X | Test-12 (TRIGONOMETRY)

1) If $\cos A = \frac{4}{5}$, then the value of $\tan A$ is —

(a) $\frac{3}{5}$ (b) $\frac{3}{4}$ (c) $\frac{4}{3}$ (d) $\frac{5}{3}$

2) If $\tan\theta + \sin\theta = m$ and $\tan\theta - \sin\theta = n$, then $m^2 - n^2$ is equal to

(a) $\sqrt{mn}$ (b) $\sqrt{\frac{m}{n}}$ (c) $4\sqrt{mn}$ (d) none of these

3) If $\sin A = \frac{1}{2}$, then the value of $\cot A$ is

(a) $\sqrt{3}$ (b) $\frac{1}{\sqrt{3}}$ (c) $\frac{\sqrt{3}}{2}$ (d) 1

4) If $x\sin^3\theta + y\cos^3\theta = \sin\theta\cos\theta$ and $x\sin\theta = y\cos\theta$, then x^2+y^2 is equal to

(a) 0 (b) $1/2$ (c) 1 (d) $3/2$

5) If $\sin\theta = a/b$, then $\cos\theta$ is equal to

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

6) $9\sec^2\theta - 9\tan^2\theta =$ ____ (a) 1 (b) 9 (c) 8 (d) 0

7) $\frac{1+\tan^2\theta}{1+\cot^2\theta} =$ ____ (a) $\sec^2\theta$ (b) -1 (c) $\cot^2\theta$ (d) $\tan^2\theta$

8) $(1+\tan\theta+\sec\theta)(1+\cot\theta-\operatorname{cosec}\theta)$ is equal to

(a) 0 (b) 1 (c) 2 (d) -1

9) $(\sec A + \tan A)(1-\sin A) =$ ____

(a) $\sec A$ (b) $\sin A$ (c) $\operatorname{cosec} A$ (d) $\cos A$

10) $\cos^4 x - \sin^4 x =$

(a) $2\sin^2 x - 1$ (b) $1 - 2\cos^2 x$ (c) $\sin^2 x - \cos^2 x$

(d) none of these

11) The value of $\sqrt{\frac{1+\cos\theta}{1-\cos\theta}}$ is ____

(a) $\cot\theta - \operatorname{cosec}\theta$ (b) $\operatorname{cosec}\theta + \cot\theta$ (c) $\operatorname{cosec}^2\theta + \cot^2\theta$

(d) $\cot\theta + \operatorname{cosec}^2\theta$

12) $\frac{\sin\theta}{1+\cos\theta} =$ ____ (a) $\frac{1+\cos\theta}{\sin\theta}$ (b) $\frac{1-\cot\theta}{\sin\theta}$ (c) $\frac{1-\cos\theta}{\sin\theta}$

(a) $\frac{1-\sin\theta}{\cos\theta}$

13) If $x = a\cos\alpha$ and $y = b\sin\alpha$, then $b^2x^2 + a^2y^2 =$ ——
(a) a^2b^2 (b) ab (c) a^4b^4 (d) a^2+b^2

14) If $\sin\theta + \sin^2\theta = 1$, then $\cos^2\theta + \cos^4\theta$ is equal to ——
(a) -1 (b) 1 (c) 0 (d) $\frac{1}{2}$

15) If $x = r\sin\theta\cos\phi$; $y = r\sin\theta\sin\phi$; $z = r\cos\theta$, then
(a) $x^2+y^2+z^2 = r^2$ (b) $x^2+y^2-z^2 = r^2$
(c) $x^2-y^2+z^2 = r^2$ (d) $z^2+y^2-x^2 = r^2$

16) $\frac{1}{1+\sin\theta} + \frac{1}{1-\sin\theta} =$ ——
(a) $\sec^2\theta$ (b) $\frac{1}{\sec^2\theta}$ (c) $2\sec^2\theta$ (d) $\frac{1}{2}\sec^2\theta$

17) $\tan^2\theta \cdot \sin^2\theta$ is equal to ——
(a) $\tan^2\theta - \sin^2\theta$ (b) $\tan^2\theta + \sin^2\theta$
(c) $\frac{\tan^2\theta}{\sin^2\theta}$ (d) none of these

18) $\sqrt{(1+\sin\theta)(1-\sin\theta)} =$

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

19) If $\cos\theta - \sin\theta = 1$, then the value of $\cos\theta + \sin\theta =$
(a) ± 4 (b) ± 3 (c) ± 2 (d) ± 1

20) Maximum value (1) for $\cos\theta$ is at $\theta =$
(a) 0° (b) 90° (c) 45° (d) 30°

X Test-12 (MCQs – TRIGONOMETRY Solutions)

1) $\cos A = \frac{4}{5}$

$\sec A = \frac{5}{4}$ [$\because \sec\theta = 1/\cos\theta$]

$\sec^2 A - 1 = \left(\frac{5}{4}\right)^2 - 1 = \frac{25-16}{16} = \frac{9}{16}$

$\therefore \tan A = \sqrt{\sec^2 A - 1} = \sqrt{\frac{9}{16}} = \frac{3}{4}$ (b)

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

$= \cancel{\tan^2\theta} + \cancel{\sin^2\theta} + 2\tan\theta.\sin\theta - \cancel{\tan^2\theta} - \cancel{\sin^2\theta} + 2\tan\theta.\sin\theta$

$= 4\tan\theta.\sin\theta$

$= \sqrt{16\tan^2\theta.\sin^2\theta}$

$= 4\sqrt{\frac{\sin^2\theta}{\cos^2\theta}.\sin^2\theta}$ [$\because \tan\theta = \sin\theta/\cos\theta$]

$= 4\sqrt{\frac{(1-\cos^2\theta)\sin^2\theta}{\cos^2\theta}}$ [$\because \sin^2\theta = 1 - \cos^2\theta$]

$= 4\sqrt{\frac{\sin^2\theta - \sin^2\theta.\cos^2\theta}{\cos^2\theta}}$

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

$= 4\sqrt{\tan^2\theta - \sin^2\theta}$

$= 4\sqrt{(\tan\theta + \sin\theta)(\tan\theta - \sin\theta)}$

$= 4\sqrt{mn}$ (c)

3) $\sin A = \frac{1}{2} \Rightarrow A = 30°$ [$\because \sin 30° = 1/2$]

$\therefore \cot A = \cot 30° = \sqrt{3}$ (a)

4) $x\sin^3\theta + y\cos^3\theta = \sin\theta\cos\theta$

$\Rightarrow x\sin\theta\cdot\sin^2\theta + y\cos\theta\cdot\cos^2\theta = \sin\theta\cos\theta$

$\Rightarrow y\cos\theta\cdot\sin^2\theta + y\cos\theta\cdot\cos^2\theta = \sin\theta\cos\theta$ $[\because x\sin\theta = y\cos\theta]$

$\Rightarrow y\cancel{\cos\theta}(\sin^2\theta+\cos^2\theta) = \sin\theta\cancel{\cos\theta}$

$\therefore y = \sin\theta$ // $[\because \sin^2\theta+\cos^2\theta = 1]$

Given, $x\sin\theta = y\cos\theta$

$\Rightarrow x\cancel{\sin\theta} = \cancel{\sin\theta}\cdot\cos\theta$

$\therefore x = \cos\theta$ //

Then, $x^2+y^2 = \cos^2\theta + \sin^2\theta = 1$ (c)

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

$$= \sqrt{1-\frac{a^2}{b^2}} = \sqrt{\frac{b^2-a^2}{b^2}} = \frac{\sqrt{b^2-a^2}}{b} \text{ (c)}$$

6) $9\sec^2\theta - 9\tan^2\theta = 9(\sec^2\theta-\tan^2\theta)$

$= 9$ (b) $[\because \sec^2\theta - \tan^2\theta = 1]$

7) $\dfrac{1+\tan^2\theta}{1+\cot^2\theta} = \dfrac{\sec^2\theta}{\csc^2\theta}$ $[\because \sec^2\theta = 1+\tan^2\theta;\ \csc^2\theta = 1+\cot^2\theta]$

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

$= \tan^2\theta$ (d) $[\tan\theta = \sin\theta/\cos\theta]$

8) $(1+\tan\theta+\sec\theta)(1+\cot\theta-\csc\theta)$

$$= \left(1+\frac{\sin\theta}{\cos\theta}+\frac{1}{\cos\theta}\right)\left(1+\frac{\cos\theta}{\sin\theta}-\frac{1}{\sin\theta}\right)$$

$$= \left(\frac{(\cos\theta+\sin\theta)+1}{\cos\theta}\right)\left(\frac{(\sin\theta+\cos\theta)-1}{\sin\theta}\right)$$

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

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

$$= \frac{\cancel{1}+2\sin\theta\cos\theta-\cancel{1}}{\sin\theta\cos\theta}$$

$$= \frac{2\cancel{\sin\theta\cos\theta}}{\cancel{\sin\theta\cos\theta}} = 2 \text{ (c)}$$

$[\because \tan\theta = \dfrac{\sin\theta}{\cos\theta};\ \sec\theta = 1/\cos\theta;\ \cot\theta = \dfrac{\cos\theta}{\sin\theta};\ \csc\theta = 1/\sin\theta]$

9) $(\sec A + \tan A)(1 - \sin A)$

$= \left(\frac{1}{\cos A} + \frac{\sin A}{\cos A}\right)(1 - \sin A)$ $\left(\sec A = 1/\cos A ; \tan A = \frac{\sin A}{\cos A}\right)$

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

$= \frac{1 - \sin^2 A}{\cos A}$

$= \frac{\cos^2 A}{\cos A}$ $[\because \cos^2 A = 1 - \sin^2 A]$

$= \cos A$ (d)

10) $\cos^4 x - \sin^4 x = (\cos^2 x)^2 - (\sin^2 x)^2$

$= (\cos^2 x + \sin^2 x)(\cos^2 x - \sin^2 x)$ $[\cos^2\theta + \sin^2\theta = 1]$

$= \cos^2 x - \sin^2 x$ (d) none of these

11) $\sqrt{\frac{1+\cos\theta}{1-\cos\theta}} = \sqrt{\frac{(1+\cos\theta)^2}{(1-\cos\theta)(1+\cos\theta)}}$

$= \sqrt{\frac{(1+\cos\theta)^2}{1-\cos^2\theta}} = \sqrt{\frac{(1+\cos\theta)^2}{\sin^2\theta}}$ $[\because \sin^2\theta = 1 - \cos^2\theta]$

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

$= \operatorname{cosec}\theta + \cot\theta$ (b) $[\because \operatorname{cosec}\theta = 1/\sin\theta ;$ $\cot\theta = \cos\theta/\sin\theta]$

12) $\frac{\sin\theta}{1+\cos\theta} = \frac{\sin\theta(1-\cos\theta)}{(1+\cos\theta)(1-\cos\theta)}$

$= \frac{\sin\theta(1-\cos\theta)}{1-\cos^2\theta}$ $[\because \sin^2\theta = 1 - \cos^2\theta]$

$= \frac{\cancel{\sin\theta}(1-\cos\theta)}{\sin^{\cancel{2}}\theta} = \frac{1-\cos\theta}{\sin\theta}$ (c)

13) $b^2x^2 + a^2y^2 = b^2a^2\cos^2\alpha + a^2b^2\sin^2\alpha$

$= a^2b^2(\cos^2\alpha + \sin^2\alpha)$

$= a^2b^2$ $[\because \sin^2\theta + \cos^2\theta = 1]$ (a)

14) $\sin\theta + \sin^2\theta = 1$

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

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

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

$\therefore \cos^2\theta + \cos^4\theta$

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

$= 1$ (b)

15) $x^2+y^2+z^2 = r^2\sin^2\theta\cos^2\phi + r^2\sin^2\theta\sin^2\phi + r^2\cos^2\theta$

$= r^2\sin^2\theta(\cos^2\phi+\sin^2\phi) + r^2\cos^2\theta$

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

$= r^2(\sin^2\theta+\cos^2\theta)$ $[\because \sin^2\theta+\cos^2\theta=1]$

$\therefore x^2+y^2+z^2 = r^2$ (a)

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

$= \frac{1-\cancel{\sin\theta}+1+\cancel{\sin\theta}}{(1+\sin\theta)(1-\sin\theta)}$

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

$= \frac{2}{\cos^2\theta}$ $[\because \cos^2\theta = 1-\sin^2\theta]$

$= 2\sec^2\theta$ (c) $[\because \sec\theta = 1/\cos\theta]$

17) $\tan^2\theta.\sin^2\theta$

$= \frac{\sin^2\theta}{\cos^2\theta}\cdot\sin^2\theta$ $[\because \tan\theta = \sin\theta/\cos\theta]$

$= \frac{\sin^2\theta}{\cos^2\theta}(1-\cos^2\theta)$ $[\because \sin^2\theta = 1-\cos^2\theta]$

$= \frac{\sin^2\theta}{\cos^2\theta} - \frac{\sin^2\theta}{\cancel{\cos^2\theta}}\times\cancel{\cos^2\theta}$

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

18) $\sqrt{(1+\sin\theta)(1-\sin\theta)} = \sqrt{1-\sin^2\theta} = \sqrt{\cos^2\theta}$

$= \cos\theta$ (d)

19) $\cos\theta-\sin\theta = 1$

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

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

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

$-2\sin\theta\cos\theta = 0$

$\sin\theta\cos\theta = 0 \longrightarrow (1)$

$\therefore (\cos\theta+\sin\theta)^2 = \cos^2\theta+\sin^2\theta+2\cos\theta.\sin\theta$

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

$= 1$ $[\because \sin\theta\cos\theta = 0]$

$\therefore \cos\theta + \sin\theta = \pm 1$ (d)

20) $\cos 0^\circ = 1$

$\therefore \theta = 0^\circ$ (a)