Mains Special Batch

Trigonometry

If $\cos\theta + \sin\theta = a$, then $\sin 2\theta = ?$

(a) $a^2 + 1$ (b) $a^2 - 1$

(c) a^2 (d) 1

$1 + \underbrace{2SC}_{\sin 2\theta} = a^2$

B

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

If A + B = 90°, sin A = a, $\underbrace{\sin B}_{\cos A}$ = b then $a^2 + b^2$ = ?

(a) 0 (b) 1

(c) –1 (d) None of these

$s^2A + c^2A$

1 B

The value of

$$\left[\frac{\sin^3 x + \cos^3 x}{\sin x + \cos x} + \frac{\sin^3 x - \cos^3 x}{\sin x - \cos x}\right] \text{ is}$$

(a) 1

(b) 2 ✓

(c) 3

(d) 4

$s^2 + c^2 - \cancel{sc}$

$+ s^2 + c^2 + \cancel{sc}$

$2(s^2 + c^2)$

2

Value put

$x = 90^\circ$

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

The value of

$$\sin\frac{\overset{9-1}{8\pi}}{3}\cos\frac{\overset{24-1}{\cancel{23}\pi}}{6}+\cos\frac{\overset{12+1}{13\pi}}{3}\sin\frac{\overset{36-1}{35\pi}}{6} \text{ is}$$

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

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

(c) 2

(d) None

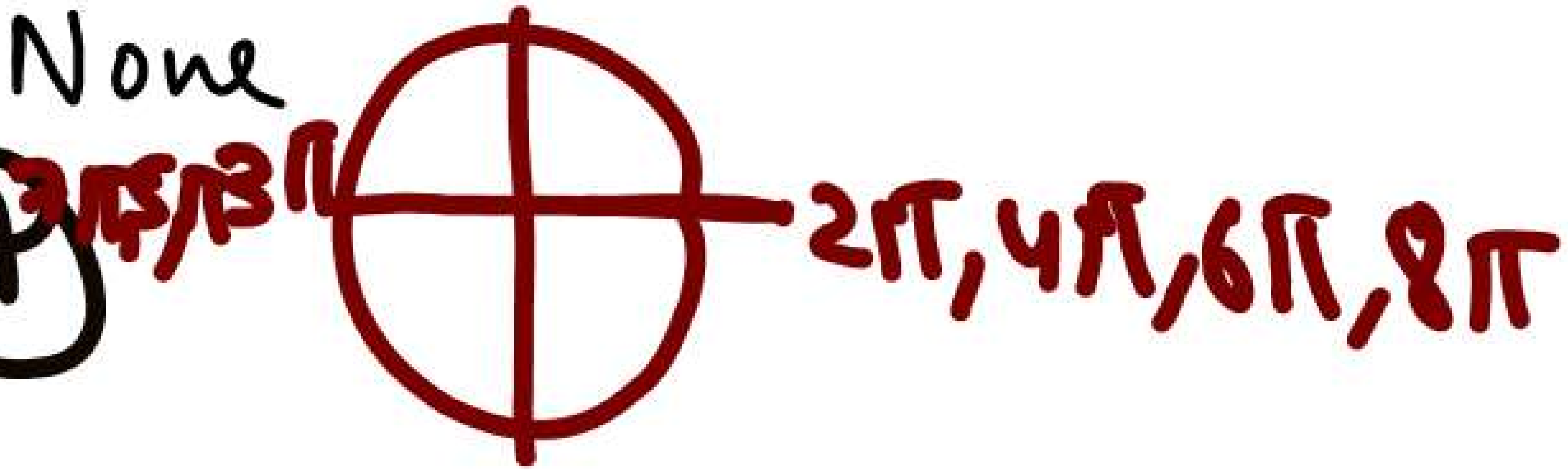
① $S480\ \text{Cos}690 +$

$\text{Cos}780\ \text{Sin}1050$

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

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

A



The value of $\cos 570^\circ \sin 510^\circ + \sin(-330^\circ)$ $\cos^\circ(-390^\circ)$ is

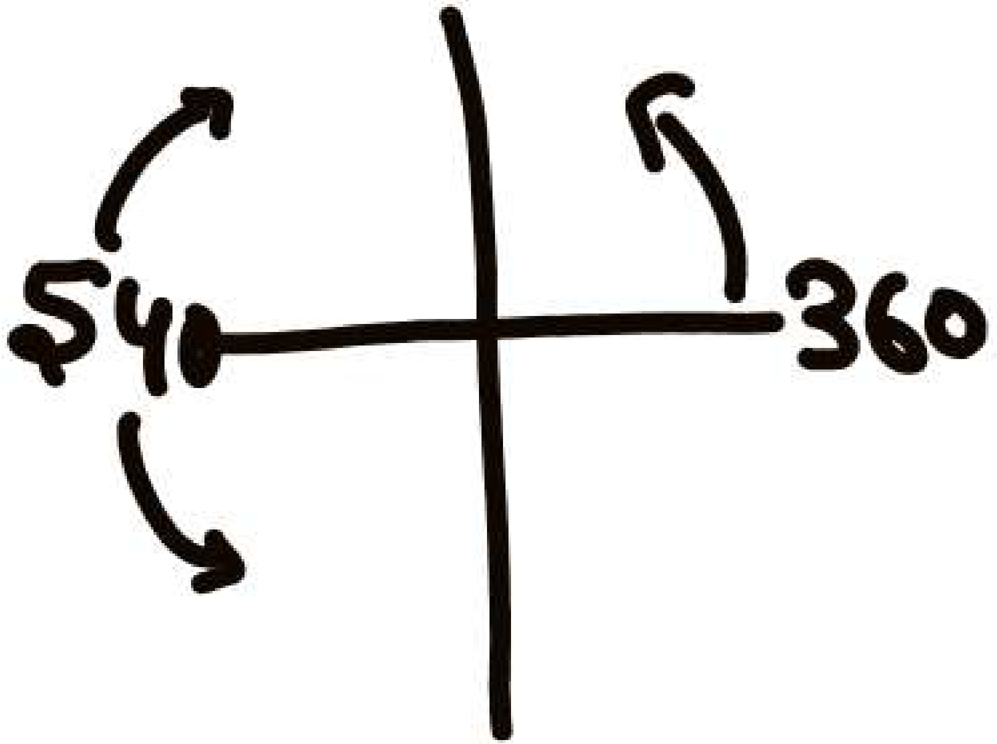
(a) 1 (b) 2

(c) 0 (d) -1

$-\cancel{\cos 30^\circ \sin 30^\circ}$

$+\cancel{(+\sin 30^\circ)\cos 30^\circ}$

(c)



The value of

$$\tan\frac{11\pi}{3} - 2\sin\frac{4\pi}{6} - \frac{3}{4}\operatorname{cosec}^2\frac{\pi}{4} + 4\cos^2\frac{17\pi}{6} \text{ is}$$

(a) $\dfrac{3-4\sqrt{3}}{2}$

(b) $\dfrac{\sqrt{3}+2\sqrt{3}}{4}$

(c) $\dfrac{3+4\sqrt{3}}{2}$

(d) $\dfrac{\sqrt{3}+1}{2}$

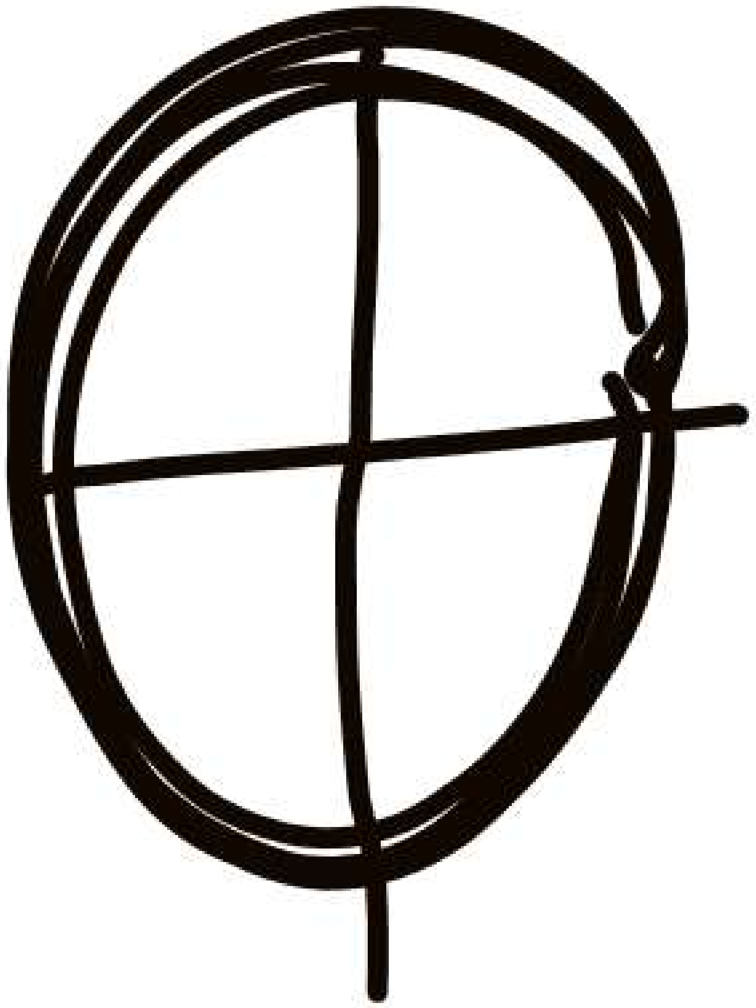
$-\sqrt{3} - \cancel{2}\times\frac{\sqrt{3}}{\cancel{2}} - \frac{3\times\cancel{2}}{\cancel{4}\,2} + 4\left(-\frac{\sqrt{3}}{2}\right)^2$

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

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

A

$7\pi, 5\pi, 3\pi, \pi$



$0, 2\pi, 4\pi, 6\pi, 8\pi$

Odd → 180°

Even → 0° ✓

The value of

$$\frac{\operatorname{cosec}(90^\circ + x) + \cot(450^\circ + x)}{\operatorname{cosec}(90^\circ - x) + \tan(180^\circ - x)} + \frac{\tan(180^\circ + x) + \sec(180^\circ - x)}{\tan(360^\circ + x) - \sec(-x)}$$

(a) 0 (b) 3

(c) 1 (d) 2

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

$1 + 1 = 2$ D

The value of

$$\frac{\sin(\pi + x)\cos\left(\frac{\pi}{2} + x\right)\tan\left(\frac{3\pi}{2} - x\right)\cot(2\pi - x)}{\sin(2\pi - x)\cos(2\pi + x)\operatorname{cosec}(-x)\sin\left(\frac{3\pi}{2} - x\right)} \text{ is}$$

(a) 2 (b) −1

(c) 1 (d) 0

$$\frac{+\cancel{S}(-\cancel{S})\,\cancel{\cot x}\,\cancel{\cot x}}{-\cancel{S}\,\cancel{C}\left(+\frac{1}{\cancel{S}}\right)(+\cancel{C})}$$

(c) Ans

The value of

$$\frac{\sin(45^\circ + x)\sin(45^\circ - x)}{\sin(60^\circ + x)(\sin(60^\circ - x)) - \frac{1}{2}\sin^2 x}$$ is

(a) $\frac{3}{2}$

(b) $\frac{2}{3}$

(c) $\frac{1}{4}$

(d) $\frac{3}{4}$

B

$$\frac{S^2 45 - S^2 x}{S^2 60 - S^2 x - \frac{S^2 x}{2}}$$

$$\frac{\frac{1}{2} - S^2}{\frac{3}{4} - \frac{3}{2}S^2}$$

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

$\sin(A+B)\sin(A-B)$

$= \sin^2 A - \sin^2 B$

If $a = \dfrac{2\sin x}{1+\cos x+\sin x}$ then find the value of $\dfrac{1-\cos x+\sin x}{1+\sin x}$ is

(a) a^2-1

(b) a^2+1

(c) $\dfrac{1}{a}$

(d) a

$(1+s)^2 - c^2$

$s^2+\cancel{1}+2s-\cancel{c^2}$

$\cancel{1}+s^2$

$2s^2+2s$

$2s(s+1)$

D

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Imp. Property

$$\boxed{\frac{2s}{1+c+s} = \frac{1-c+s}{1+s}}$$

If $\tan\theta + \sec\theta = e^x$, then $\cos\theta$ equals

(a) $\dfrac{e^x + e^{-x}}{2}$

(b) $\dfrac{2}{e^x + e^{-x}}$

(c) $\dfrac{e^x - e^{-x}}{2}$

(d) $\dfrac{e^x - e^{-x}}{e^x + e^{-x}}$

$\sec + \tan = e^x$

$\sec - \tan = e^{-x}$

$\cancel{2}\sec = \dfrac{e^x + e^{-x}}{2}$

$\cos = \dfrac{2}{e^x + e^{-x}}$

B

If $\sqrt{2}\sin\theta - \sqrt{2}\cos\theta + 1 = 0$ and θ is an acute angle, then the value of $\operatorname{cosec}\theta$ is.

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

(b) $\sqrt{2}\left(\sqrt{3}+1\right)$ ✓ B

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

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

$\sqrt{2}S + 1 = \sqrt{2}C$

$2S^2 + 1 + 2\sqrt{2}S = 2C^2$

$= 2(1 - S^2)$

$4S^2 + 2\sqrt{2}S - 1 = 0$

$\rightarrow S = \frac{-2\sqrt{2} \pm \sqrt{24}}{8}$

$S = \frac{-\cancel{2}\sqrt{2} + \cancel{2}\sqrt{6}}{\cancel{8}\,4}$

$\sin\theta = \frac{\sqrt{6}-\sqrt{2}}{4}$

$\operatorname{cosec} = \frac{4}{\sqrt{6}-\sqrt{2}} \quad \frac{4}{\sqrt{6}+\sqrt{2}}$

If a + b = 3 - cos4θ and a – b = 4 sin 2θ then (ab) is always less then equal to

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

(b) 1

(c) $\frac{2}{3}$

(d) $\frac{3}{4}$

$a = \frac{3 - C4 + 4S2}{2}$

$= \frac{3 - (1 - 2S^2 2) + 4S2}{2}$

$= \frac{2 + 2S^2 2 + 4S2}{2} = (1 + \sin 2\theta)^2$

$b = (1 - \sin 2\theta)^2$

$ab = (1 - \sin^2 2\theta)^2$

$= \cos^4 2\theta$

B

$ab \leq 1$

If $\sin\alpha + \sin\beta = \frac{1}{2}$ and $\cos\alpha + \cos\beta = \frac{\sqrt{3}}{2}$

then $3\beta + \alpha$ =?

Square & Add

$\boxed{\alpha - \beta = 120^\circ}$

(a) 0° $-90+90$ (b) 60°

(c) 120° (d) 90°

$1+1+2(S\alpha S\beta + C\alpha C\beta) = \frac{1}{4} + \frac{3}{4} = 1$

$2S\frac{\alpha+\beta}{2} \cancel{C\left(\frac{\alpha-\beta}{2}\right)} = \cancel{\frac{1}{2}}$

$2C(\alpha-\beta) = 1-2 = -1$

$C(\alpha-\beta) = \frac{-1}{2}$

$\alpha+\beta = 60^\circ$

$\alpha-\beta = 120^\circ$

$\alpha = 90^\circ$

$\beta = -30^\circ$

A

$S\left(\frac{\alpha+\beta}{2}\right) = \frac{1}{2}$

$\boxed{\alpha+\beta = 60^\circ}$

If $\cos(\alpha+\beta)\sin(\gamma+\delta) = \cos(\alpha-\beta)\sin(\gamma-\delta)$ then

(a) $\cot\alpha\cot\beta\cot\delta = \cot\gamma$

(b) $\cot\beta\cot\delta\cot\gamma = \cot\alpha$

(c) $\cot\alpha\cot\gamma\cot\delta = \cot\beta$

(d) $\cot\alpha\cot\beta\cot\gamma = \cot\delta$

$(C\alpha C\beta - S\alpha S\beta)(S\gamma C\delta + C\gamma S\delta)$

$= (C\alpha C\beta + S\alpha S\beta)(S\gamma C\delta - C\gamma S\delta)$

$C\alpha C\beta \cancel{S\gamma C\delta} - S\alpha S\beta S\gamma C\delta + C\alpha C\beta C\gamma S\delta - S\alpha S\beta C\gamma S\delta$

$= \cancel{C\alpha C\beta S\gamma C\delta} - C\alpha C\beta C\gamma S\delta + S\alpha S\beta S\gamma C\delta - S\alpha S\beta S\delta C\gamma$

$\cancel{2} S\alpha S\beta S\gamma C\delta = \cancel{2} C\alpha C\beta C\gamma S\delta$

$\cot\delta = \cot\alpha \cot\beta \cot\gamma$

The value of $\sqrt{3}\cot 20^\circ - 4\cos 20^\circ = ?$

(a) 1 (b) -1

(c) 0 (d) None of these

$\frac{\sqrt{3}C20}{S20} - 4C20$

$\frac{\sqrt{3}C20 - 2S40}{S20}$

$\frac{2S60C20 - 2S40}{S20}$

$\frac{S80 + S40 - 2S40}{S20}$

$\frac{S80 - S40}{S20} = \frac{2C60\cancel{S20}}{\cancel{S20}}$

$= 1$

A

$$2(S1+S89+S2+S88+\dots S45)$$
$$\overline{2(C1+C2+\dots C44)+1}$$

If $x = \dfrac{2(\sin 1^\circ + \sin 2^\circ + \sin 3^\circ + \dots + \sin 89^\circ)}{2[(\cos 1^\circ + \cos 2^\circ + \dots + \cos 44) + 1]}$,

then the value of (x^2+1) is

(a) 1

(b) 2

(c) 3

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

$2+1=3$

(c)

$$\frac{2\times 2[S45C44+S45C43+\dots\dots S45)}{2(C1+C2+\dots C44)+1}$$

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$$\frac{2\times\cancel{2}S45(C44+C43+\dots+1)}{\cancel{2}(C1+C2\dots C44)+1)} = \sqrt{2} \; x$$

Ques

The value of

$4\sin\theta\cos\theta - 2\cos\theta - 2\sqrt{3}\sin\theta + \sqrt{3} = 0$ **in the interval** $(0, 2\pi)$ **is**

(a) $\left(\frac{3\pi}{4}, \frac{7\pi}{4}\right)$

(b) $\left(\frac{\pi}{3}, \frac{5\pi}{3}\right)$

(c) $\left(\frac{3\pi}{4}, \frac{7\pi}{4}, \frac{\pi}{3}, \frac{5\pi}{3}\right)$

(d) $\left(\frac{\pi}{6}, \frac{5\pi}{6}, \frac{11\pi}{6}\right)$

$2C(2S-1) - \sqrt{3}(2S-1) = 0$

$(2C-\sqrt{3})(2S-1) = 0$

$C = \frac{\sqrt{3}}{2}$, $S = \frac{1}{2}$

$\frac{\pi}{6}, \frac{11\pi}{6}$ $\qquad$ $\frac{\pi}{6}, \frac{5\pi}{6}$

D Ans

$$p=\sqrt{\frac{(1-S)^2}{1-S^2}}$$

$$=\frac{1-S}{C}=\sec-\tan$$

$$q=\frac{1}{C}-\frac{S}{C}=\sec-\tan$$

$$r=\frac{C}{1+S}=\frac{1-S}{C}=q$$

If $p=\sqrt{\dfrac{1-\sin x}{1+\sin x}}$, $q=\dfrac{1-\sin x}{\cos x}$, $r=\dfrac{\cos x}{1+\sin x}$ which one of the following is correct?

(a) $p=q\neq r$

(b) $q=r\neq p$

(c) $r=p\neq q$

(d) $p=q=r$ ✓

$p=q=r$

D

$\frac{1}{2}\sin(2x)\,(1+\cot^2 x)$ is equal to

(a) tanx (b) sinx

(c) cotx (d) secx

$\frac{1}{\cancel{2}} \times \cancel{2}\cancel{s}c \times \frac{1}{s^2}$

cotx (c)

In the given figure, $\angle B = 90^\circ$, $Ac = 20$, $AB = 12$, $AD = 15$ and $\angle ADB = x^\circ$, then find $\cos^2 x + \sin^2 x$.

(a) 1

(b) 2

(c) 0

(d) -1

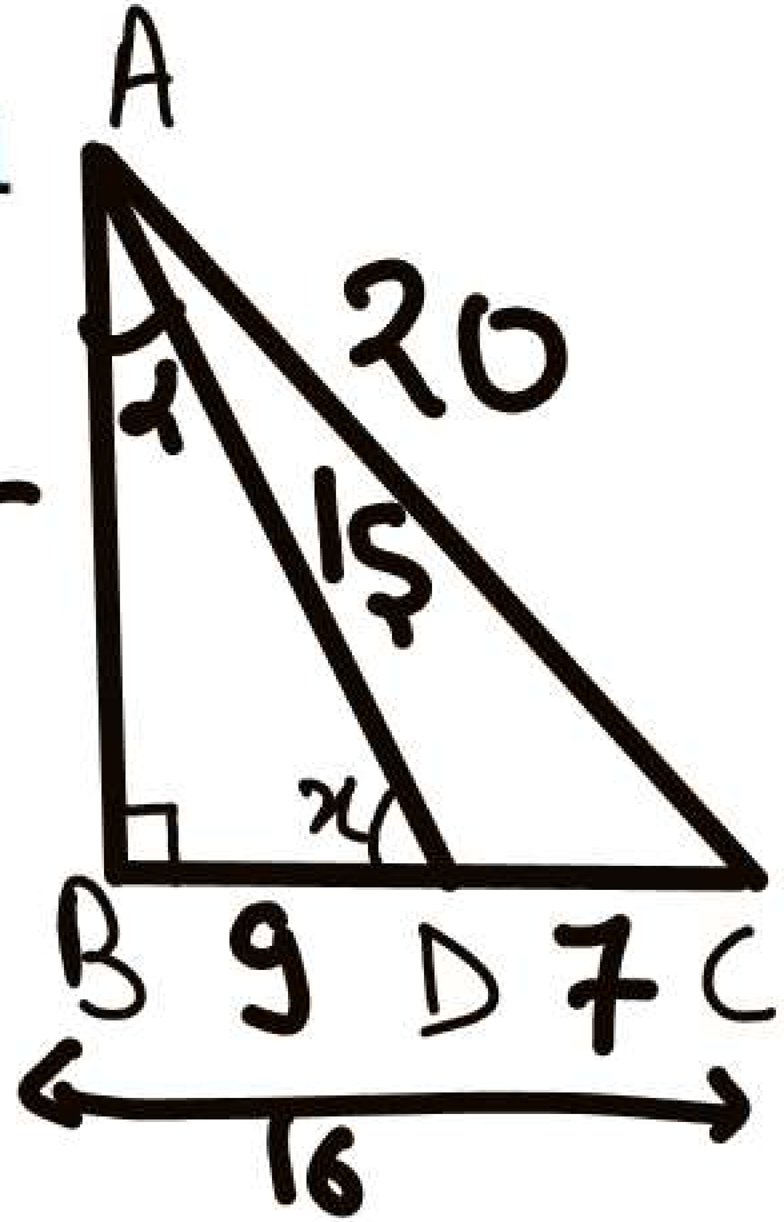
Change

$\cos^2 x + \sin^2 c$

$\frac{9}{25} + \frac{9}{25}$

$\frac{18}{25}$

A



The value of $\dfrac{\cos^2\theta + \tan^2\theta - 1}{\sin^2\theta}$ is

(a) 0

(b) $\cos^2\theta$

(c) $\tan^2\theta$

(d) $\dfrac{1}{\sin^2\theta}$

$\dfrac{t^2 - s^2}{s^2}$

$\sec^2 - 1$

$\tan^2\theta$

c

$t = \dfrac{s}{c} = \dfrac{\sec}{\operatorname{cosec}}$

$= \sin \sec$

The value of the expression $\dfrac{1-4\sin 10^\circ \sin 70^\circ}{2\sin 10^\circ}$ is

$$\frac{1-2\times 2\sin 70\sin 10}{2\sin 10}$$

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

(b) 1

(c) 2

(d) None of these

$$\frac{1-2[\cos 60-\cos 80]}{2\sin 10} = \frac{2\cancel{\cos 80}}{2\cancel{\sin 10}} = 1 \quad B$$