

55. If  $x = \frac{2\sin\theta}{(1+\cos\theta+\sin\theta)}$ , then the value of  $\frac{1-\cos\theta+\sin\theta}{(1+\sin\theta)}$  is:

यदि  $x = \frac{2\sin\theta}{(1+\cos\theta+\sin\theta)}$  है, तो  $\frac{1-\cos\theta+\sin\theta}{(1+\sin\theta)}$  का मान है-

**(CPO 2022)**

[A]  $\frac{x}{(1+x)}$

[C]  $1/x$

[B]  $x$

[D]  $(1+x)$

56. If  $x = \frac{1 - \cos\theta + \sin\theta}{1 + \sin\theta}$ , then find  $\frac{\sin\theta + \cos\theta - 1}{\cos\theta}$ ?

यदि  $x = \frac{1 - \cos\theta + \sin\theta}{1 + \sin\theta}$  है, तो  $\frac{\sin\theta + \cos\theta - 1}{\cos\theta}$  ज्ञात कीजिये?

(CDS 2022)

[A]  $1/x$

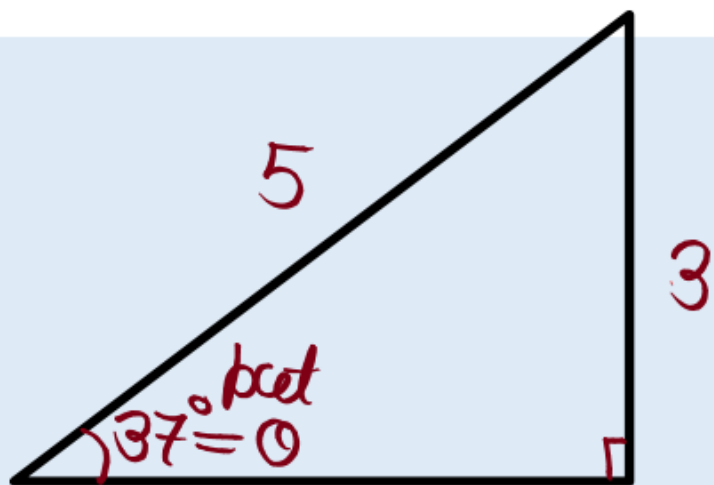
[C]  $1+x$

[B]  $x$

[D]  $x-1$

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

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



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

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

#  
(V.V.V imp)

57. For the next two (02) items that follow/अगले दो (02) मदों के लिए:

$$p = \frac{\sin\theta}{1+\cos\theta+\sin\theta} \text{ and/और } q = \frac{1+\sin\theta}{1+\sin\theta-\cos\theta}$$

Which one of the following is correct?

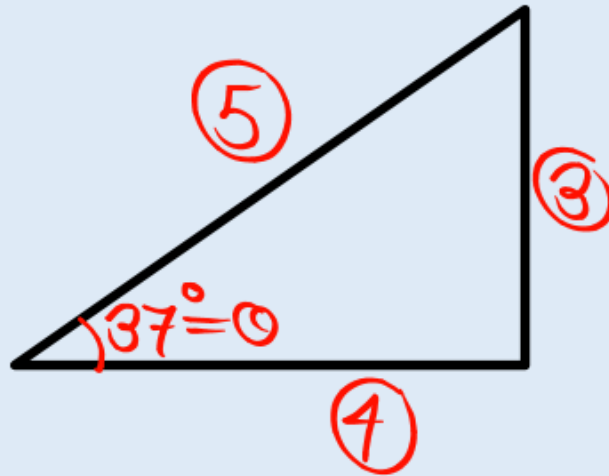
निम्नलिखित में से कौन सा सही है?

~~[A]~~  $p - q = 0$

~~[B]~~  $2pq - 1 = 0$

~~[C]~~  $pq - 2 = 0$

~~[D]~~  $pq - 1 = 0$



$$p = \frac{\frac{3}{5}}{\frac{5}{2} + \frac{3}{5} + \frac{3}{5}} = \frac{1}{4}$$

$$q = \frac{1 + \frac{3}{5}}{1 + \frac{3}{5} - \frac{3}{5}} = 2$$

58. For the next two (02) items that follow/अगले दो (02) मदों के लिए:

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

and/और  $q = \frac{1+\sin\theta}{1+\sin\theta-\cos\theta}$

What is  $\left(p + \frac{1}{q}\right) \left(q + \frac{1}{p}\right)$  equal to?

$\left(p + \frac{1}{q}\right) \left(q + \frac{1}{p}\right)$  किसके बराबर है?

(UPSC CDS - I 2026)

[A]  $\frac{1}{2}$   
[C]  $\frac{9}{2}$

$\left(\frac{1}{4} + \frac{1}{2}\right) \times (2 + 4)$   
 $\frac{3}{4} \times 6 = \frac{9}{2}$

[B]  $\frac{17}{4}$   
[D]  $\frac{21}{4}$

$p = \frac{1}{4}$

$q = 2$

59.  $\tan^2\alpha = 1 + 2\tan^2\beta$  then find the value of  $\sqrt{2}\cos\alpha - \cos\beta = ?$

यदि  $\tan^2\alpha = 1 + 2\tan^2\beta$  है, तो  $\sqrt{2}\cos\alpha - \cos\beta$  का मान ज्ञात कीजिए।

[A] 0

[B] 1

[C] 2

[D]  $\sqrt{2}$

$\sqrt{2} \times \frac{1}{\sqrt{2}} - 1 = 0$

put  $\beta = 0^\circ$

$\Rightarrow \tan\alpha = 1$

$\Rightarrow \alpha = 45^\circ$

**60.** If  $\cos^2 \theta - \sin^2 \theta = \tan^2 \varphi$ , then which of the following is true?

यदि  $\cos^2 \theta - \sin^2 \theta = \tan^2 \phi$  है, तो निम्नलिखित में से कौन सा कथन सत्य है?

~~$[A] \cos \theta \cos \varphi = 1$~~

~~[B]~~  $\cos^2 \phi - \sin^2 \phi = \tan^2 \theta$

~~[c]~~  $\cos^2 \varphi - \sin^2 \varphi = \cot^2 \theta$

$$[D] \times \cos\theta \cos\phi = \sqrt{2}$$

(v.v.v.vimp)

$$\cos \theta - \sin \theta = \tan \phi$$

but  $\odot = 0^\circ$

$$\phi = 45^\circ$$

$$1 = \tan^2 \phi$$

61. If  $\operatorname{cosec}\theta - \sin\theta = p^3$  and  $\sec\theta - \cos\theta = q^3$ , then what is the value of  $\tan\theta$ ?

यदि  $\operatorname{cosec}\theta - \sin\theta = p^3$  और  $\sec\theta - \cos\theta = q^3$  है, तो  $\tan\theta$  का मान क्या होगा?

[A]  $\frac{p}{q}$

[B]  $\frac{q}{p}$

[C]  $pq$

[D]  $p+q$

$$\frac{1}{S} - S = p^3$$

$$\frac{1}{C} - C = q^3$$

$$\frac{1}{S^2} = p^3$$

$$\frac{1}{C^2} = q^3$$

$$\frac{1}{S^3} = \left(\frac{p}{q}\right)^3$$

$$\frac{1}{S} = \frac{p}{q}$$

$$\tan\theta = \frac{q}{p}$$

$$\frac{1}{\frac{1}{S^2}} = \frac{1}{\frac{p^3}{q^3}}$$

62. Let  $\sin\theta + \cos\theta = p$  and  $\sec\theta + \operatorname{cosec}\theta = q$ , where  $p \neq 1$ . What is  $\tan\theta + \cot\theta$  equal to?

मान लीजिए  $\sin\theta + \cos\theta = p$  और  $\sec\theta + \operatorname{cosec}\theta = q$ , जहाँ  $p \neq 1$  है।  $\tan\theta + \cot\theta$  का मान क्या है?

(UPSC CDS - II 2025)

[A]  $p/q$

[C]  $2p/q$

[B]  $q/p$

[D]  $2q/p$

$$\cancel{\frac{1}{c} + \frac{1}{s}} = 2$$

$$\frac{p}{c \cdot s} = 2$$

$$\frac{1}{sc} = \frac{2}{p}$$

$$\tan\theta + \cot\theta = \frac{2}{p}$$

63. If  $\sec\theta + \operatorname{cosec}\theta = a$  and  $\tan\theta + \cot\theta = b$ , find the value of  $\operatorname{cosec}2\theta$ .

यदि  $\sec\theta + \operatorname{cosec}\theta = a$  और  $\tan\theta + \cot\theta = b$  है, तो  $\operatorname{cosec}2\theta$  का मान ज्ञात कीजिए।

RRB NTPC 12<sup>TH</sup> LEVEL 2026

[A]  $\frac{a^2 - b^2}{2}$

[C]  $\frac{a}{2}$

[B]  $\frac{b^2 - a^2}{2}$

~~[D]  $\frac{b}{2}$~~

$\sin 2\theta = 2 \sin \theta \cdot \cos \theta$

$\frac{2 \times 1}{2 \sin \theta \cdot \cos \theta} = b$

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

$2 \cos 2\theta = b$

64. If  $(\sin\theta + \operatorname{cosec}\theta)^2 + (\cos\theta + \sec\theta)^2 = k + \tan^2\theta + \cot^2\theta$ , then the value of  $k$  is equal to:  
यदि  $(\sin\theta + \operatorname{cosec}\theta)^2 + (\cos\theta + \sec\theta)^2 = k + \tan^2\theta + \cot^2\theta$  है, तो  $k$  का मान ज्ञात कीजिए।

[A] 7

[B] 2

[C] 9

[D] 5

# put  $\theta = 45^\circ$

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

$$\frac{9}{2} + \frac{9}{2} = k + 2$$

$$7 = k$$

65.  $\frac{\tan A}{1 - \cot A} + \frac{\cot A}{1 - \tan A} = K + \tan A + \cot A$ , then  $K = ?$

[A] 1

[B] 2

[C] 3

[D] 0

put  $A = 135^\circ$

$$\tan 135^\circ = \cot 135^\circ = -1$$

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

$$K = 1$$

**66. If  $\frac{\tan\theta}{1-\cot\theta} + \frac{\cot\theta}{1-\tan\theta} = 1 + k$ , then  $k = ?$**

**[A]  $\tan\theta + \sec\theta$**

**~~[B]  $\operatorname{cosec}\theta \sec\theta$~~**

**[C]  $\cot\theta + \sec\theta$**

**[D]  $\tan\theta + \operatorname{cosec}\theta$**

67. For  $0^\circ < \theta < 90^\circ$ , if  $\frac{\sec\theta(1-\sin\theta)(\sec\theta+\tan\theta)}{(\sec\theta-\tan\theta)^2} = \frac{1+k}{1-k}$ , then k is equal to:

$0^\circ < \theta < 90^\circ$  के लिए, अगर  $\frac{\sec\theta(1-\sin\theta)(\sec\theta+\tan\theta)}{(\sec\theta-\tan\theta)^2} = \frac{1+k}{1-k}$  है तो k बराबर है:

[A] cosec $\theta$

[B] cos $\theta$

[C] sec $\theta$

[D] sin $\theta$

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

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

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

68. If  $2 \times \frac{\cos^2 x - \sec^2 x}{\tan^2 x} = a + b \cos 2x$ , then find a, b?

यदि  $2 \times \frac{\cos^2 x - \sec^2 x}{\tan^2 x} = a + b \cos 2x$  है, तो a, b ज्ञात कीजिये?

[A]  ~~$-3/2, -1/2$~~

[B]  ~~$3/2, 1/2$~~

☒ [C]  $-3, -1$

[D]  ~~$3, 1$~~

let  $x = 45^\circ$

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

$$-3 = a$$

69. If A, B and C are angles of a triangle, then  $\sin^2 A + \sin^2 B + \sin^2 C - 2\cos A \cdot \cos B \cdot \cos C = ?$   
यदि A, B और C एक त्रिभुज के कोण हैं, तो  $\sin^2 A + \sin^2 B + \sin^2 C - 2\cos A \cdot \cos B \cdot \cos C = ?$

[A] 0

[B] 1

[C] 2

[D] 4

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

$$\begin{matrix} A & + & B & + & C & = & 180^\circ \\ 60^\circ & & 60^\circ & & 60^\circ & & \end{matrix}$$

$$\begin{aligned} &= \frac{8}{4} \\ &= 2 \end{aligned}$$



70. If  $x\sin^3\theta + y\cos^3\theta = \sin\theta\cos\theta$  &  $x\sin\theta - y\cos\theta = 0$  for every  $\theta \in (0, \frac{\pi}{2})$ , then what is  $x^2 + y^2$  equal to?

यदि  $x\sin^3\theta + y\cos^3\theta = \sin\theta\cos\theta$  &  $x\sin\theta - y\cos\theta = 0$  प्रत्येक  $\theta \in (0, \pi/2)$  के लिए, तो  $x^2 + y^2$  किसके बराबर है?

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

(CDS 2023)

[A] 0

[C] 2

[B] 1

[D] 3

$$\Rightarrow x = y = \frac{1}{\sqrt{2}}$$

put  $\theta = 45^\circ$

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

71. If  $2y\cos\theta = x\sin\theta$  and  $2x\sec\theta - y\csc\theta = 3$ , then  $x^2 + 4y^2 = ?$

यदि  $2y\cos\theta = x\sin\theta$  और  $2x\sec\theta - y\csc\theta = 3$  है, तो  $x^2 + 4y^2 = ?$

[A] 1

[B] 2

[C] 0

[D] 4

$$2 + 4 \times \frac{1}{2} = 4$$

$$\text{put } \theta = 45^\circ$$

$$\Rightarrow x = 2y$$

$$x = \sqrt{2}$$

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

$$y = \frac{1}{\sqrt{2}}$$

72. If  $\tan\theta - \cot\theta = a$  and  $\cos\theta + \sin\theta = b$ , then  $(b^2 - 1)^2 (a^2 + 4) = ?$

यदि  $\tan\theta - \cot\theta = a$  और  $\cos\theta + \sin\theta = b$  है, तो  $(b^2 - 1)^2 (a^2 + 4) = ?$

[A] 2

[B] 1

$$= 1 \times 4$$

[C] 0

[D] 4

$$= 4$$

(CGL 20/12 MAINS)

$$\text{Let } \theta = 45^\circ$$

$$a = 0$$

$$b = 2 \times \frac{1}{\sqrt{2}} = \sqrt{2}$$

73. If  $\text{Cosec}\theta - \sin\theta = 1$  &  $\sec\theta - \cos\theta = m$ , then  $l^2 m^2 (l^2 + m^2 + 3) = ?$

यदि  $\text{Cosec}\theta - \sin\theta = 1$  और  $\sec\theta - \cos\theta = m$  है, तो  $l^2 m^2 (l^2 + m^2 + 3) = ?$

[A] 0

[C] -1

[B] 1

[D] 2

$$= \frac{1}{2} \times \frac{1}{2} (4) \\ = 1$$

put  $\theta = 45^\circ$

$$\frac{1}{\sqrt{2}} = l = m$$

74. If  $\cos\theta + \sin\theta = m$ ,  $\sec\theta + \csc\theta = n$ , then  $n(m^2-1)$  is equal to?

यदि  $(\cos\theta + \sin\theta) = m$ ,  $\sec\theta + \csc\theta = n$ , तो  $n(m^2-1)$  किसके बराबर है?

[A]  $2m$

[B]  $mn$

[C]  $4mn$

[D]  $2n$

$2\sqrt{2} \times 1 = 2\sqrt{2}$

put  $\theta = 45^\circ$

$m = \sqrt{2}$

$n = 2\sqrt{2}$

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

$\frac{m}{C \cdot S} = n$

$\frac{2m}{m^2-1} = n$

$1 + \sec\theta = m^2$

$C \cdot S = \frac{m^2-1}{2}$

75. Which of the following is true when  $x = \sin A + \cos A$ ;  $y = \sec A + \operatorname{cosec} A$ ?

$x = \sin A + \cos A$ ,  $y = \sec A + \operatorname{cosec} A$  होने पर निम्नलिखित में से कौन-सा विकल्प सत्य होगा?

**SSC CPO Pre 2024**

[A]  $y(1+x^2) = 2x$

[B]  $y - 2x = x^2y$

[C]  $y + 2x = x^2y$

[D]  $y(1-2x^2) = x$

76.  $a(\tan\theta + \cot\theta) = 1$ ,  $\sin\theta + \cos\theta = b$  and  $0 < \theta < 90$ , then relation between  $a$  and  $b$ ?

$a(\tan\theta + \cot\theta) = 1$ ,  $(\sin\theta + \cos\theta)^2 = b^2$  और  $0 < \theta < 90$ , तो  $a$  और  $b$  के बीच संबंध क्या है?

~~[A]  $b^2 = 2(a+1)$~~

[B]  $b^2 = 2(a+1)$

~~[C]  $2a = b^2 - 1$~~

[D]  $2a = b^2 + 1$

$$a \times \frac{1}{S.C} = 1$$

$$a = S.C$$

$$1 + 2SC = b^2$$

$$1 + 2a = b^2$$

$$\Rightarrow 2a = b^2 - 1$$

77. If  $\tan A + \sin A = p$  and  $\tan A - \sin A = q$ , then which of the following is true?

यदि  $\tan A + \sin A = p$  और  $\tan A - \sin A = q$  है, तो निम्नलिखित में से कौन सा कथन सत्य है?

(SSC CGL PRE 2023, 2024) (SSC CHSL PRE 2024)

[A]  $p^2 + q^2 = 4\sqrt{pq}$

[B]  $p + q = pq$

[C]  $p - q = pq$

☒ [D]  $p^2 - q^2 = 4\sqrt{pq}$

$$\tan^2 A - \sin^2 A = (\tan A \cdot \sin A)^2$$

$$pq = \left( \frac{p^2 - q^2}{4} \right)^2$$

$$\sqrt{pq} = \frac{p^2 - q^2}{4}$$

$$(a+b)^2 - (a-b)^2 = 4ab$$

$$(T+S)^2 - (T-S)^2 = 4TS$$

$$p^2 - q^2 = 4(TS)$$

$$\frac{p^2 - q^2}{4} = TS$$

78. If  $\cot A + \cos A = p$ ,  $\cot A - \cos A = q$ , then what is the value of  $p^2 - q^2$ ?  
यदि  $\cot A + \cos A = p$ ,  $\cot A - \cos A = q$  है, तो  $p^2 - q^2$  का मान ज्ञात कीजिए।

(RRB NTPC 12<sup>th</sup> LEVEL 2025)

[A]  $\sqrt{pq}$

[B]  $3\sqrt{pq}$

[C]  $2\sqrt{pq}$

~~[D]  $4\sqrt{pq}$~~

$$\cot^2 A - \cos^2 A = \cot^2 A \cdot \cos^2 A$$

79. If  $m^2(\sin\theta - 1) + n^2(\sin\theta + 1) = 0$ , where  $0 < \theta < \frac{\pi}{2}$ , then what is  $(m^2 + n^2)\cos\theta - (m^2 - n^2)\cot\theta$ ?  
 यदि  $m^2(\sin\theta - 1) + n^2(\sin\theta + 1) = 0$ , जहाँ  $0 < \theta < \frac{\pi}{2}$ , तो  $(m^2 + n^2)\cos\theta - (m^2 - n^2)\cot\theta$  क्या है?

(UPSC CDS-1 2025)

[a]  $4mn$

[b]  $2mn$

[c]  $1$

[d]  $0$

$$2mn - 2mn = 0$$

$$\sin\theta(m^2 + n^2) - m^2 + n^2 = 0$$

$$\sin\theta = \frac{m^2 - n^2}{m^2 + n^2} \rightarrow P/H$$

$$2mn \rightarrow B$$

$$\frac{\cancel{S} + \cancel{S}}{\cancel{S} - \cancel{S}}$$

$$= \frac{\cancel{800} + 1}{\cancel{800} - 1} \times \frac{\cancel{800} + 1}{\cancel{800} + 1}$$

$$= 610 \times (800 + 1)^2$$

80. For  $0 < \theta < \frac{\pi}{2}$ , consider the following:

$0 < \theta < \frac{\pi}{2}$ , के लिए, निम्नलिखित पर विचार करें:

I.  $(\tan^4 \theta + \tan^6 \theta)(\cot^4 \theta + \cot^6 \theta) = \sec^2 \theta \operatorname{cosec}^2 \theta$

II.  $\frac{\tan \theta + \sin \theta}{\tan \theta - \sin \theta} = \cot^2 \theta (\sec \theta + 1)^2$

Which of the above is/are identities?

उपरोक्त में से कौन सी पहचान है/हैं?

(UPSC CDS - I 2026)

[A] only/ केवल I

[B] only/ केवल II

[C] Both I and II/ I और II दोनों

[D] Neither I nor II/ न तो I और न ही II

81. For the next two (02) items that follow/अगले दो (02) मदों के लिए:

$$p + q \cot \theta = 3 \operatorname{cosec} \theta \text{ and/ और } q - p \cot \theta = 2 \operatorname{cosec} \theta$$

What is  $p^2 + q^2$  equal to?

$p^2 + q^2$  किसके बराबर है?

(UPSC CDS - I 2026)

[A] 5

[B] 7

[C] 10

[D] 13

Let  $\theta = 45^\circ$

$$p + q = 3\sqrt{2}$$

$$q - p = 2\sqrt{2}$$

$$(p+q)^2 + (q-p)^2 = 2(p^2 + q^2)$$

$$18 + 8 = 2(p^2 + q^2)$$



**82. For the next two (02) items that follow/अगले दो (02) मदों के लिए:**

**$p + q \cot \theta = 3 \operatorname{cosec} \theta$  and/ और  $q - p \cot \theta = 2 \operatorname{cosec} \theta$**

**What is  $\tan \theta$  equal to?**

**$\tan \theta$  किसके बराबर है?**

**[A]  $\frac{(2q+3p)}{(3q-2p)}$**

**[C]  $\frac{(3q+2p)}{(2q-3p)}$**

**[B]  $\frac{(2q-3p)}{(3q+2p)}$**

**[D]  $\frac{(3q-2p)}{(2q+3p)}$**