QB365 Question Bank Software Study Materials

Trigonometry Important 2 Marks Questions With Answers (Book Back and Creative)

11th Standard

Maths

Total Marks : 50

2 Marks

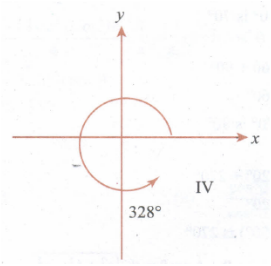
30 x 2 = 60

1) Identify the quadrant in which an angle of each given measure lies; 328^0

Answer : 328^0

$328^0 = 270^0 + 58^0$

∴ 328^0 lies in the IV quadrant

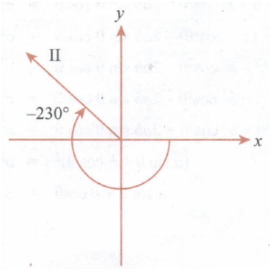


2) Identify the quadrant in which an angle of each given measure lies; -230^0

Answer : -230^0

$-230^0 = -230^0 = -180^0 + (-50^0)$

∴ -230^0 lies in the II quadrant



3) Find the value of cos 105°

Answer : cos 105° = cos (60 + 45)

= cos 60 cos 45 - sin 60 sin 45

= $\frac{1}{2}.\frac{1}{\sqrt{2}} - \frac{\sqrt{3}}{2}.\frac{1}{\sqrt{2}} = \frac{1-\sqrt{3}}{2\sqrt{2}}$

4) Prove that $\cos(30^o + x) = \frac{\sqrt{3}\cos x - \sin x}{2}$

Answer : $\cos(30^o + x) = \frac{\sqrt{3}\cos x - \sin x}{2}$

$\cos(30^o + x) = \cos 30^o \cos x - \sin 30^o \sin x$

$= \frac{\sqrt{3}}{2}.\cos x - \frac{1}{2}\sin x = \frac{\sqrt{3}\cos x - \sin x}{2}$

5) Prove that $\sin(\pi + \theta) = -\sin\theta$

Answer : $\sin(\pi + \theta) = -\sin\theta$

$\sin(\pi + \theta) = \sin\pi\cos\theta + \cos\pi\sin\theta$

$= (0)\cos\theta + (-1)\sin\theta$

$= 0 - \sin\theta$

$\sin(\pi + \theta) = -\sin\theta$

6) Find the principal value of $sin^{-1}\left(\frac{1}{\sqrt{2}}\right)$.

Answer : Let $sin^{-1}\left(\frac{1}{\sqrt{2}}\right)$ = y, where $-\frac{\pi}{2} \le y \le \frac{\pi}{2}$

⇒ sin y = $\frac{1}{\sqrt{2}}$

⇒ sin y = sin $\frac{\pi}{4}$

⇒ y = $\frac{\pi}{4}$

Thus the principal value of $sin^{-1}\left(\frac{1}{\sqrt{2}}\right) = \frac{\pi}{4}$.

7) Find the principal value of $\text{cosec}^{-1}(-1)$

Answer : Let cosec-1(-1) = y, where $-\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$

⇒ -1 = cosec y

⇒ cosec y = -cosec $\left(\frac{\pi}{2}\right)$

⇒ cosec y = cosec -$\left(\frac{\pi}{2}\right)$ [∵ cosec (-θ) = -cosec θ]

⇒ y = -$\left(\frac{\pi}{2}\right)$

Thus, the principal value of cosec-1 is -$\left(\frac{\pi}{2}\right)$.

8) Express each of the following angles in radian measure

150^0

Answer : 150^0

150^0 = 150 $\times \frac{\pi}{180} = \frac{5\pi}{6}$

9) Express each of the following angles in radian measure

330^0

Answer : 330^0

330^0 = 330 $\times \frac{\pi}{180} = \frac{11\pi}{6}$

10) Find the degree measure corresponding to the following radian measure; $\frac{\pi}{9}$

Answer : $\frac{\pi}{9}$

$\frac{\pi}{9}$ = $\frac{\pi}{9}$ $\times$ $\frac{180}{\pi}$ = 20°

11) Express each of the following as a sum or difference. sin 35° cos 28°

Answer : sin 35° cos 28° = $\frac{1}{2}$ [2 sin 35° cos 28°]

= $\frac{1}{2}$ [sin (35 + 28) + sin (35 - 28)]

= $\frac{1}{2}$ [sin 63° + sin 7°]

12) Express each of the following as a sum or difference. sin 4x cos 2x

Answer : sin 4x cos 2x = $\frac{1}{2}$ [sin (4x + 2x) + sin (4x - 2x)]

= $\frac{1}{2}$ [sin 6x + sin 2x]

13) Express each of the following as a sum or difference. cos 5θ cos 2θ

Answer : cos 5θ cos 2θ = $\frac{1}{2}$ [cos (5θ + 2θ) + cos (5θ - 2θ)]

= $\frac{1}{2}$ [cos 7θ + cos 3θ]

14) A football player can kick a football from ground level with an initial velocity of 80 ft/second. Find the maximum horizontal distance the football travels and at what angle? (Take g = 32)

Answer : The formula for horizontal distance R is given by

$R = \frac{u^2 sin2\alpha}{g} = \frac{(80\times80) sin2\alpha}{32}$

= 10 × 20 sin 2α

Thus, the maximum distance is 200ft.

Hence, he has to kick the football at an angle of α = 45° to reach the maximum distance.

15) Convert : 18° to radians.

Answer : Now, 180° =π radians gives $1^0 = \frac{\pi}{180}$ radians

$18^0 = \frac{\pi}{180} \times 18\, radians\ = \frac{\pi}{10}\, radians.$

16) Convert : 6 radians to degrees.

Answer : We know that π radians = 180° and thus,

6 radians $= (\frac{180}{\pi} \times 6)^0 \approx (\frac{7\times180}{22} \times 6)^0 = (343\frac{7}{11})^0$

17) Find the general solution of sin$\theta = -\frac{\sqrt{3}}{2}$.

Answer : The general solution of sin θ = sin $\alpha, \alpha \in [-\frac{\pi}{2}, \frac{\pi}{2}], is\ \theta = n\pi + (-1)^n\alpha, n \in Z$

$sin\theta = -\frac{\sqrt{3}}{2} = sin(-\frac{\pi}{3}),$

Thus the general solution is

$\theta = n\pi + (-1)^n(-\frac{\pi}{3}) = n\pi + (-1)^{n+1}\frac{\pi}{3}; n \in Z....(i)$

18) Simplify $\frac{sin\ 75^0 - sin\ 15^0}{cos\ 75^0 + cos\ 15^0}$.

Answer : We have $\frac{sin\ 75^0 - sin\ 15^0}{cos\ 75^0 + cos\ 15^0} = \frac{2cos(\frac{75^0+15^0}{2})sin\frac{75^0-15^0}{2}}{2cos(\frac{75^0+15^0}{2})cos(\frac{75^0-15^0}{2})}$

$= \frac{2cos45^0 sin30^0}{2cos45^0 cos30^0} = tan30^0 = \frac{1}{\sqrt{3}}$

19) Find the principal value of sin$^{-1}(\frac{\sqrt{3}}{2})$

Answer : Let sin$^{-1}(\frac{\sqrt{3}}{2})$ = y, where -$\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$

$\Rightarrow$ sin y = $\frac{\sqrt{3}}{2}$ = sin $\frac{\pi}{3} \Rightarrow y = \frac{\pi}{3}$

Thus, the principal value of sin^{-1} $(\frac{\sqrt{3}}{2})$ = $\frac{\pi}{3}$

20) Find the principal value of tan^{-1} $(\frac{-1}{\sqrt{3}})$

Answer : Let tan^{-1} $(\frac{-1}{\sqrt{3}})$ = y, where -$\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$

$tan\ y = -\frac{1}{\sqrt{3}} \Rightarrow tan\ y = tan(-\frac{\pi}{6}) \Rightarrow y = -\frac{\pi}{6}$

Thus the principal value of tan^{-1} $(\frac{-1}{\sqrt{3}}) = -\frac{\pi}{6}$

21) Find the radian measures 40^0 20'

Answer : Clearly 20' = $\left(\frac{20}{60}\right)^0 = \frac{1}{3}^0$

$\therefore$ 40^0 20' = $\left(40\frac{1}{3}\right)^0 = \left(\frac{121}{3}\right)^0 = \left(\frac{121}{3} \times \frac{\pi}{180}\right)^c = \left(\frac{121\pi}{540}\right)^c$

22) Find the value of tan$\frac{\pi}{2}$.

Answer : $tan\left(\frac{\pi}{12}\right) = tan\left(\frac{\pi}{4} - \frac{\pi}{6}\right)$

$= \frac{tan\frac{\pi}{4} - tan\frac{\pi}{6}}{1+tan\frac{\pi}{4}.tan\frac{\pi}{6}}$ $\left[\because tan(A-B) = \frac{tanA - tanB}{1+tanAtanB}\right]$

$= \frac{1-\frac{1}{\sqrt{3}}}{1+1\left(\frac{1}{\sqrt{3}}\right)} = \frac{\frac{\sqrt{3}-1}{\sqrt{3}}}{\frac{\sqrt{3}+1}{\sqrt{3}}} = \frac{\sqrt{3}-1}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}+1} = \frac{\sqrt{3}-1}{\sqrt{3}+1}$ $[\because tan\frac{\pi}{4} = 1, tan\frac{\pi}{6} = \sqrt{3}]$

$= \frac{(\sqrt{3}-1)(\sqrt{3}-1)}{(\sqrt{3}+1)(\sqrt{3}1)} = \frac{(\sqrt{3})^2 - 2(1)(\sqrt{3})+1}{(\sqrt{3})^2 - 1^2} = \frac{3-2\sqrt{3}+1}{2}$ [$\because$ conjugating the denominator]

$tan\left(\frac{\pi}{12}\right) = \frac{4-2\sqrt{3}}{2} = \frac{2(2-\sqrt{3})}{2} = 2 - \sqrt{3}.$

23) Prove that $2cos\left(\frac{\pi}{13}\right) cos\left(\frac{9\pi}{13}\right) + cos\frac{3\pi}{13} + cos\frac{5\pi}{13}$ = 0

Answer : LHS = $cos\left(\frac{\pi}{13}\right) cos\left(\frac{9\pi}{13}\right) + cos\frac{3\pi}{13} + cos\frac{5\pi}{13}$

$cos\left(\frac{9\pi}{13} + \frac{\pi}{13}\right) + cos\left(\frac{9\pi}{13} - \frac{\pi}{13}\right) + cos\left(\frac{3\pi}{13}\right) + cos\left(\frac{5\pi}{13}\right)$ [2cos A cos B = cos(A + B) + cos(A - B)

= $cos\left(\frac{10\pi}{13}\right) + cos\left(\frac{8\pi}{13}\right) + cos\left(\frac{3\pi}{13}\right) + cos\left(\frac{5\pi}{13}\right)$

= $cos\left(\pi - \frac{3\pi}{13}\right) + cos\left(\pi - \frac{5\pi}{13}\right) + cos\left(\frac{3\pi}{13}\right) + cos\left(\frac{3\pi}{13}\right) = -cos\left(\frac{3\pi}{13}\right) - cos\left(\frac{5\pi}{13}\right) + cos\left(\frac{3\pi}{13}\right) + cos\left(\frac{5\pi}{13}\right)$

= 0 = RHS

$[\because cos(\pi - A) = -cosA]$

24) Find the area of a triangle ABC in which ∠A = 60^0, b = 4 cm and c =$\sqrt{3}$ cm.

Answer : Area of triangle ABC is given by

Δ = $\frac{1}{2}$bc sinA

= $\frac{1}{2}(4)(\sqrt{3})sin60^0 = \left(\frac{1}{2}\right)(4)(\sqrt{3})\left(\frac{\sqrt{3}}{2}\right)$

Δ = 3 sq.cm

25) Find sin15°, cos15° and tan15°. Hence evaluate cot75° + tan75°.

Answer : $\frac{\sqrt{3}-1}{2\sqrt{2}}, \frac{\sqrt{3}+1}{2\sqrt{2}}, \frac{\sqrt{3}-1}{\sqrt{3}+1}, 4$

26) Evaluate: sin^{-1} $\left(cos^{-1}\frac{3}{5}\right)$

Answer : $\frac{4}{5}$

27) Evaluate: $cos^{-1}(-\frac{1}{\sqrt{2}})$

Answer : $\frac{3\pi}{4}$

28) Find the principal solutions of the equation $\sin x = \frac{\sqrt{3}}{2}$

Answer : We know that,

$\sin\frac{\pi}{3} = \frac{\sqrt{3}}{2}$ and
$\sin\frac{2\pi}{3} = \sin\left(\pi - \frac{\pi}{3}\right)$
$= \sin\frac{\pi}{3}$
$= \frac{\sqrt{3}}{2}$

Therefore, principal solutions are $x = \frac{\pi}{3}$ and $\frac{2\pi}{3}$

29) Express sin 5θ sin 4θ as a sum or difference.

Answer : sin 5θ sin 4θ = $\frac{1}{2}$ [cos (5θ - 4θ) - cos (5θ + 4θ)]
= $\frac{1}{2}$ [cos θ - cos 9θ]

30) If A+B = 45°, show that (1 + tan A)(1 + tan B) = 2.

Answer : A + B = 45°

tan(A + B) = tan 45°

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

tan A + tan B = 1 - tan A tan B

L.H.S. = (1 + tan A)(1 + tan B)

= 1 + tan A + tan B + tan A tan B

= 1 + 1 - tan A tan B + tan A tan B

= 2 = R. H. S.