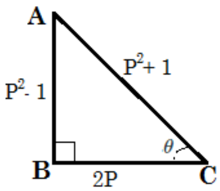
Trigonometry

Solution

1. **Answer: (B)**



$\cos\theta = 2P/(P^2+1)$

$\tan\theta$ = Perpendicular/Base

$= p^2 – 1/2p$

2. **Answer: (C)**

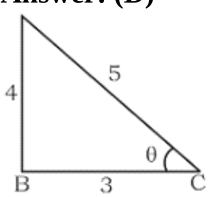
$2\cos^2\theta = 3\sin\theta$

After solving $\theta = 30°$

Now,

$\text{cosec}^2\,\theta – \cot^2\theta + \cos^2\theta = 4 – 3 + ¾ = 1¾$

3. **Answer: (D)**



$\text{cosec}\,\theta = 1.25 = 5/4$

Now,

$4\tan\theta – 5\cos\theta/\sec\theta + 4\cot\theta$

$= (4 \times 4/3 – 5\times 3/5)/(5/3 + 4 \times 3/4) = 1/2$

4. **Answer: (D)**

$$\frac{\sec\theta(1-\sin\theta)(\sec\theta+\tan\theta)}{(\sec\theta-\tan\theta)^2}=\frac{1+k}{1-k}$$

$$=\frac{\frac{1}{\cos\theta}[1-\sin\theta]\left[\frac{1}{\cos\theta}+\frac{\sin\theta}{\cos\theta}\right]}{\left[\frac{1}{\cos\theta}-\frac{\sin\theta}{\cos\theta}\right]^2}=\frac{1+k}{1-k}$$

$$=\frac{\frac{1}{\cos^2\theta}\times[1-\sin^2\theta]}{\frac{1}{\cos^2\theta}\times[1-\sin\theta]^2}=\frac{1+k}{1-k}$$

$$=\frac{1+\sin\theta}{1-\sin\theta}=\frac{1+k}{1-k}$$

By comparing

$k = \sin\theta$

5. **Answer: (C)**

$6[\sec^2 59^0 – \cot^2 31^0] + 2/3 \sin 90^0 – 3\tan^2 56^0$ y $\tan^2 34^0 = y/3$

Cot $(90–\theta)$

$6[\sec^2 59^0 – \tan^2 59^0] + 2/3\times1–3\times y = y/3$

$6\times1+2/3 –3y = y/3$

$20/3 = 10y/3$

Y=2

6. **Answer: (C)**

$\sec\theta = 4x$ and $\tan\theta = 4/x$

$4\left[x-\frac{1}{x}\right] = \sec\theta - \tan\theta$ ————(1)

$4\left[x+\frac{1}{x}\right] = sec\theta - tan\theta$————(2)

Multiply (1) and (2)

$16\left[x^2-\frac{1}{x^2}\right] = sec^2\theta - tan^2\theta$

$16\left[x^2-\frac{1}{x^2}\right] = 1\ [\therefore sec^2\theta - tan^2\theta = 1]$

Divide by 2 both side.

$8\left[x^2-\frac{1}{x^2}\right] = 1/2$

7. **Answer: (A)**

Cos =1/2

$x = \cos^{-1}(–1/2)$

$x = 240°$

A.T.Q

$= 4\tan^2 x + 3\text{cosec}^2 x$

$= 4\tan^2 240° + 3\text{cosec}^2 240°$

$= 4 \times 3 + 3 \times 4/3 = 16$

8. **Answer: (A)**

$6(\sec^2 59^0 – \cot^2 31^0) – 2/3 \sin 90^0 – 3\tan^2 56^0$ y $\tan^2 34^0 = y/3$

$\Rightarrow 6(1+\tan^2 59^0 – \cot^2 31^0) - \frac{-2}{3} \times 1 - 3tan^2 56^0$ y $\cot^2 56 = y/3$

$\Rightarrow 6[1+\cot^2 31^0 – \cot^2 31^0] – 2/3 – 3y = y/3$

[as, $\tan^2\theta\cot^2\theta = 1$]

$\Rightarrow 6–2/3 –3y = y/3$

$\Rightarrow 16/3 = y/3+3y \Rightarrow 10y/3 = 16/3$

$\Rightarrow y = \frac{48}{3\times10} = \frac{8}{5}$

9. **Answer: (B)**

As cosx =-1/2 and $p < x < 3p/2$

=> x = 4p/3

So, $2\tan^2\left(\frac{4p}{3}\right) + 3cosec^2\left(\frac{4p}{3}\right)$

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

(As tan x> 0 and cosec x< if x ϵ 3rd quadrant)

$=3\times 3 + 3\times\frac{4}{3} = 6 + 4 = 10$

10. Answer: (C)

Secθ=3x, tanθ =3/x

We know that

$1+\tan^2\theta = \sec^2\theta$

=> $1+(3/2)^2 = (3x)^2$

=> $1+9/x^2 = 9x^2$

=> $9x^2 - 9/x^2 = 1$

=> $9(x^2 - 1/x^2) = 1$

11. Answer: (B)

$2\sin^2\theta + 5\cos\theta - 4 = 0$

Let$\theta = 60^0$

$=2\times\sin^2 60^0 + 5\cos 60^0 - 4$

$=2\times 3/4 + 5\times 1/2 - 4$

$=0$

For$\theta = 60^0$ value satisfied

A.T.Q

= cotθ + cosec θ

$=\cot 60^0 + cosec 60^0$

$= \frac{1}{\sqrt{3}} + \frac{2}{\sqrt{3}} = \frac{3}{\sqrt{3}}\times\frac{\sqrt{3}}{\sqrt{3}} = \sqrt{3}$

12. Answer: (C)

$12\cot^2\theta - 31\ cosec\ \theta + 32 = 0$

$12[cosec^2\theta - 1] - 31 cosec\ \theta + 32 = 0$

$12\ cosec^2\theta - 12 - 31\ cosec\ \theta + 32 = 0$

$12\ cosec^2\theta - 31 cosec\ \theta + 20 = 0$

$12\ cosec^2\theta - 15\ cosec\ \theta - 16\ cosec\ \theta + 20$

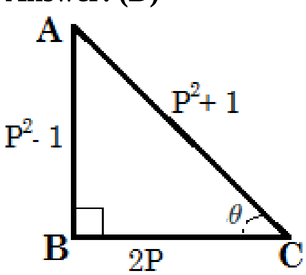
$3\ cosec\ \theta[4cosec\ \theta - 5] - 4[4cosec\ \theta - 5]$

$[3\ cosec\ \theta - 4][4cosec\ \theta - 5]$

Then cosec θ= 5/4, 4/3

Then sin θ = 4/5, 3/4

13. Answer: (D)



$\cos\theta = \frac{bace}{Hypotenus} = \frac{2p}{p^2+1}$

$Cosec\theta = \frac{hypotenus}{perpendicular}$

$Cosec\theta = \frac{p^2+1}{p^2+1}$

14. Answer: (A)

$Cosx = -\frac{\sqrt{3}}{2}$

$x = \cos^{-1}\left(\frac{-\sqrt{3}}{2}\right)$

$x=210^0$

A.T.Q

$= 2\cot^2 x - 3\sec^2 x$

$= 2\cot^2 210° - 3\sec^2 210°$

= 2

15. Answer: (C)

$Sin\theta = 3x\ and\ cos\theta = \frac{3}{x}$

Squaring both and then add

$Sin^2\theta + \cos^2\theta = 9x^2 + 9/x^2$

$1 = 9x^2 + 9/x^2$

Multiply by 2/3 both side

$2/3 = 6\left[x^2 + \frac{1}{x^2}\right]$

16. Answer: (B)

$4[cosec^2 66^0 - tan^2 24^0] + \frac{1}{2}sin90^0 - 4tan^2 66^0 \times y \times tan^2 24^0 = \frac{y}{2}$

tan(90-θ)=cotθ

$4[cosec^2 66^0 - tan^2(90^0 - 66^0)] + \frac{1}{2}sin90^0 - 4tan^2 66^0 \times y \times tan^2 24^0 = \frac{y}{2}$

$4\times 1 + \frac{1}{2}\times 1 - 4\times y = \frac{y}{2}$

$\frac{9}{2} = \frac{9y}{2}$

Y=1

17. Answer: (C)

$cot\theta = 5x\ and\ cosec\theta = \frac{5}{x}$

$cot\theta + cosec\theta = 5\left(x + \frac{1}{x}\right)$-----------(1)

$cot\theta + cosec\theta = 5\left(x - \frac{1}{x}\right)$-----------(2)

multiply (1) and (2)

$\cot^2\theta + cosec^2\theta = 25\left[x^2 - \frac{1}{x^2}\right]$

$-1 = 25\left[x^2 - \frac{1}{x^2}\right]$

Divide by 5 from both side

$-\frac{1}{5} = 5\left[x^2 - \frac{1}{x^2}\right]$

18. Answer: (B)

$4[cosec^2 65^0 - tan^2 25^0] - sin 90^0 - tan^2 63^0 . y$

$tan^2 27^0 = y/2$

$$\begin{bmatrix} tan(90-\theta) = cot\theta \\ if\ x + y = 90^0 \\ tanA\ tan\ B = 1 \end{bmatrix}$$

$4[cosec^2 65^0 - cot^2 65^0] - 1 - y = y/2$

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

Y=2

19. Answer: (D)

$cosx = \frac{-\sqrt{3}}{2}$

X= $cosx^{-1} = \left(\frac{-\sqrt{3}}{2}\right)$

$x = 210^0$

A.T.Q

$= 2cot^2 X - 3sec^2 x$

$= 2\ cot^2\ 210^0 - 3\ sec^2 210^0$

$= 2[cot 210^0]^2 - 3[sec 210^0]^2$

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

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

20. Answer: (A)

Cosx $= \frac{-1}{2}$

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

$x = 240^0$

A.T.Q

$= 2tan^2 x - 3cosec^2 x$

$= 2tan^2 240^0 - 3cosec^2 240^0$

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

=6-4 =2