

Foundation Batch



MATHS

Trigonometry

Part -5

LIVE

05-11-2024 07:00PM



$\sin^2 \theta = 1$

$3\cos\theta + 1 = 0$

$\cos\theta - \cos\theta + 1 = 0$

$(\cos\theta - 1) - 1(\cos\theta - 1) = 0$

$(-1)(2\cos\theta - 1) = 0$

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

following statements is/are correct?

1. There are two values of θ satisfying equations.

2. $\theta = 60^\circ$ is satisfied the above

Select the correct answer using the code g

- a. 1 only
- b. 2 only
- c. Both 1 and 2
- d. Neither 1 nor 2

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



यदि $\frac{\cos^2 \theta - 3\cos \theta + 2}{\sin^2 \theta} = 1$, जहां $0 < \theta < \frac{\pi}{2}$, तो निम्नलिखित में से कौन सा/से कथन सही है/हैं?

1. उपरोक्त समीकरणों को संतुष्ट करने वाले θ के दो मान हैं।

2. $\theta = 60^\circ$ उपरोक्त समीकरण से संतुष्ट है।

नीचे दिए गए कूट का प्रयोग कर सही उत्तर चुनिए।

(A) केवल 1

(B) केवल 2

(C) दोनों 1 और 2

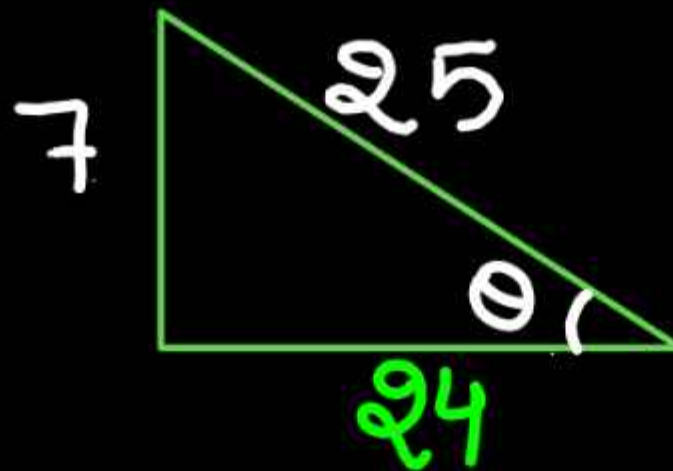
(D) न तो 1 और न ही 2



22. If $\sin \theta = \frac{7}{25}$, then the value of $\cos \theta$ and $\tan \theta$ respectively are..... (Where θ -in-frist-Quadraut)

यदि $\sin \theta = \frac{7}{25}$ है, तो $\cos \theta$ और $\tan \theta$ के मान क्रमशः.....हैं।
(जहां θ प्रथम चतुथांश में है)

- (a) $\frac{25}{7}$ और $\frac{7}{24}$
- ☒ (b) $\frac{24}{25}$ और $\frac{7}{24}$
- (c) $\frac{24}{25}$ और $\frac{24}{7}$
- (d) $\frac{25}{24}$ और $\frac{24}{7}$



$$\cos \theta = \frac{24}{25}, \tan \theta = \frac{7}{24}$$

(SSC-CHSL Pre. 09/07/2024)



23. If $\sin \theta = \left(\frac{9}{41}\right)$, $0^\circ < \theta < 90^\circ$ then what is the value of $\cot \theta$?

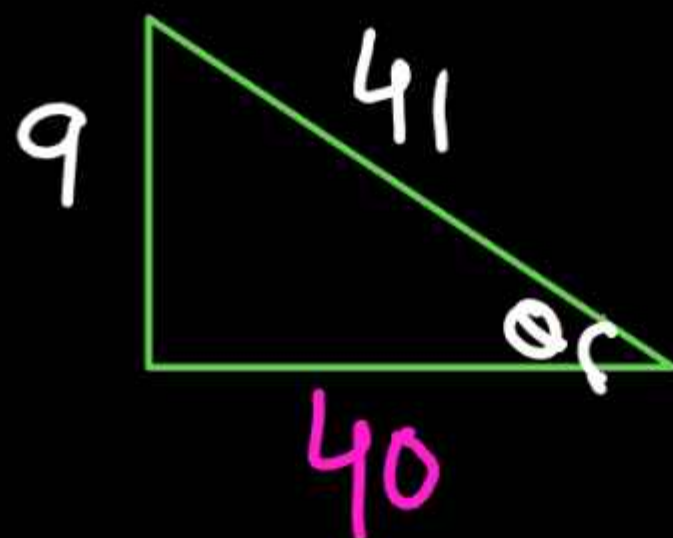
यदि $\sin \theta = \left(\frac{9}{41}\right)$, $0^\circ < \theta < 90^\circ$ तो $\cot \theta$ का मान क्या होगा?

(a) $\frac{40}{9}$

(b) $\frac{35}{8}$

(c) $\frac{39}{9}$

(d) $\frac{47}{8}$



$$\cot \theta = \frac{40}{9}$$

(SSC-CGL Mains 08/08/2019)



24. If $\cos \theta \geq \frac{1}{2}$ in the first quadrant, then which one of the following is correct?

यदि पहले चतुर्थांश में $\cos \theta \geq \frac{1}{2}$ हो, तो निम्नलिखित में से कौन सा सही है?

(A) $\theta \leq \frac{\pi}{3}$

(B) $\theta \geq \frac{\pi}{3}$

(C) $\theta \leq \frac{\pi}{6}$

(D) $\theta \geq \frac{\pi}{6}$



25. If $\sin \theta = \frac{2xy}{x^2+y^2}$, then find the value of $\tan \theta$

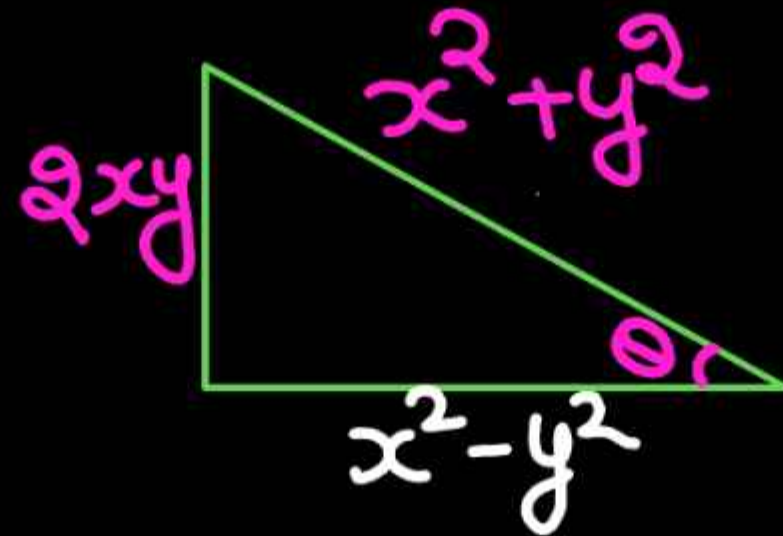
यदि $\sin \theta = \frac{2xy}{x^2+y^2}$ तो $\tan \theta$ का मान है।

(a) $\frac{2xy}{x^2-y^2}$

(b) $\frac{x^2+y^2}{x^2-y^2}$

(c) $\frac{x^2-y^2}{2xy}$

(d) $\frac{x^2-y^2}{x^2+y^2}$



$$\tan \theta = \frac{2xy}{x^2-y^2}$$

(SSC-CHSL Pre. 01/07/2024)



26. If given that $\sin \theta = \frac{15}{17}$, find the value of $\frac{15\cot \theta + 17\sin \theta}{8\tan \theta + 16\sec \theta}$, where $0^\circ < \theta < 90^\circ$ is.

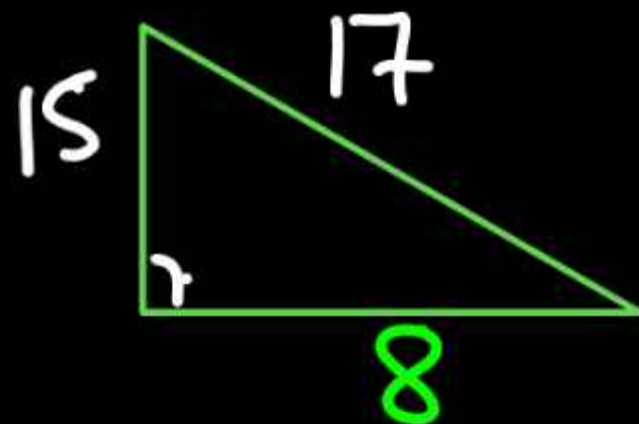
यदि $\sin \theta = \frac{15}{17}$ दिया गया है, $\frac{15\cot \theta + 17\sin \theta}{8\tan \theta + 16\sec \theta}$ का मान ज्ञात कीजिए। जहाँ $0^\circ < \theta < 90^\circ$ है।

(a) $\frac{49}{26}$

(b) $\frac{23}{49}$

(c) $\frac{49}{23}$

(d) $\frac{26}{23}$



$$\frac{15 \times \frac{8}{15} + 17 \times \frac{15}{17}}{8 \times \frac{15}{8} + 16 \times \frac{17}{8}}$$

$$\frac{8+15}{15+34} = \frac{23}{49}$$

(SSC-CHSL Pre. 02/07/2024)



Foundation Batch

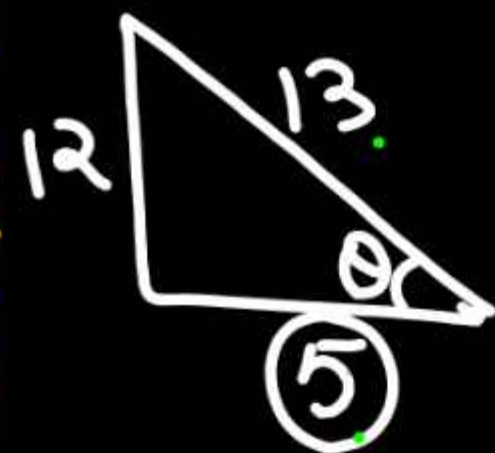
MATHS



27. If $\sin \theta = \frac{12}{13}$, $0 < \theta < 90^\circ$, then $\frac{\sin^2 \theta - \cos^2 \theta}{2 \sin \theta \cdot \cos \theta} \times \frac{1}{\tan^2 \theta} = \dots$

यदि $\sin \theta = \frac{12}{13}$, $0 < \theta < 90^\circ$ है तो $\frac{\sin^2 \theta - \cos^2 \theta}{2 \sin \theta \cdot \cos \theta} \times \frac{1}{\tan^2 \theta} = \dots$

- (a) 295
3456
(b) 290
3542
(c) 695
3542
(d) 595
3456



$$\frac{\frac{144}{169} - \frac{25}{169}}{2 \times \frac{12}{13} \times \frac{5}{13}} \times \frac{25}{144}$$

$$\frac{119}{169} \times \frac{25}{144} \Rightarrow \frac{119}{120} \times \frac{25}{144} = \frac{595}{3456}$$

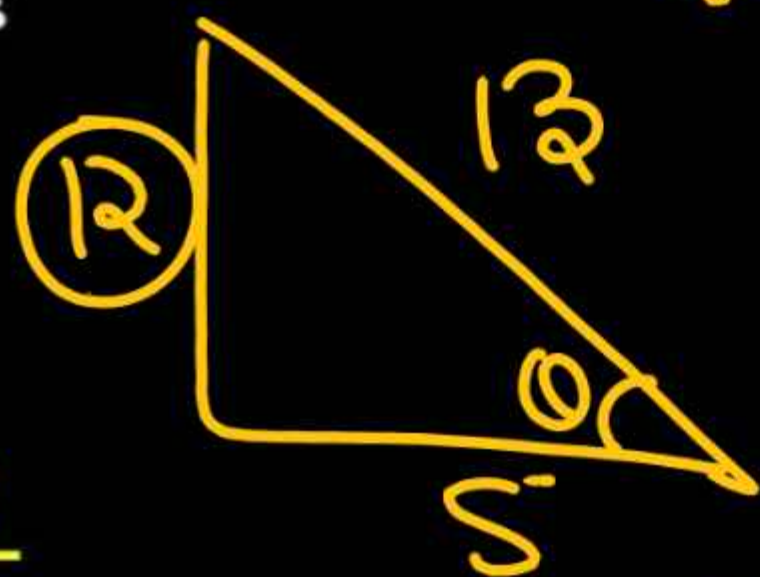


28. If $\sec \theta = \frac{13}{5}$ and $\frac{3\pi}{2} < \theta < 2\pi$ then find $\cot \theta$?

यदि $\sec \theta = \frac{13}{5}$ और $\frac{3\pi}{2} < \theta < 2\pi$ तो $\cot \theta$ का मान ज्ञात कीजिये?

$$270^\circ < \theta < 360^\circ$$

IVth Quad



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

$$-\frac{5}{12}$$

(A) $\frac{5}{12}$

(B) $\frac{12}{5}$

(C) $-\frac{5}{12}$

(D) $-\frac{12}{5}$



29. If $\frac{\sin^2 \theta}{\tan^2 \theta - \sin^2 \theta} = 5$, θ is an acute angle, then the value of $\frac{24\sin^2 \theta - 15\sec^2 \theta}{6\operatorname{cosec}^2 \theta - 7\cot^2 \theta}$ is :

यदि $\frac{\sin^2 \theta}{\tan^2 \theta - \sin^2 \theta} = 5$ है, θ न्यून कोण है, तो $\frac{24\sin^2 \theta - 15\sec^2 \theta}{6\operatorname{cosec}^2 \theta - 7\cot^2 \theta}$ का मान ज्ञात करें।

(a) 2 $\sin^2 \theta = 5 \tan^2 \theta - 5 \sin^2 \theta$

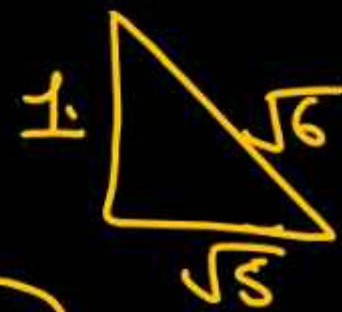
(b) -14 $6 \sin^2 \theta = 5 \tan^2 \theta$

(c) 14 $6 \sin^2 \theta = 5 \times \frac{\sin^2 \theta}{\cos^2 \theta}$

(d) -2

$\cos^2 \theta = \frac{5}{6}$

$\cos \theta = \frac{\sqrt{5}}{\sqrt{6}}$



$$\frac{24 \times \frac{1}{6} - 15 \times \frac{6}{5}}{6 \times \frac{6}{1} - 7 \times \frac{5}{1}} = \frac{4 - 18}{36 - 35} = \frac{-14}{1}$$

(SSC-CGL Pre. 23/08/2021)



30. If $\sin \theta = \frac{1}{\sqrt{10}}$ where $0 < \theta < \frac{\pi}{2}$ then

$\frac{(6 \tan \theta)(1 + \tan \theta)^{-1}}{(1 - \tan \theta)}$ is equal to?

यदि $\sin \theta = \frac{1}{\sqrt{10}}$ जहाँ $0 < \theta < \frac{\pi}{2}$ तो $\frac{(6 \tan \theta)(1 + \tan \theta)^{-1}}{(1 - \tan \theta)}$

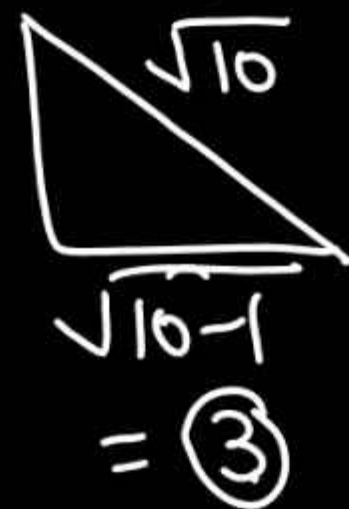
किसके बराबर है?

(a) 2.5

(b) 2.25

(c) 2.75

(d) 2.78



$$\frac{6 \times \frac{1}{3}}{1 - \frac{1}{3}} = \frac{2 \times 9}{8} = \frac{9}{4} = 2.25$$

$$\frac{6 \tan \theta}{(1 - \tan \theta)(1 + \tan \theta)} = \frac{6 \tan \theta}{1 - \tan^2 \theta}$$



31. If $\cos \theta = \sqrt{\frac{1}{7} \sqrt{\frac{1}{7} \sqrt{\frac{1}{7} \dots \dots \infty}}}$ ($\theta \neq 0^\circ$, θ is acute angle), then find

$\tan \theta + \cot \theta$?

यदि $\cos \theta = \sqrt{\frac{1}{7} \sqrt{\frac{1}{7} \sqrt{\frac{1}{7} \dots \dots \infty}}}$ ($\theta \neq 0^\circ$, θ न्यूनकोण है), तो $\tan \theta + \cot \theta$

ज्ञात कीजिये?

$$\cos \theta = \frac{1}{7}$$

$$\frac{\sqrt{48}}{1} + \frac{1}{\sqrt{48}} \Rightarrow \frac{48+1}{\sqrt{48}} = \frac{49}{\sqrt{48}}$$

(a) $\frac{49}{\sqrt{48}}$

(b) $\frac{49}{48} \sqrt{49-1}$

(c) $\frac{\sqrt{48}}{49}$

(d) $\sqrt{\frac{48}{49}}$



$$x = \sqrt{a \sqrt{a \sqrt{a \sqrt{a \dots \infty}}}}$$

$$x = a$$



33. If $\cot \theta = \frac{1}{2}$ & θ is acute angle, the value of

$$\frac{8\sin \theta + 5\cos \theta}{\sin^3 \theta + 2\cos^3 \theta + 3\cos \theta}$$
 is

यदि $\cot \theta = \frac{1}{2}$ और θ न्यूनकोण है, तो $\frac{8\sin \theta + 5\cos \theta}{\sin^3 \theta + 2\cos^3 \theta + 3\cos \theta}$ का

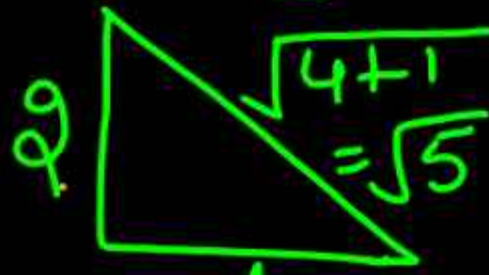
मान है

(a) $\frac{23}{5}$

(b) $\frac{21}{5}$

(c) $\frac{21}{5\sqrt{5}}$

(d) $\frac{23\sqrt{5}}{5}$



$$(\sqrt{a})^3 = a\sqrt{a}$$

$$8 \times \frac{2}{\sqrt{5}} + 5 \times \frac{1}{\sqrt{5}}$$

$$\frac{\left(\frac{2}{\sqrt{5}}\right)^3 + 2\left(\frac{1}{\sqrt{5}}\right)^3 + 3 \times \frac{1}{\sqrt{5}}}{\frac{1}{\sqrt{5}}(16+5)}$$

$$\frac{8}{5\sqrt{5}} + \frac{2 \times 1}{5\sqrt{5}} + \frac{3}{\sqrt{5}}$$

$$\frac{1}{\sqrt{5}} \left(\frac{8}{5} + \frac{2}{5} + 3 \right)$$

$$\frac{1}{\sqrt{5}} (21)$$

$$= \frac{21}{\sqrt{5}} = \frac{21\sqrt{5}}{5}$$



34. If $\frac{\sin \theta}{a} = \frac{\cos \theta}{b}$, then find cosec θ ?

यदि $\frac{\sin \theta}{a} = \frac{\cos \theta}{b}$, तो cosec θ ज्ञात कीजिये।

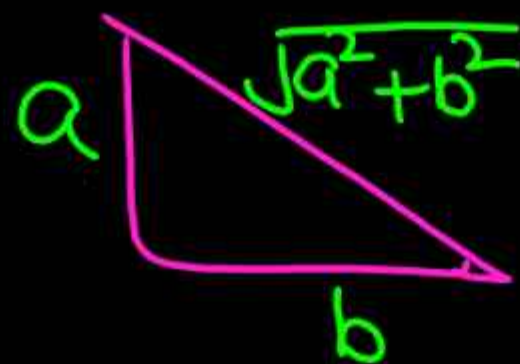
(a) $2a$

(b) $\frac{a}{b}$

(c) $\frac{\sqrt{a^2+b^2}}{a}$

(d) $\frac{\sqrt{a^2+b^2}}{b}$

$$\frac{\sin \theta}{\cos \theta} = \frac{a}{b} \Rightarrow \tan \theta = \frac{a}{b}$$



$$\operatorname{cosec} \theta = \frac{\sqrt{a^2+b^2}}{a}$$



35. If $\sin 23^\circ = \frac{p}{q}$ then $\sec 23^\circ - \sin 67^\circ = ?$

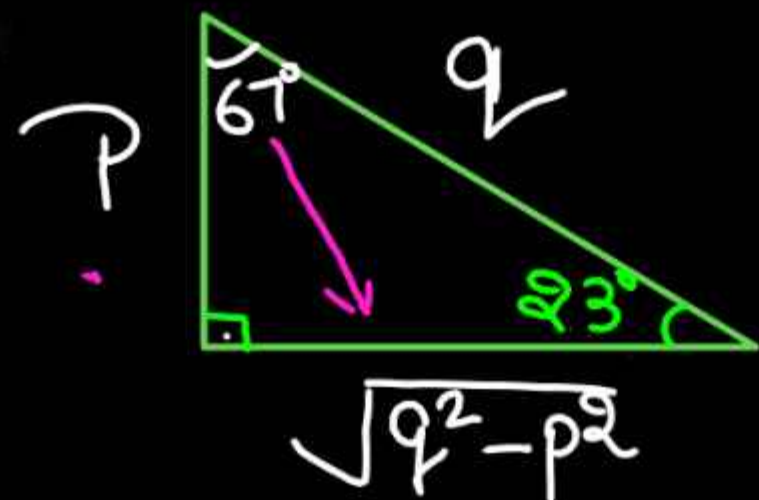
यदि $\sin 23^\circ = \frac{p}{q}$ तो $\sec 23^\circ - \sin 67^\circ = ?$

(a) $\frac{q^2}{p\sqrt{q^2-p^2}}$

(b) $\frac{p^2q^2}{\sqrt{q^2-p^2}}$

(c) $\frac{\sqrt{q^2-p^2}}{pq}$

~~(d) $\frac{p^2}{q\sqrt{q^2-p^2}}$~~



$$\frac{q}{\sqrt{q^2-p^2}} - \frac{\sqrt{q^2-p^2}}{q}$$

$$\frac{q^2 - (q^2 - p^2)}{q\sqrt{q^2-p^2}} = \frac{q^2 - q^2 + p^2}{q\sqrt{q^2-p^2}}$$

$$\frac{p^2}{q\sqrt{q^2-p^2}}$$



36. If $\tan \theta = \frac{\sqrt{q^2 - p^2}}{p}$, $0^\circ < \theta < 90^\circ$, then what is the value of $\sec \theta + \cos \theta + 2$?

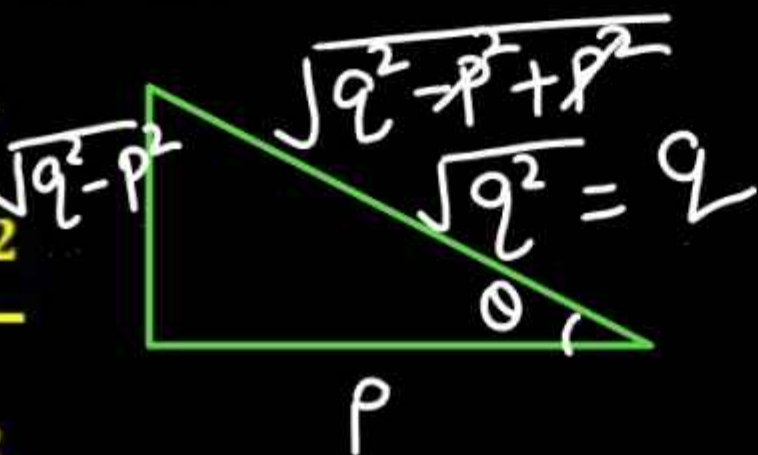
यदि $\tan \theta = \frac{\sqrt{q^2 - p^2}}{p}$, $0^\circ < \theta < 90^\circ$, तब $\sec \theta + \cos \theta + 2$ का मान क्या होगा?

(a) $\frac{p^2 + q^2}{pq}$

(b) $\frac{(p+q)^2}{pq}$

(c) $\frac{(p+q)^2}{2pq}$

(d) $\frac{(p-q)^2}{pq}$



$$\frac{q}{p} + \frac{p}{q} + 2$$

$$\frac{q^2 + p^2}{pq} + 2 \Rightarrow \frac{q^2 + p^2 + 2pq}{pq}$$

(UPSC CDS 04/09/2022)



Foundation Batch

MATHS



TRIGONOMETRIC IDENTITIES

①

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

$$\begin{cases} \cos^2 \theta = 1 - \sin^2 \theta \\ \sin^2 \theta = 1 - \cos^2 \theta \end{cases}$$

★ ②

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

$$\hookrightarrow \sec^2 \theta = 1 + \tan^2 \theta$$

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

$$\hookrightarrow (\sec \theta + \tan \theta)(\sec \theta - \tan \theta) = 1$$

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

ex

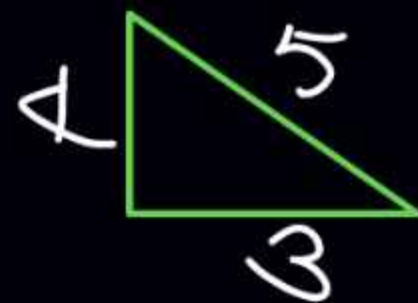
$$\sec \theta + \tan \theta = 3$$

$$\sec \theta - \tan \theta = \frac{1}{3}$$

$$2 \sec \theta = 3 + \frac{1}{3}$$

$$2 \sec \theta = \frac{10}{3}$$

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



③ $\boxed{\operatorname{cosec}^2 \theta - \cot^2 \theta = 1}$

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

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

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



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

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

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

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

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

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

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

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

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

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

3. $1 + \tan^2 \theta = \sec^2 \theta$

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

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

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

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



37. If $\sec \theta - \operatorname{cosec} \theta = 0$, then what will be the value of $(\sec \theta + \operatorname{cosec} \theta)$?

यदि $\sec \theta - \operatorname{cosec} \theta = 0$ हो, तो $(\sec \theta + \operatorname{cosec} \theta)$ का मान कितना होगा?

(A) $\frac{\sqrt{3}}{2}$

(B) $\frac{2}{\sqrt{3}}$

(C) 0

(D) $2\sqrt{2}$

$\sec \theta = \operatorname{cosec} \theta$

$\theta = 45^\circ$

$\downarrow$
 $\sec 45^\circ + \operatorname{cosec} 45^\circ$
 $\sqrt{2} + \sqrt{2}$
 $= 2\sqrt{2}$



38. If $p \sin \theta = \sqrt{3}$ and $p \cos \theta = 1$, then what will be the value of p ?

यदि $p \sin \theta = \sqrt{3}$ तथा $p \cos \theta = 1$ हो, तो p का मान कितना होगा?

(A) $\frac{1}{2}$

(B) $\frac{2}{\sqrt{3}}$

(C) $\frac{-1}{\sqrt{3}}$

☒ (D) 2

$$p^2 \sin^2 \theta = 3$$

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

$$p^2 \sin^2 \theta + p^2 \cos^2 \theta = 4$$

$$p^2 (\sin^2 \theta + \cos^2 \theta) = 4$$

$$p^2 \times 1 = 4 \Rightarrow p = \sqrt{4} = 2$$



39. If $5 \tan \theta = 4$, then what will be the value of

$$\left(\frac{5 \sin \theta - 3 \cos \theta}{5 \sin \theta + 3 \cos \theta} \right)$$

यदि $5 \tan \theta = 4$ हो, तो $\left(\frac{5 \sin \theta - 3 \cos \theta}{5 \sin \theta + 3 \cos \theta} \right)$ का मान क्या होगा?

- (A) $\frac{1}{7}$
- (B) $\frac{5}{7}$
- (C) $\frac{2}{7}$
- (D) $\frac{2}{5}$

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

$$\frac{\cancel{\cos \theta} \left[5 \times \frac{\sin \theta}{\cancel{\cos \theta}} - 3 \right]}{\cancel{\cos \theta} \left[5 \times \frac{\sin \theta}{\cancel{\cos \theta}} + 3 \right]}$$

$$\frac{5 \tan \theta - 3}{5 \tan \theta + 3}$$

$$= \frac{5 \times \frac{4}{5} - 3}{5 \times \frac{4}{5} + 3} = \frac{1}{7}$$



40. If $\sec \theta + \tan \theta = \sqrt{3}$ then the positive value of $\sin \theta$ is-

यदि $\sec \theta + \tan \theta = \sqrt{3}$ तो $\sin \theta$ का धनात्मक मान है-

(A) 0

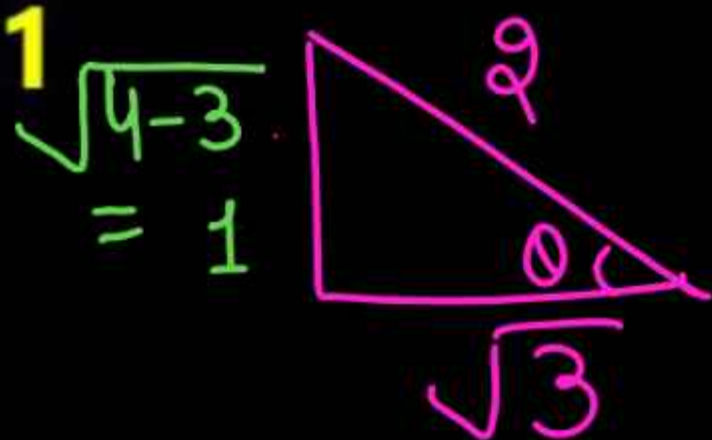
(B) $\frac{1}{2}$

(C) $\frac{\sqrt{3}}{2}$

(D) 1

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

$$\sec \theta = \sqrt{3} + \frac{1}{\sqrt{3}} = \frac{4}{\sqrt{3}}$$



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



41. If $\sin^2 \theta + 3\cos^2 \theta = 4$ ($0^\circ \leq \theta \leq 90^\circ$) then what will be the value of θ ?

यदि $7\sin^2 \theta + 3\cos^2 \theta = 4$ ($0^\circ \leq \theta \leq 90^\circ$) हो, तो θ का मान कितना होगा?

~~(A)~~ $\frac{\pi}{2} = 90^\circ$

~~(B)~~ $\frac{\pi}{3} = 60^\circ$

~~(C)~~ $\frac{\pi}{6} = 30^\circ \Rightarrow 7 \times \frac{1}{4} + 3 \times \frac{3}{4}$

(D) $\frac{\pi}{4} = 45^\circ$

$7 + 0 = 4$

$\frac{7}{4} + \frac{9}{4} = \frac{16}{4} \text{ (4)}$

$7\sin^2 \theta + 3(1 - \sin^2 \theta) = 4$

$7\sin^2 \theta + 3 - 3\sin^2 \theta = 4$

$4\sin^2 \theta = 1$

$\sin^2 \theta = \frac{1}{4}$

$\sin \theta = \sqrt{\frac{1}{4}} = \frac{1}{2} \text{ (}\theta = 30^\circ\text{)}$



42. If $\sec \theta + \tan \theta = 2$, then what will be the value of $\sec \theta$?

यदि $\sec \theta + \tan \theta = 2$ हो, तो $\sec \theta$ का मान क्या होगा ?

(A) $\frac{4}{5}$ $\sec \theta - \tan \theta = \frac{1}{2}$

(B) 5 $+$

~~(C) $\frac{5}{4}$~~ $2 \sec \theta = 2 + \frac{1}{2} = \frac{5}{2}$

(D) $\sqrt{2}$

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



Q.43

43. If $\sec \theta = x + \frac{1}{4x}$ ($0^\circ < \theta < 90^\circ$), then what will be $\sec \theta + \tan \theta$ equal to?

यदि $\sec \theta = x + \frac{1}{4x}$ ($0^\circ < \theta < 90^\circ$) हो, तो $\sec \theta + \tan \theta$ किसके बराबर होगा?

- (A) $\frac{x}{2}$
- (B) $2x$
- (C) x
- (D) $\frac{1}{2x}$