NDA 1 2025

LIVE

MATHS

TRIGONOMETRY

CLASS 6

NAVJYOTI SIR

Crack
EXAMS

Q) If $\sin\theta = \sqrt{3}\cos\theta, -\pi < \theta < 0$, then θ is equal to

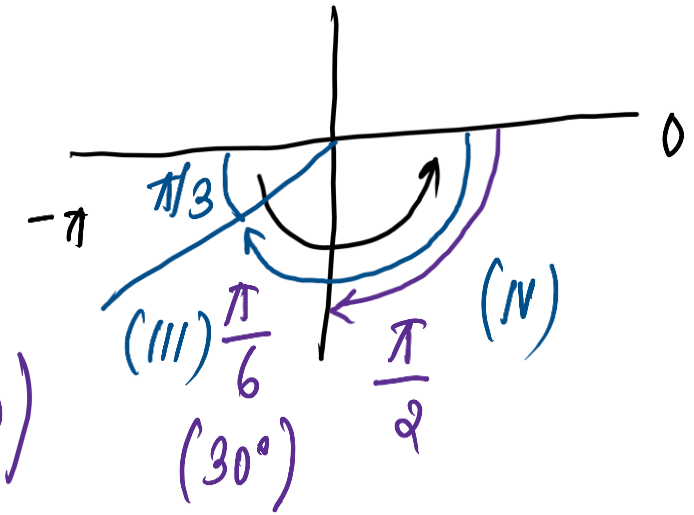
(a) $\frac{-5\pi}{6}$ (b) $\frac{-4\pi}{6}$ ✓ (c) $\frac{4\pi}{6}$ (d) $\frac{5\pi}{6}$

$\sin\theta = \sqrt{3}\cos\theta$

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

$\theta = \left(\pi + \frac{\pi}{3}\right) \quad (-\pi < \theta < 0)$

$= \frac{4\pi}{3}$



$\left(\frac{-\pi}{2}\right) + \left(-\frac{\pi}{6}\right)$

$= \frac{-4\pi}{6} = -\frac{4\pi}{6}$

Q) If $\sin\theta = \sqrt{3}\cos\theta, -\pi < \theta < 0$, then θ is equal to

(a) $\frac{-5\pi}{6}$ (b) $\frac{-4\pi}{6}$ (c) $\frac{4\pi}{6}$ (d) $\frac{5\pi}{6}$

Ans: (b)

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(PYQ – 2024 – II)

Consider the following numbers :

I. $\tan 22 \cdot 5^\circ$ ✓

II. $\cot 22 \cdot 5^\circ$ ✓

III. $\tan 22 \cdot 5^\circ - \cot 22 \cdot 5^\circ$

How many of the above are irrational numbers?

(a) None

(b) Only one

(c) Only two ✓

(d) All three

$\tan 22.5^\circ = \sqrt{2}+1$

$\cot 22.5^\circ = \frac{1}{\sqrt{2}+1} = \sqrt{2}-1$

irrational

$(\sqrt{2}+1) - (\sqrt{2}-1) = 2 \longrightarrow$ rational

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Consider the following numbers :

I. $\tan 22 \cdot 5^\circ$

II. $\cot 22 \cdot 5^\circ$

III. $\tan 22 \cdot 5^\circ - \cot 22 \cdot 5^\circ$

How many of the above are irrational numbers?

(a) None

(b) Only one

(c) Only two

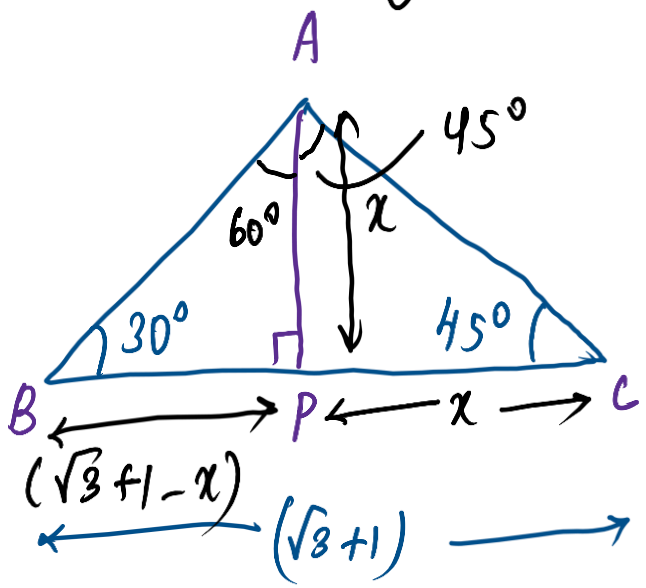
(d) All three

Ans: (c)

Q) If the angles of a triangle are 30° and 45° and the included side is $(\sqrt{3}+1)$ cm, then what is the area of the triangle ?

(a) $(\sqrt{3}+1)$ cm^2 (b) $(\sqrt{3}+3)$ cm^2

(c) $\frac{1}{2}(\sqrt{3}+1)$ cm^2 ✓ (d) $2(\sqrt{3}+1)$ cm^2



$\triangle APB$,

$$\tan 30^\circ = \frac{x}{\sqrt{3}+1-x}$$

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

$$\sqrt{3}+1 = (\sqrt{3}+1)x$$

$$\Rightarrow \underline{x = 1}$$

$$\text{Area} = \frac{1}{2} \times (\sqrt{3}+1) \times 1$$

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

Q) If the angles of a triangle are $30°$ and $45°$ and the included side is $\left(\sqrt{3}+1\right)$ cm, then what is the area of the triangle ?

(a) $\left(\sqrt{3}+1\right)$ cm^2

(b) $\left(\sqrt{3}+3\right)$ cm^2

(c) $\frac{1}{2}\left(\sqrt{3}+1\right)$ cm^2

(d) $2\left(\sqrt{3}+1\right)$ cm^2

Ans: (c)

Q) $\cot^{-1}\left[\dfrac{\sqrt{1-\sin x}+\sqrt{1+\sin x}}{\sqrt{1-\sin x}-\sqrt{1+\sin x}}\right]$ is equal to

(a) $\pi - x$ (b) $2\pi - x$

(c) $\dfrac{x}{2}$ (d) $\pi - \dfrac{x}{2}$

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

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

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

$\cos x + 1 = 2\cos^2 x/2$

$\sin 2x = 2\sin x \cos x$

$\sin x = 2\sin\frac{x}{2}\cos\frac{x}{2}$

$$= -\left(\frac{2\cos^2 x/2}{2\sin x/2 \cos x/2}\right)$$

$$= -\left(\cot x/2\right)$$

$$\cot^{-1}\left(-\cot x/2\right) = \pi - \cot^{-1}\left(\cot\frac{x}{2}\right)$$

$$= \pi - \frac{x}{2}$$

Q) $\cot^{-1}\left[\dfrac{\sqrt{1-\sin x}+\sqrt{1+\sin x}}{\sqrt{1-\sin x}-\sqrt{1+\sin x}}\right]$ is equal to

(a) $\pi - x$

(b) $2\pi - x$

(c) $\dfrac{x}{2}$

(d) $\pi - \dfrac{x}{2}$

Ans: (d)

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. If $4\sin^{-1}x+\cos^{-1}x=\pi$, then what is $\sin^{-1}x+4\cos^{-1}x$ equal to? **(PYQ – 2024 – II)**

(a) $\pi/2$

(b) π

(c) $3\pi/2$ ✓

(d) 2π

$$4\sin^{-1}x+\frac{\pi}{2}-\sin^{-1}x=\pi$$

$$3\sin^{-1}x=\frac{\pi}{2}$$

$$\sin^{-1}x=\frac{\pi}{6}$$

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

$$\sin^{-1}\left(\frac{1}{2}\right)+4\cos^{-1}\left(\frac{1}{2}\right)$$

$$\frac{\pi}{6}+4\left(\frac{\pi}{3}\right)$$

$$\frac{\pi+8\pi}{6}=\frac{3\pi}{2}$$

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. If $4\sin^{-1}x+\cos^{-1}x=\pi$, then what is $\sin^{-1}x+4\cos^{-1}x$ equal to? **(PYQ – 2024 – II)**

(a) $\pi/2$

(b) π

(c) $3\pi/2$

(d) 2π

Ans: (c)

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What is $\cot^2(\sec^{-1}2) + \tan^2(\operatorname{cosec}^{-1}3)$ equal to? **(PYQ – 2024 – II)**

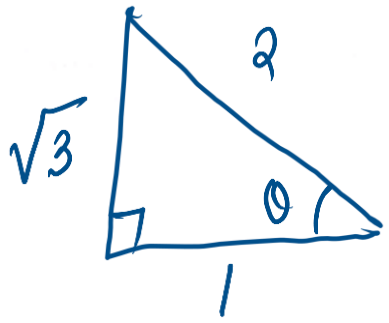
(a) 11/12

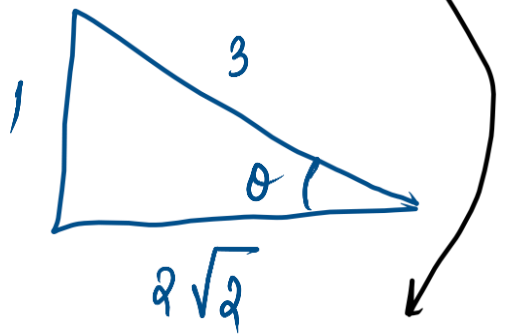
(b) 11/24 ✓

(c) 7/24

(d) 1/24

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





$\cot^2\theta = (\cot\theta)^2$

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

$\left(\frac{h}{b}\right)$ ← $\sec\theta = \frac{2}{1}$

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

$= \frac{1}{3} + \frac{1}{8} = \frac{11}{24}$

NDA 1 2025 LIVE CLASS - MATHS - PART 6

What is $\cot^2(\sec^{-1} 2) + \tan^2(\operatorname{cosec}^{-1} 3)$ equal to? **(PYQ – 2024 – II)**

(a) 11/12

(b) 11/24

(c) 7/24

(d) 1/24

Ans: (b)

Q) What is the value of the following?

$$\cot\left[\sin^{-1}\left(\frac{3}{5}\right)+\cot^{-1}\left(\frac{3}{2}\right)\right]$$

(a) $\frac{6}{17}$ ✓ (b) $\frac{7}{16}$

(c) $\frac{16}{7}$ (d) $\frac{17}{6}$

$$\cot^{-1}A+\cot^{-1}B=\cot^{-1}\left(\frac{AB-1}{A+B}\right)$$

$$\cot\left[\cot^{-1}\left(\frac{4}{3}\right)+\cot^{-1}\left(\frac{3}{2}\right)\right]$$

$$\cot\left[\cot^{-1}\left(\frac{\frac{4}{3}\times\frac{3}{2}-1}{\frac{4}{3}+\frac{3}{2}}\right)\right]=\frac{1}{\left(\frac{17}{6}\right)}=\frac{6}{17}$$

Q) What is the value of the following?

$$\cot\left[\sin^{-1}\left(\frac{3}{5}\right)+\cot^{-1}\left(\frac{3}{2}\right)\right]$$

(a) $\frac{6}{17}$ (b) $\frac{7}{16}$

(c) $\frac{16}{7}$ (d) $\frac{17}{6}$

Ans: (a)

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(PYQ – 2024 – II)

If

$$\frac{x}{\cos\theta} = \frac{y}{\cos\left(\frac{2\pi}{3} - \theta\right)} = \frac{z}{\cos\left(\frac{2\pi}{3} + \theta\right)}$$

then what is $x + y + z$ equal to?

(a) -1

(b) 0 ✓

(c) 1

(d) 3

$\theta = 60^\circ$

$$\frac{x}{\cos 60^\circ} = \frac{y}{\cos 60^\circ} = \frac{z}{\cos 180^\circ}$$

$$\frac{x}{1/2} = \frac{y}{1/2} = \frac{z}{(-1)} = k$$

$x + y + z = 0$

$\Rightarrow x = \frac{1}{2}k \; ; \; y = \frac{1}{2}k \; ; \; z = -k$

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If

$$\frac{x}{\cos\theta} = \frac{y}{\cos\left(\frac{2\pi}{3} - \theta\right)} = \frac{z}{\cos\left(\frac{2\pi}{3} + \theta\right)}$$

then what is $x + y + z$ equal to?

(a) -1

(b) 0

(c) 1

(d) 3

Ans: (b)

NDA 1 2025 LIVE CLASS - MATHS - PART 6

If $p\tan(\theta - 30°) = q\tan(\theta + 120°)$, then what is $(p+q)/(p-q)$ equal to? **(PYQ – 2024 – II)**

(a) $\sin 2\theta$ ✗

(b) $\cos 2\theta$ ✗

(c) $2\sin 2\theta$

(d) $2\cos 2\theta$ ✓

$$p\tan(\theta - 30°) = q\tan(\theta + 120°)$$

$$\{\theta = 60°\}$$

$$p\tan(30°) = q\tan(180°)$$

$$\frac{p}{q} = \frac{0}{\left(\frac{1}{\sqrt{3}}\right)} \Rightarrow \frac{p+q}{p-q} = \frac{0 + 1/\sqrt{3}}{0 - 1/\sqrt{3}} = -1$$

NDA 1 2025 LIVE CLASS - MATHS - PART 6

If $p\tan(\theta - 30°) = q\tan(\theta + 120°)$, then what is $(p+q)/(p-q)$ equal to?

(a) $\sin 2\theta$

(b) $\cos 2\theta$

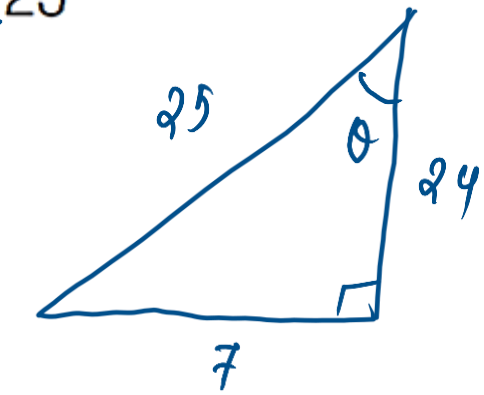
(c) $2\sin 2\theta$

(d) $2\cos 2\theta$

Ans: (d)

Q) If $7\sin\theta + 24\cos\theta = 25$, then what is the value of $(\sin\theta + \cos\theta)$?

(a) 1 (b) $\frac{26}{25}$ (c) $\frac{6}{5}$ (d) $\frac{31}{25}$



$49 + 576 = 625 = 25^2$

$\sin\theta = \frac{7}{25}$

$\cos\theta = \frac{24}{25}$

$\sin\theta + \cos\theta = \frac{31}{25}$

Q) If $7\sin\theta + 24\cos\theta = 25$, then what is the value of $(\sin\theta + \cos\theta)$?

(a) 1 (b) $\frac{26}{25}$ (c) $\frac{6}{5}$ (d) $\frac{31}{25}$

Ans: (d)

Q) If $A+B=\frac{\pi}{2}$, what are the greatest and the least values of $\cos A \cos B$, respectively?

(a) 1/2 and 0
(b) 0 and –1/2
(c) 1/2 and –1/2 ✓
(d) 0 and –1

$\cos A \cos\left(\frac{\pi}{2}-A\right)$

$\cos A \sin A$

$\frac{1}{2}(2\sin A\cos A) = \frac{1}{2}\sin 2A$

max. value $= \frac{1}{2}$ ✓

min. value $= -\frac{1}{2}$ ✓

(Max. value of $\sin\theta = 1$

Min. value $\rightarrow -1$)

Q) If $A + B = \frac{\pi}{2}$, what are the greatest and the least values of $\cos A \cos B$, respectively?

(a) 1/2 and 0
(b) 0 and –1/2
(c) 1/2 and –1/2
(d) 0 and –1

Ans: (c)

Q) If $\alpha+\beta=\frac{\pi}{2}$ and $\beta+\gamma=\alpha$, then which one of the following is correct?

(a) $2\tan\beta+\tan\gamma=\tan\alpha$ (b) $\tan\beta+2\tan\gamma=\tan\alpha$ ✓

(c) $\tan\beta+\tan\gamma=\tan\alpha$ (d) $2(\tan\beta+\tan\gamma)=\tan\alpha$

$\tan(\beta+\gamma)=\tan\alpha$

$\tan\beta+\tan\gamma=\tan\alpha-\tan\alpha\tan\beta\tan\gamma$

$(\tan\alpha\cot\alpha)=1$

$\tan\beta+\tan\gamma+\tan\gamma=\tan\alpha$

$\tan\beta+2\tan\gamma=\tan\alpha$

$\alpha+\beta=\frac{\pi}{2}$

$\tan\beta=\tan\left(\frac{\pi}{2}-\alpha\right)$

$=\cot\alpha$

Q) If $\alpha + \beta = \frac{\pi}{2}$ and $\beta + \gamma = \alpha$, then which one of the following is correct?

(a) $2\tan\beta + \tan\gamma = \tan\alpha$ (b) $\tan\beta + 2\tan\gamma = \tan\alpha$
(c) $\tan\beta + \tan\gamma = \tan\alpha$ (d) $2(\tan\beta + \tan\gamma) = \tan\alpha$

Ans: (b)

Q) What is the value of $\tan 15° \cdot \tan 195°$?

(a) $7 - 4\sqrt{3}$ ✓

(b) $7 + 4\sqrt{3}$

(c) $7 + 2\sqrt{3}$

(d) $7 + 6\sqrt{3}$

$\tan 15° \tan(180° + 15°)$

$\tan^2 15°$

$(2 - \sqrt{3})^2 = 7 - 4\sqrt{3}$

$\tan 15° = \tan(45° - 30°)$

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

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

Q) What is the value of $\tan 15° \cdot \tan 195°$?

(a) $7 - 4\sqrt{3}$

(b) $7 + 4\sqrt{3}$

(c) $7 + 2\sqrt{3}$

(d) $7 + 6\sqrt{3}$

Ans: (a)

Q) If $\cos\theta = \frac{1}{2}\left(x + \frac{1}{x}\right)$, then $\frac{1}{2}\left(x^2 + \frac{1}{x^2}\right)$ is equal to

(a) $\sin 2\theta$
(b) $\cos 2\theta$ ✓
(c) $\tan 2\theta$
(d) $\sec 2\theta$

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

$$2\cos\theta = \left(x + \frac{1}{x}\right)$$

$$4\cos^2\theta = \left(x^2 + \frac{1}{x^2}\right) + 2$$

$$x^2 + \frac{1}{x^2} = 4\cos^2\theta - 2$$

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

$$= \cos 2\theta$$

Q) If $\cos\theta = \frac{1}{2}\left(x + \frac{1}{x}\right)$, then $\frac{1}{2}\left(x^2 + \frac{1}{x^2}\right)$ is equal to

(a) $\sin 2\theta$
(b) $\cos 2\theta$
(c) $\tan 2\theta$
(d) $\sec 2\theta$

Ans: (b)

Q) Let $0 < x < \frac{\pi}{4}$ then $(\sec 2x - \tan 2x)$ equals

(a) $\tan\left(x - \frac{\pi}{4}\right)$

(b) $\tan\left(\frac{\pi}{4} - x\right)$ ✓

(c) $\tan\left(x + \frac{\pi}{4}\right)$

(d) $\tan^2\left(x + \frac{\pi}{4}\right)$

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

$$= \tan\left(\frac{\pi}{4} - x\right)$$

Q) Let $0 < x < \frac{\pi}{4}$ then $(\sec 2x - \tan 2x)$ equals

(a) $\tan\left(x - \frac{\pi}{4}\right)$

(b) $\tan\left(\frac{\pi}{4} - x\right)$

(c) $\tan\left(x + \frac{\pi}{4}\right)$

(d) $\tan^2\left(x + \frac{\pi}{4}\right)$

Ans: (b)

SSBCrack EXAMS

Q) What is the value of :

$$\cos\left[\tan^{-1}\left\{\tan\left(\frac{15\pi}{4}\right)\right\}\right]?$$

(a) $-\frac{1}{\sqrt{2}}$ (b) 0

(c) $\frac{1}{\sqrt{2}}$ (d) $\frac{1}{2\sqrt{2}}$

$$\tan\left(\frac{15\pi}{4}\right) = \tan\left(4\pi - \frac{\pi}{4}\right)$$

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

$$\cos\left[\tan^{-1}(-1)\right]$$

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

$\cos(-x) = \cos x$

Q) What is the value of :

$$\cos\left[\tan^{-1}\left\{\tan\left(\frac{15\pi}{4}\right)\right\}\right]?$$

(a) $-\frac{1}{\sqrt{2}}$ (b) 0

(c) $\frac{1}{\sqrt{2}}$ (d) $\frac{1}{2\sqrt{2}}$

Ans: (c)

Q) What is the value of $\tan\left(7\frac{1}{2}\right)^{\circ}$?

(a) $\sqrt{6}+\sqrt{3}-\sqrt{2}+2$ (b) $\sqrt{6}+\sqrt{3}+\sqrt{2}+2$

(c) $\sqrt{6}-\sqrt{3}+\sqrt{2}-2$ (d) $\sqrt{6}+\sqrt{3}+\sqrt{2}-2$

(HW)

Q) What is the value of $\tan\left(7\frac{1}{2}\right)^{\circ}$?

(a) $\sqrt{6}+\sqrt{3}-\sqrt{2}+2$ (b) $\sqrt{6}+\sqrt{3}+\sqrt{2}+2$

(c) $\sqrt{6}-\sqrt{3}+\sqrt{2}-2$ (d) $\sqrt{6}+\sqrt{3}+\sqrt{2}-2$

Ans: (c)

Q) The value of $\sin 36° \sin 72° \sin 108° \sin 144°$ is equal to

(a) 1/4 (b) 1/16 (c) 3/4 (d) 5/16

$180° - 72°$ $180° - 36°$

$\sin 36° \sin 72° \sin 72° \sin 36°$

$\sin^2 36° \sin^2 72°$

$\frac{1}{4}\left(2 \sin 36° \sin 72°\right)^2$

$\cos(-36°) - \cos(108°)$

$\cos 36° - \cos 108°$

$\cos 36° + \cos 72°$

Q) The value of $\sin 36° \sin 72° \sin 108° \sin 144°$ is equal to

(a) 1/4 (b) 1/16 (c) 3/4 (d) 5/16

Ans: (d)

Q) If $\cos\theta + \sec\theta = k$, then what is the value of $\sin^2\theta - \tan^2\theta$?

$(a)\ \ 4-k \qquad (b)\ \ 4-k^2 \qquad (c)\ \ k^2-4 \qquad (d)\ \ k^2+2$

Q) If $\cos\theta + \sec\theta = k$, then what is the value of $\sin^2\theta - \tan^2\theta$?

$(a)\ \ 4-k \qquad (b)\ \ 4-k^2 \qquad (c)\ \ k^2-4 \qquad (d)\ \ k^2+2$

Ans: (b)

Q) If the sides of a triangle are 6cm, 10cm and 14 cm, then what is the largest angle included by the sides?

(a) 90°
(b) 120°
(c) 135°
(d) 150°

Q) If the sides of a triangle are 6cm, 10cm and 14 cm, then what is the largest angle included by the sides?

(a) 90°
(b) 120°
(c) 135°
(d) 150°

Ans: (b)

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ANALYTICAL GEOMETRY 2D

CLASS 1

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