

Foundation Batch



MATHS

Trigonometry

Part -7

LIVE

07-11-2024 07:00PM





What is $(\sin^2 x - \cos^2 x)(1 - \sin^2 x \cos^2 x)$ equal to?

$(\sin^2 x - \cos^2 x)(1 - \sin^2 x \cos^2 x)$ किसके बराबर है?

(a) $\sin^4 x - \cos^4 x$ $(\sin^2 x - \cos^2 x) \left((\sin^2 x + \cos^2 x)^2 - \sin^2 x \cos^2 x \right)$

~~(b) $\sin^6 x - \cos^6 x$~~

(c) $\cos^8 x - \sin^8 x$

(d) $\sin^8 x - \cos^8 x$

$(\sin^4 x + \cos^4 x + 2\sin^2 x \cos^2 x - \sin^2 x \cos^2 x)$

$(\sin^2 x - \cos^2 x) (\sin^4 x + \cos^4 x + \sin^2 x \cos^2 x)$
 $= (\sin^2 x)^3 - (\cos^2 x)^3$
 $= \sin^6 x - \cos^6 x$

$$\left. \begin{aligned} a^3 + b^3 &= (a+b)(a^2 + b^2 - ab) \\ \underline{a^3 - b^3} &= \underline{(a-b)(a^2 + b^2 + ab)} \end{aligned} \right\}$$

$$\frac{1}{\sin^2 x} + \frac{1}{\cos^2 x}$$

$$\frac{\cos^2 x + \sin^2 x}{\sin^2 x \cdot \cos^2 x}$$

$$= \frac{1}{\sin^2 x \cdot \cos^2 x}$$

$$= \operatorname{cosec}^2 x \cdot \sec^2 x$$

$$\frac{1}{\cos^2 x} + \frac{\sin^2 x}{\cos^2 x}$$

$$\frac{1 + \sin^2 x}{\cos^2 x}$$

$$\cancel{1 + \cot^2 x + \sec^2 x} \\ = \cot^2 x + \sec^2 x$$

58. Consider the following equations:

निम्नलिखित समीकरणों पर विचार करें:

I. $\operatorname{cosec}^2 x + \sec^2 x = \operatorname{cosec}^2 x \sec^2 x$

II. $\sec^2 x + \tan^2 x = \sec^2 x \tan^2 x$

III. $\operatorname{cosec}^2 x + \tan^2 x = \cot^2 x + \sec^2 x$

Which of the above statements are correct?

उपर्युक्त में से कौन से कथन सही हैं?

(a) I and II

(b) II and III

(c) I and III

(d) All of these

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

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



60. If $\sin^2 \alpha = \cos^3 \alpha$, then the value of $(\cot^6 \alpha - \cot^2 \alpha)$ is-

यदि $\sin^2 \alpha = \cos^3 \alpha$, तो $(\cot^6 \alpha - \cot^2 \alpha)$ का मान है-

(A) 1

$$\sin^2 \alpha = \cos \alpha \cos^2 \alpha$$

(B) 0

(C) -1

$$\frac{\cos^2 \alpha}{\sin^2 \alpha} = \frac{1}{\cos \alpha}$$

(D) 2

$$\cot^2 \alpha = \sec \alpha$$

$$\cot^4 \alpha = \sec^2 \alpha$$

$$\cot^2 \alpha (\cot^4 \alpha - 1)$$

$$\cot^2 \alpha (\sec^2 \alpha - 1)$$
$$\cot^2 \alpha \cdot \tan^2 \alpha$$

$$= 1$$



61. If $a^2 = \frac{1+2\sin\theta\cos\theta}{1-2\sin\theta\cos\theta}$, then what is the value of $\frac{a+1}{a-1}$?

यदि $a^2 = \frac{1+2\sin\theta\cos\theta}{1-2\sin\theta\cos\theta}$ है, तो $\frac{a+1}{a-1}$ का मान क्या है?

(a) $\sec\theta$

(b) 1

(c) 0

~~(d) $\tan\theta$~~

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

$$a^2 = \frac{(\sin\theta + \cos\theta)^2}{(\sin\theta - \cos\theta)^2}$$

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

$$\frac{a+1}{a-1} = \frac{\sin\theta}{\cos\theta} = \underline{\tan\theta}$$



62. If $\sin \theta + \sin^2 \theta = 1$, then what is the value of $\cos^{12} \theta + 3\cos^{10} \theta + 3\cos^8 \theta + \cos^6 \theta - 1$?

यदि $\sin \theta + \sin^2 \theta = 1$ हो, तो $\cos^{12} \theta + 3\cos^{10} \theta + 3\cos^8 \theta + \cos^6 \theta - 1$ का मान क्या होगा?

(A) 0

(B) 1

(C) -1

(D) 2

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

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

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

$$\left[(\cos^4 \theta)^3 + (\cos^2 \theta)^3 + 3 \cos^8 \theta \cdot \cos^2 \theta + 3 \times \cos^4 \theta \times \cos^4 \theta \right] - 1$$

$$[\cos^4 \theta + \cos^2 \theta]^3 - 1$$

$$[\sin^2 \theta + \cos^2 \theta]^3 - 1$$

$$1 - 1 = 0$$

$$\begin{cases} (a+b)^3 = a^3 + b^3 + 3a^2b + 3ab^2 \\ (a-b)^3 = a^3 - b^3 - 3a^2b + 3ab^2 \end{cases}$$



63. If $\cos A = 1 - \sin^2(90^\circ - A)$, then $\sin^{12} A + 3\sin^{10} A + 3\sin^8 A + \sin^6 A + 2\sin^4 A + 2\sin^2 A - 2 = ?$

यदि $\cos A = 1 - \sin^2(90^\circ - A)$, तो $(\sin^{12} A + 3\sin^{10} A + 3\sin^8 A + \sin^6 A + 2\sin^4 A + 2\sin^2 A - 2) = ?$

✓ (A) 1 $\cos A = 1 - \cos^2 A$

(B) 0 $\cos A = \sin^2 A$

(C) -1

(D) -2

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

$(\sin^4 A + \sin^2 A)^3 + 2(\sin^4 A + \sin^2 A - 1)$

$(\cos^2 A + \sin^2 A)^3 + 2(\cos^2 A + \sin^2 A - 1)$

$1^3 + 2(1 - 1)$

$1 + 2 \times 0 \Rightarrow \textcircled{1}$

#

$$\sin \theta + \operatorname{cosec} \theta = 2$$

$$\begin{array}{c} \parallel \\ 1 \end{array}$$

$$\begin{array}{c} \downarrow \\ 1 \end{array}$$

$$\underline{\underline{\theta = 90^\circ}}$$

$$\boxed{\sin^n \theta + \operatorname{cosec}^n \theta = 2}$$

#

$$\cos \theta + \sec \theta = 2$$

$$\begin{array}{c} \downarrow \\ 1 \end{array}$$

$$\begin{array}{c} \downarrow \\ 1 \end{array}$$

$$\boxed{\theta = 0}$$

$$\boxed{\cos^n \theta + \sec^n \theta = 2}$$

$$\# \tan \theta + \cot \theta = 2$$

$$\begin{array}{c} \downarrow \\ 1 \end{array}$$

$$\begin{array}{c} \downarrow \\ 1 \end{array}$$

$$\boxed{\theta = 45^\circ}$$

$$\boxed{\tan^n \theta + \cot^n \theta = 2}$$



64. If $\cos \theta + \sec \theta = 2$, the value of $\cos^6 \theta + \sec^6 \theta$ is:

यदि $\cos \theta + \sec \theta = 2$, तो $\cos^6 \theta + \sec^6 \theta$ का मान है:

(a) -1

(b) 8

✓ (c) 2

(d) 0

$$\underline{\theta = 0^\circ}$$

$$\frac{11}{2}$$



65. If $\sin \theta + \operatorname{cosec} \theta = 2$, then what is the value of $\sin^4 \theta + \cos^4 \theta$?

यदि $\sin \theta + \operatorname{cosec} \theta = 2$ है, तो $\sin^4 \theta + \cos^4 \theta$ का मान क्या है?

$$\underline{\underline{\theta = 90^\circ}}$$

$$\begin{aligned} & \sin^4 90^\circ + \cos^4 90^\circ \\ & \quad \downarrow \\ & 1 + 0 \\ & = 1 \end{aligned}$$

~~(a) 2~~

(b) 2^2

(c) 2^3

(d) 1



66. If θ is an acute angle and $\tan \theta + \cot \theta = 2$, then find the value of $\tan^3 \theta + \cot^3 \theta + 6 \tan^3 \theta \cdot \cot^2 \theta$

यदि θ एक न्यूनकोण है और $\tan \theta + \cot \theta = 2$ है, तो $\tan^3 \theta + \cot^3 \theta + 6 \tan^3 \theta \cdot \cot^2 \theta$ का मान ज्ञात कीजिए।

1

(a) 8

$6 \times 1 \times 1$

(b) 6

(c) 10

$1 + 1 + 6$

(d) 12

$= 8$

$\theta = 45^\circ$



67. If $\sin \theta + \operatorname{cosec} \theta = 2$, then what will be the value of $\sin^n \theta + \operatorname{cosec}^n \theta$?

यदि $\sin \theta + \operatorname{cosec} \theta = 2$ हो, तो $\sin^n \theta + \operatorname{cosec}^n \theta$ का मान क्या होगा ?

2

(a) 2^n

(b) $2^{\frac{1}{n}}$

(c) 2

(d) 0

(SSC CGL Tier-I -07.09.2016)



68. If $\cos \theta + \sec \theta = 2$, then $(\cos^{117} \theta + \sec^{117} \theta)$ is equal to:

यदि $\cos \theta + \sec \theta = 2$ है, तो $(\cos^{117} \theta + \sec^{117} \theta)$ बराबर है:

(A) 234

☒ (B) 2

(C) 2^{117}

(D) 117

↓
2

(SSC CGL Tier-I 19.06.2019)



69. If θ is an acute angle and $\cot \theta + \tan \theta = 2$ then find the value of $\tan^{12} \theta + \cot^{12} \theta + 2\tan^5 \theta \cot^7 \theta$.

यदि θ एक न्यून कोण है और $\cot \theta + \tan \theta = 2$ है तो $\tan^{12} \theta + \cot^{12} \theta + 2\tan^5 \theta \cot^7 \theta$ का मान ज्ञात कीजिए।

(a) 1

(b) 4

(c) 3

(d) 2

$$1 + 1 + 2 \times 1 \times 1$$

$$1 + 1 + 2$$

$$= 4$$

$$\theta = 45^\circ$$

$$\begin{array}{l} \# \\ B \rightarrow (-B) \end{array} \left\{ \begin{array}{l} \sin(A+B) = \sin A \cos B + \cos A \sin B \\ \sin(A-B) = \sin A \cos B - \cos A \sin B \end{array} \right.$$

$$\begin{array}{l} \underline{A \rightarrow (90+A)} \\ B \rightarrow (-B) \end{array} \left\{ \begin{array}{l} \cos(A+B) = \cos A \cos B - \sin A \sin B \\ \cos(A-B) = \cos A \cos B + \sin A \sin B \end{array} \right.$$

$$\left\{ \begin{array}{l} \tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \tan B} \\ \tan(A-B) = \frac{\tan A - \tan B}{1 + \tan A \tan B} \end{array} \right. \quad \left\{ \begin{array}{l} \cot(A+B) = \frac{\cot A \cot B - 1}{\cot A + \cot B} \\ \cot(A-B) = \frac{\cot A \cot B + 1}{\cot B - \cot A} \end{array} \right.$$



$$\sin(A + B) = \sin A \cos B + \cos A \sin B$$

$$\sin(A - B) = \sin A \cos B - \cos A \sin B$$

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

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

$$\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

$$\tan(A - B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$$

$$\cot(A + B) = \frac{\cot A \cot B - 1}{\cot B + \cot A}$$

$$\cot(A - B) = \frac{\cot A \cot B + 1}{\cot B - \cot A}$$



$$\sin(15^\circ) = \sin(45^\circ - 30^\circ)$$

$$= \sin 45^\circ \cos 30^\circ - \cos 45^\circ \sin 30^\circ$$

$$\frac{1}{\sqrt{2}} \times \frac{\sqrt{3}}{2} - \frac{1}{\sqrt{2}} \times \frac{1}{2}$$

$$\frac{1}{\sqrt{2}} \left[\frac{\sqrt{3}}{2} - \frac{1}{2} \right]$$

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

$$\boxed{\sin 15^\circ = \frac{\sqrt{3}-1}{2\sqrt{2}}}$$

70. Find the value of $\sin 15^\circ$.

$\sin 15^\circ$ का मान ज्ञात कीजिए।

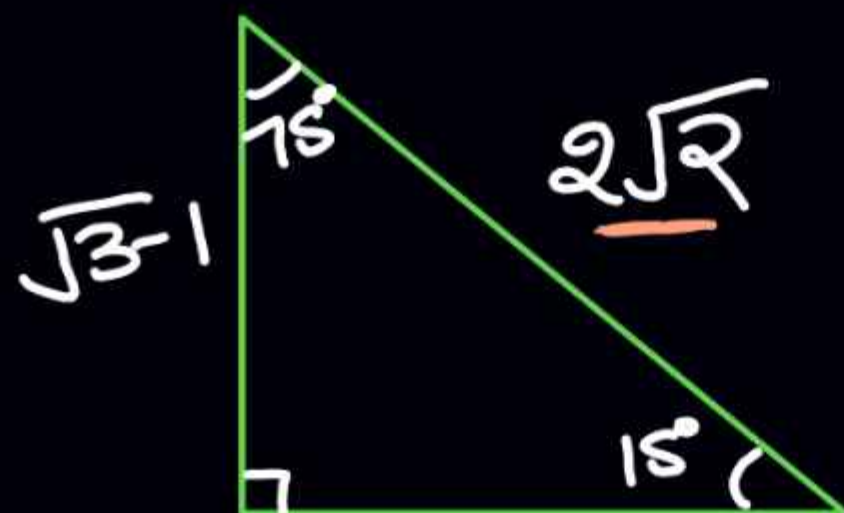
~~A.~~ $\frac{\sqrt{3}-1}{2\sqrt{2}}$

B. $\frac{\sqrt{3}+1}{2\sqrt{2}}$

C. $\frac{\sqrt{3}-1}{4}$

d. $\frac{\sqrt{3}+1}{4}$

$$\sin 15^\circ = \frac{\sqrt{3}-1}{2\sqrt{2}}$$



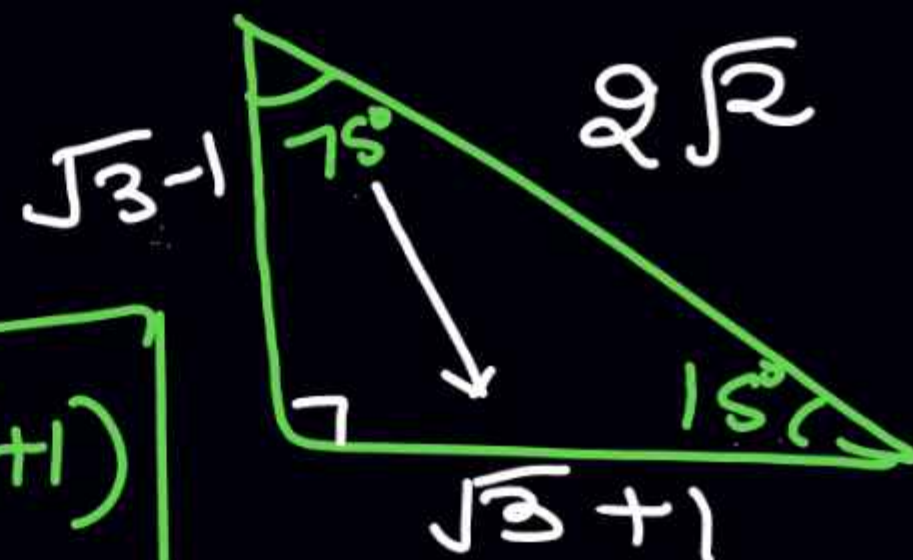
$$\sqrt{8 - (\sqrt{3}-1)^2}$$

$$\sqrt{8 - (3+1-2\sqrt{3})}$$

$$\sqrt{8 - (4-2\sqrt{3})}$$

$$\sqrt{8-4+2\sqrt{3}}$$

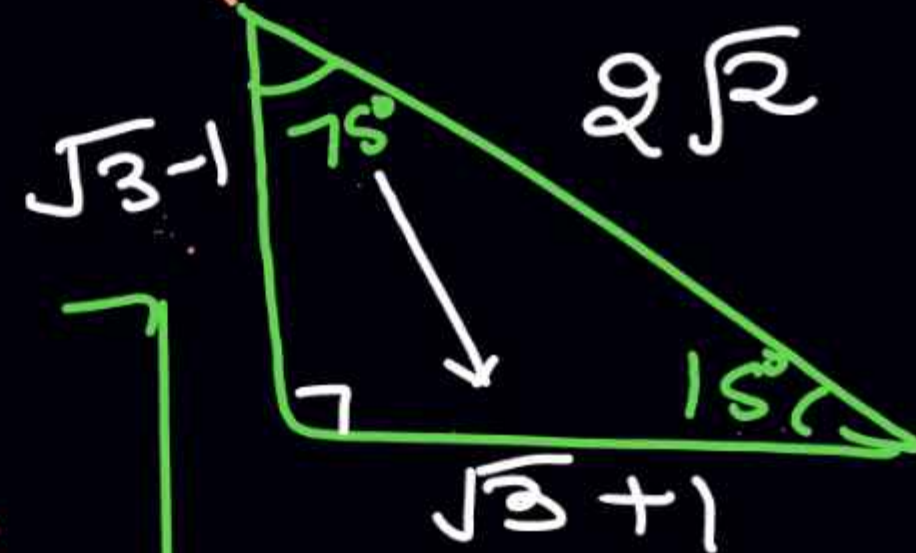
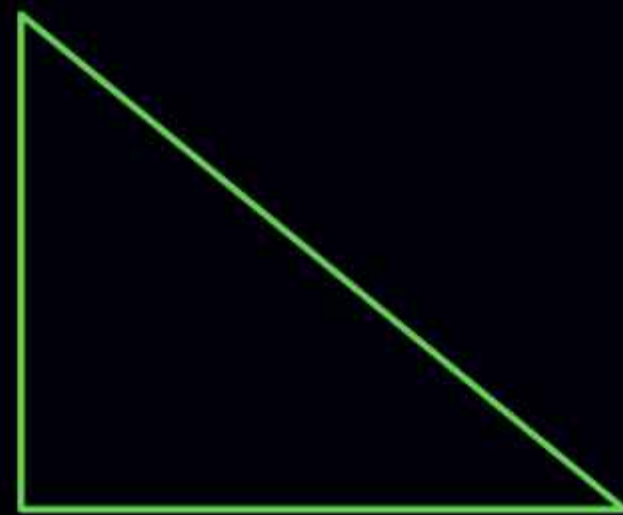
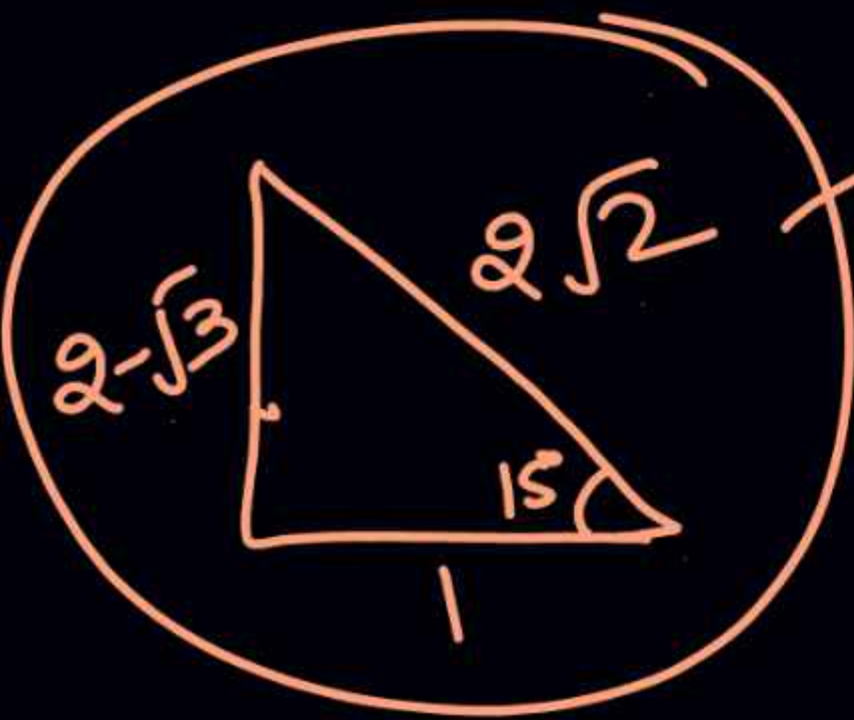
$$\sqrt{4+2\sqrt{3}} = (\sqrt{3}+1)$$



$$\sin 75^\circ = \frac{\sqrt{3}+1}{2\sqrt{2}}$$

$$\cos 15^\circ = \frac{\sqrt{3}+1}{2\sqrt{2}}$$

$$\cos 75^\circ = \frac{\sqrt{3}-1}{2\sqrt{2}}$$



$$\tan 15^\circ = \frac{\sqrt{3}-1}{\sqrt{3}+1} \times \frac{\sqrt{3}-1}{\sqrt{3}-1}$$

$$\frac{(\sqrt{3}-1)^2}{3-1} = \frac{4-2\sqrt{3}}{2}$$

$$= \frac{2(2-\sqrt{3})}{2}$$

$$\tan 15^\circ = 2-\sqrt{3}$$

$$\sin 75^\circ = \frac{\sqrt{3}+1}{2\sqrt{2}}$$

$$\cos 15^\circ = \frac{\sqrt{3}+1}{2\sqrt{2}}$$

$$\cos 75^\circ = \frac{\sqrt{3}-1}{2\sqrt{2}}$$



71. Find the value of $\tan 75^\circ$

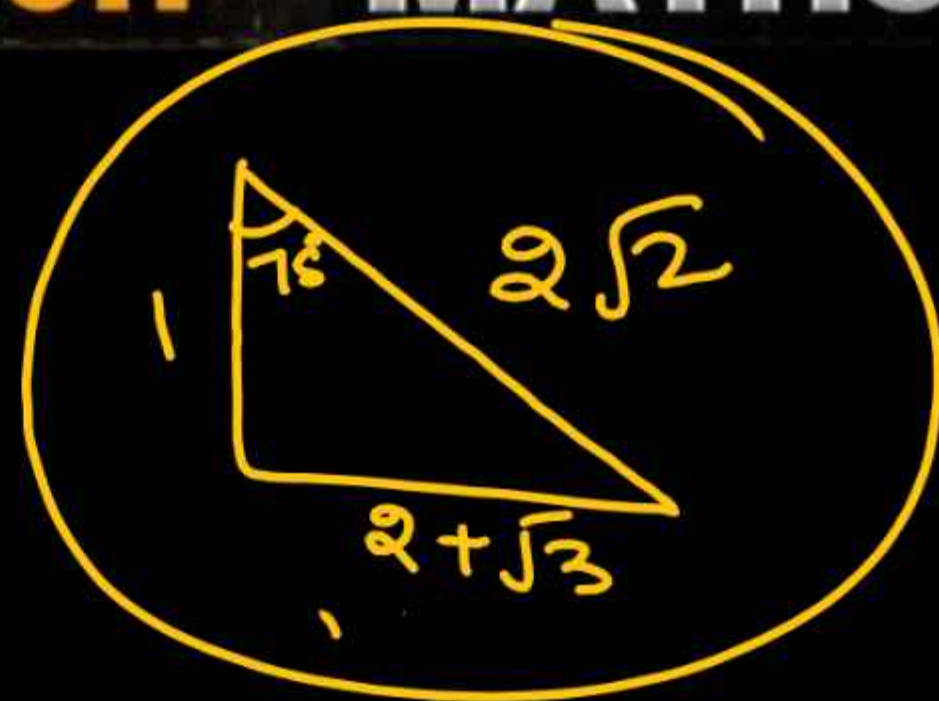
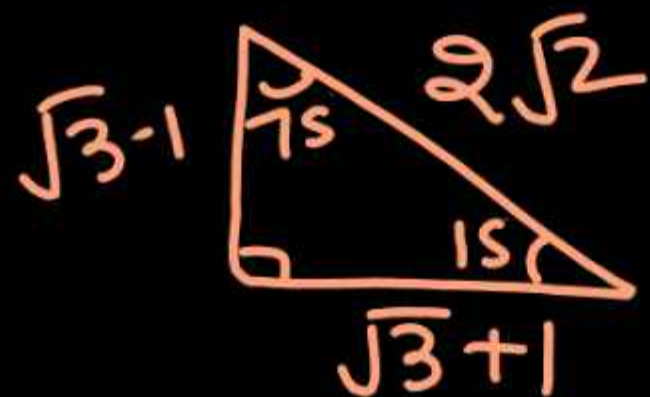
$\tan 75^\circ$ का मान ज्ञात कीजिए

~~(A) $2 + \sqrt{3}$~~

~~(B) $2 - \sqrt{3}$~~

~~(C) $1 + \sqrt{3}$~~

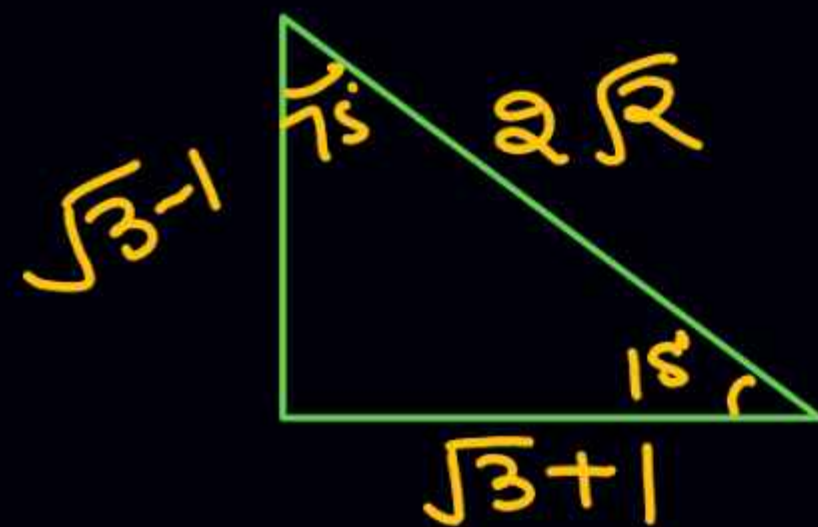
~~(D) $1 - \sqrt{3}$~~



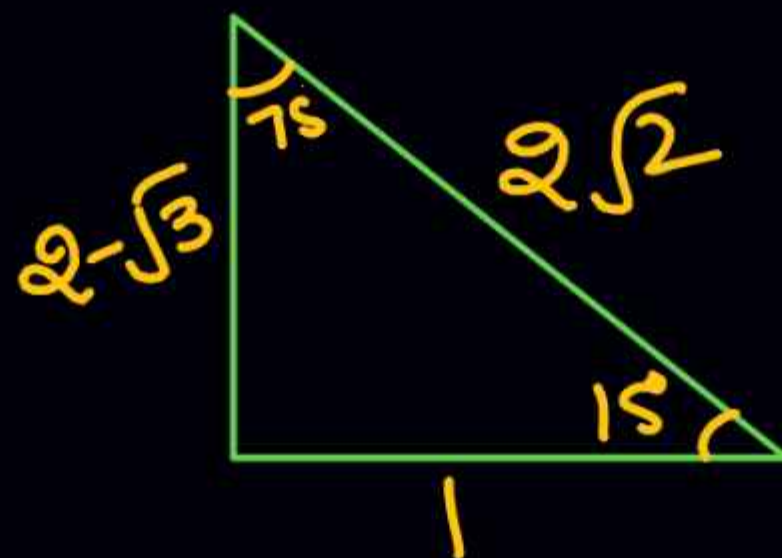
$$\tan 75^\circ = \frac{\sqrt{3}+1}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1} = \frac{(\sqrt{3}+1)^2}{3-1} = \frac{4+2\sqrt{3}}{2}$$

$$= \frac{2(2+\sqrt{3})}{2} = 2+\sqrt{3}$$

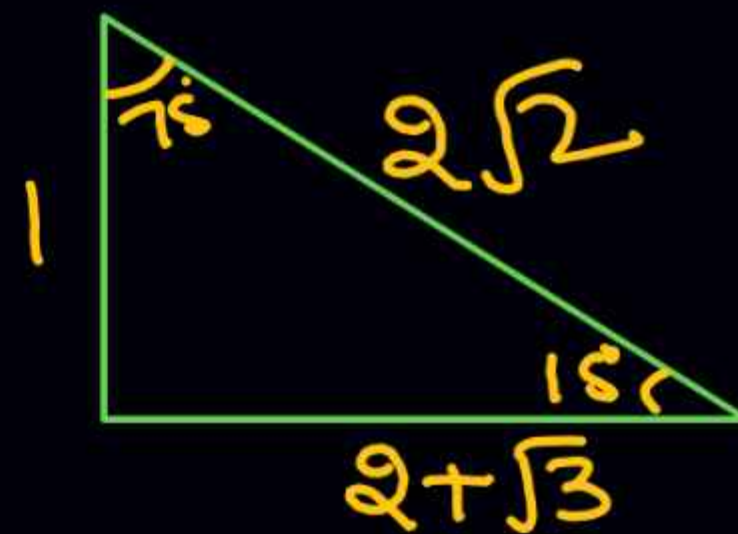
I



II



III





72. What is the value of $\sin 75^\circ + \sin 15^\circ$?

$\sin 75^\circ + \sin 15^\circ$ का मान क्या है?

(a) $\sqrt{3}$

(b) $2\sqrt{3}$

(c) $\sqrt{(3/2)}$

(d) $3/\sqrt{2}$