta - \sin^2\theta = \tan^2\theta \cdot \sin^2\theta$

$\tan^2\theta - \sin^2\theta$

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

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

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

$= \sin^2\theta \times \frac{\sin^2\theta}{\cos^2\theta}$

$= \sin^2\theta \times \tan^2\theta$ RHS

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F) New

$\sin^4\theta + \cos^4\theta = 1 - 2\sin^2\theta\cdot\cos^2\theta$

LHS $(a^2 + b^2 + 2ab)$

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

$\{\sin^2\theta + \cos^2\theta\}^2 - 2\sin^2\theta\cos^2\theta$

$1 - 2\sin^2\theta\cos^2\theta$ RHS.

G) New

$\sin^6\theta + \cos^6\theta = 1 - 3\sin^2\theta\cdot\cos^2\theta$

LHS $(\sin^2\theta)^3 + (\cos^2\theta)^3$

$= (\sin^2\theta + \cos^2\theta)^3 - 3\cdot\sin^2\theta\cdot\cos^2\theta(\sin^2\theta + \cos^2\theta)$

$= 1 - 3\sin^2\theta\cdot\cos^2\theta$

RHS

$a^3 + b^3 + 3ab(a+b) = (a+b)^3$

$a^3 + b^3 = (a+b)^3 - 3ab(a+b)$

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Q. $\sec^4 x - \csc^4 x - 2\sec^2 x + 2\csc^2 x = \frac{15}{4}$

find $\tan x = ?$

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

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

$\csc^2 x - \cot^2 x = 1$

$\csc^2 x - 1 = \cot^2 x$,

$\cot^2 x = \frac{1}{\tan^2 x}$

$(\sec^4 x - 2\sec^2 x + 1) - ((\csc^4 x - 2(\csc^2 x + 1)) = \frac{15}{4}$

$(\sec^2 x - 1)^2 - ((\csc^2 x - 1)^2 = \frac{15}{4}$

$(\tan^2 x)^2 - ((\cot^2 x)^2 = \frac{15}{4}$

$\tan^4 x - \frac{1}{\tan^4 x} = 4 - \frac{1}{4}$

$\tan^4 x = 4$

$\tan^2 x = \pm 2 \Rightarrow \tan^2 x = 2$ (+) $\quad 2\bar{1} - 2$ (−) ✗

$\tan^2 x = 2$

$\tan x = \pm\sqrt{2}$

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Q If $\sin x + \sin^2 x = 1$ then $\cos^8 x + 2\cos^6 x + \cos^4 x = ?$

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

$\sin x = \cos^2 x$

$\sin^2 x = \cos^4 x$

$\sin^4 x = \cos^8 x$

$\sin^4 x + 2\cos^2 x \cdot \cos^4 x + \sin^2 x$

$\sin^4 x + 2\cos^2 x \cdot \sin^2 x + \sin^2 x$

$\sin^4 x + 2\sin x \cdot \sin^2 x + \sin^2 x$

$\sin^4 x + 2\sin^3 x + \sin^2 x$ Kisi Ka Perfect Sqr. h?

$(\sin^2 x)^2 + 2\sin^2 x \cdot \sin x + (\sin x)^2$

$(\sin^2 x + \sin x)^2 = 1^2 = 1$

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Q If $\sec x - \tan x = p$ then $\sec x = ?$

$$\sec x - \tan x = p$$

add $\sec x + \tan x = 1/p$

$$2\sec x = p + \frac{1}{p}$$

$$\sec x = \frac{1}{2}\left(p + \frac{1}{p}\right)$$

$$\sec x - \tan x = \frac{1}{\sec x + \tan x}$$

$$p = \frac{1}{\sec x + \tan x}$$

$$\sec x + \tan x = \frac{1}{p}$$

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Q P.T.

1) $\sqrt{\sec^2\theta + \operatorname{cosec}^2\theta} = \tan\theta + \cot\theta$

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

3) $\tan\theta + \sec\theta = 3$ then $\sin\theta =$

4) If $2\sin\theta = 2 - \cos\theta$ then $\sin\theta = ?$

5) $3\sec^4\theta + 8 = 10\sec^2\theta$ then $\tan\theta = ?$

(6) $\dfrac{\sin x + \cos x}{\cos^3 x} = \tan^3 x + \tan^2 x + \tan x + 1$

log Ki DPP → 3