19/02/2021

CH-11

Exercise 11.2

Q.1 $\cos\theta = \frac{4}{5}$

$\sin^2\theta + \cos^2\theta = 1$ [Identity]

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

$\sin\theta = \sqrt{1 - \left(\frac{4}{5}\right)^2}$

$= \sqrt{1 - \frac{16}{25}} = \sqrt{\frac{25 - 16}{25}} = \sqrt{\frac{9}{25}}$

$= \boxed{\frac{3}{5}}$

$\tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{4}{5} \div \frac{3}{5} = \frac{4}{\cancel{5}} \times \frac{\cancel{5}}{3} = \boxed{\frac{4}{3}}$

$\sec\theta = \frac{1}{\cos\theta} = \boxed{\frac{5}{4}}$

$\operatorname{cosec}\theta = \frac{1}{\sin\theta} = \boxed{\frac{5}{3}}$

$\cot\theta = \frac{1}{\tan\theta} = \boxed{\frac{3}{4}}$

Q.2 $\sin\theta = \frac{1}{\sqrt{2}}$

$\sin^2\theta + \cos^2\theta = 1$ (Identity)

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

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

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

$= \sqrt{\frac{1}{2}} = \boxed{\frac{1}{\sqrt{2}}}$

$\tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{1/\sqrt{2}}{1/\sqrt{2}} = \boxed{1}$

$\operatorname{cosec}\theta = \frac{1}{\sin\theta} = \boxed{\sqrt{2}}$

$\sec\theta = \frac{1}{\cos\theta} = \boxed{\sqrt{2}}$

$\cot\theta = \frac{1}{\tan\theta} = \boxed{1}$

Q.3 $\tan\theta = \frac{1}{\sqrt{2}}$ (Given)

$\cot\theta = \frac{1}{\tan\theta} = \sqrt{2}$

$\sec^2\theta = 1 + \tan^2\theta$ [Identity]

$\sec\theta = \sqrt{1 + \tan^2\theta}$

$= \sqrt{1 + \left(\frac{1}{\sqrt{2}}\right)^2} = \sqrt{1 + \frac{1}{2}} = \sqrt{\frac{3}{2}} = \frac{\sqrt{3}}{\sqrt{2}}$

$\operatorname{cosec}^2\theta = 1 + \cot^2\theta$ [Identity]

$\operatorname{cosec}\theta = \sqrt{1+\cot^2\theta}$

$= \sqrt{1+(\sqrt{2})^2}$

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

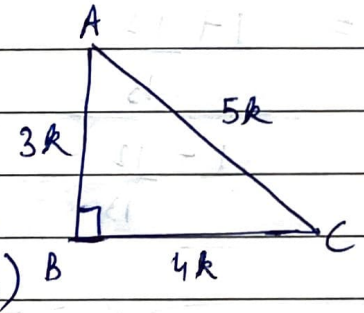
$$\frac{\operatorname{cosec}^2\theta - \sec^2\theta}{\operatorname{cosec}^2\theta + \cot^2\theta}$$

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

$$= \frac{\frac{6-3}{2}}{5} = \frac{3}{2\times 5} = \boxed{\frac{3}{10}}$$

Q.4 $4\tan\theta = 3$ (given)

$\tan\theta = \frac{3}{4} = \frac{P}{B}$



$H = \sqrt{P^2+B^2}$ (Pythagoras theorem)

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

$= \sqrt{9k^2+16k^2}$

$= \sqrt{25k^2} = 5k$

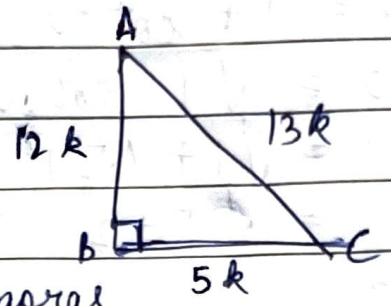
$\sin\theta = \frac{P}{H} = \frac{3k}{5k} = \frac{3}{5}$; $\cos\theta = \frac{B}{H} = \frac{4k}{5k} = \frac{4}{5}$

$$\frac{(4\sin\theta - \cos\theta)}{(4\sin\theta + \cos\theta)}$$

$$= \frac{4\left(\frac{3}{5}\right) - \frac{4}{5}}{4\left(\frac{3}{5}\right) + \frac{4}{5}} = \frac{\frac{12-4}{5}}{\frac{12+4}{5}} = \frac{8}{16} = \boxed{\frac{1}{2}}$$

Q.5 $\tan\theta = \frac{12}{5}$ (given)

$= \frac{P}{B}$



$H = \sqrt{P^2 + B^2}$ (Pythagoras theorem)

$= \sqrt{(12k)^2 + (5k)^2}$

$= \sqrt{144k^2 + 25k^2}$

$= \sqrt{169k^2} = 13k$

$\sin\theta = \frac{P}{H} = \frac{12k}{13k} = \frac{12}{13}$

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

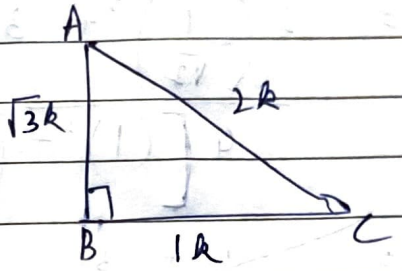
$= \frac{1+\frac{12}{13}}{1-\frac{12}{13}} = \frac{\frac{13}{13}+\frac{12}{13}}{\frac{13}{13}-\frac{12}{13}} = \frac{\frac{13+12}{13}}{\frac{13-12}{13}} = \frac{25}{1} = \boxed{25}$

classmate
Date
Page

CA-11

Exercise 11.2

Q.6 $\cot\theta = \frac{1}{\sqrt{3}} = \frac{B}{P}$ (given)



$H = \sqrt{P^2 + B^2}$ (Pythagoras theorem)

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

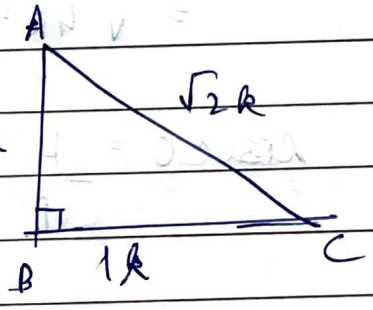
$= \sqrt{3k^2 + k^2}$

$= \sqrt{4k^2} = 2k$

$\sin\theta = \frac{P}{H} = \frac{\sqrt{3}k}{2k} = \frac{\sqrt{3}}{2}$; $\cos\theta = \frac{B}{H} = \frac{1k}{2k} = \frac{1}{2}$

$$= \frac{1 - \cos^2\theta}{2 - \sin^2\theta} = \frac{1 - \left(\frac{1}{2}\right)^2}{2 - \left(\frac{\sqrt{3}}{2}\right)^2} = \frac{1 - \frac{1}{4}}{2 - \frac{3}{4}} = \frac{\frac{4-1}{4}}{\frac{8-3}{4}} = \boxed{\frac{3}{5}}$$

Q.7 $\operatorname{cosec} A = \sqrt{2} = \frac{H}{P}$ (given)



$B = \sqrt{H^2 - P^2}$ (Pythagoras theorem)

$= \sqrt{(\sqrt{2}k)^2 - (1k)^2}$

$= \sqrt{2k^2 - 1k^2}$

$= \sqrt{1k^2} = 1k$

$\sin\theta = \frac{1}{\operatorname{cosec}\theta} = \frac{1}{\sqrt{2}}$; $\cos\theta = \frac{B}{H} = \frac{1k}{\sqrt{2}k} = \frac{1}{\sqrt{2}}$

$\tan\theta = \frac{P}{B} = \frac{1k}{1k} = 1$; $\cot\theta = \frac{1}{\tan\theta} = 1$

$$\frac{2\sin^2 A + 3\cot^2 A}{4(\tan^2 A - \cos^2 A)}$$

$$= \frac{2\left(\frac{1}{\sqrt{2}}\right)^2 + 3(1)}{4\left[(1)^2 - \left(\frac{1}{\sqrt{2}}\right)^2\right]} = \frac{2\left(\frac{1}{2}\right) + 3}{4\left(1 - \frac{1}{2}\right)}$$

$$= \frac{\frac{1}{2} + 3}{4\left(\frac{4-1}{4}\right)} = \frac{1+6}{\frac{2}{4}\left(\frac{3}{4}\right)}$$

$$= \frac{1+3}{4\left(\frac{2-1}{2}\right)} = \frac{4}{2\cancel{4}\left(\frac{1}{\cancel{2}}\right)} = \frac{\cancel{4}2}{\cancel{2}} = \boxed{2}$$

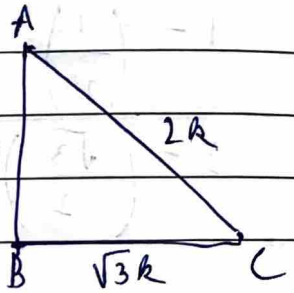
Q.8 $\cot\theta = \sqrt{3} = \frac{B}{P}$ (given)

$$H = \sqrt{P^2 + B^2} \quad \text{(Pythagoras theorem)}$$

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

$$= \sqrt{1k^2 + 3k^2}$$

$$= \sqrt{4k^2} = 2k$$



$$\text{cosec}\,\theta = \frac{H}{P} = \frac{2k}{1k} = 2 \; ; \quad \sec\theta = \frac{H}{B} = \frac{2k}{\sqrt{3}k} = \frac{2}{\sqrt{3}}$$

$$\frac{\text{cosec}^2\theta + \cot^2\theta}{\text{cosec}^2\theta - \sec^2\theta}$$

$$= \frac{(2)^2 + (\sqrt{3})^2}{(2)^2 - \left(\frac{2}{\sqrt{3}}\right)^2} = \frac{4+3}{4 - \frac{4}{3}} = \frac{7}{\frac{12-4}{3}}$$

$$= \frac{7 \times 3}{8} = \boxed{\frac{21}{8}}$$

Q.9 $3\cos\theta = 1$

$\cos\theta = \frac{1}{3}$

$\cos^2\theta = \frac{1^2}{3^2} = \frac{1}{9}$

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

$= 1 - \frac{1}{9} = \frac{8}{9}$

$\tan^2\theta = \frac{\sin^2\theta}{\cos^2\theta} = \frac{8}{9} \times \frac{9}{1} = 8$

$$\frac{6\sin^2\theta + \tan^2\theta}{4\cos\theta}$$

$$= \frac{26\left(\frac{8}{9}\right) + 8}{4\left(\frac{1}{3}\right)} = \frac{\frac{16}{3} + 8}{\frac{4}{3}}$$

$$= \frac{16 + 24}{3} \times \frac{3}{4} = \frac{40}{4} = \boxed{10}$$

Q.10 $\sqrt{3}\tan\theta = 3\sin\theta$

$\sqrt{3}\frac{\tan\theta}{\sin\theta} = 3$

$\sqrt{3}\frac{\sin\theta}{\cos\theta} = 3\sin\theta$

$\sqrt{3}\sin\theta = 3\sin\theta\cos\theta$

$\frac{\sqrt{3}\sin\theta}{\sqrt{3}\sin\theta} = \cos\theta$

$\cos\theta = \frac{1}{\sqrt{3}}$

$\cos^2\theta = \frac{(1)^2}{(\sqrt{3})^2} = \frac{1}{3}$

$$\sin^2\theta = 1 - \cos^2\theta$$
$$= 1 - \frac{1}{3}$$
$$= \frac{2}{3}$$

$$[\sin^2\theta + \cos^2\theta = 1]$$

$$\sin^2\theta - \cos^2\theta = \frac{2}{3} - \frac{1}{3} = \boxed{\frac{1}{3}}$$

Q.11 $\operatorname{cosec}\theta = \frac{13}{12}$

$$\sin\theta = \frac{1}{\operatorname{cosec}\theta} = \frac{12}{13}$$

$$\cos^2\theta = 1 - \sin^2\theta$$
$$= 1 - \left(\frac{12}{13}\right)^2$$
$$= 1 - \frac{144}{169} = \frac{25}{169}$$

$$[\sin^2\theta + \cos^2\theta = 1]$$

$$\cos\theta = \sqrt{\frac{25}{169}} = \frac{5}{13}$$

$$\frac{2\sin\theta - 3\cos\theta}{4\sin\theta - 9\cos\theta}$$
$$= \frac{2\left(\frac{12}{13}\right) - 3\left(\frac{5}{13}\right)}{4\left(\frac{12}{13}\right) - 9\left(\frac{5}{13}\right)} = \frac{\frac{24-15}{13}}{\frac{48-45}{13}}$$
$$= \frac{9}{3} = \boxed{3}$$

Q.12 $\sin\theta + \cos\theta = \sqrt{2}\cos(90° - \theta)$

$\Rightarrow \sin\theta + \cos\theta = \sqrt{2}\sin\theta$ $\quad [\sin\theta = \cos(90° - \theta)$

$\Rightarrow \cos\theta = \sqrt{2}\sin\theta - \sin\theta$

$\Rightarrow \cos\theta = \sin\theta(\sqrt{2} - 1)$

$\Rightarrow \frac{\cos\theta}{\sin\theta} = \sqrt{2} - 1$

$\Rightarrow \boxed{\cot\theta = \sqrt{2} - 1}$

Q.13 $2\sin^2\theta - \cos^2\theta = 2$

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

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

$\Rightarrow 2 - 3\cos^2\theta = 2$

$\Rightarrow 2 - 2 = 3\cos^2\theta$

$\Rightarrow \cos^2\theta = \frac{0}{3}$

$\Rightarrow \cos^2\theta = 0$

$\therefore \boxed{\theta = 90°}$

Q.14 $\sqrt{3}\tan\theta - 1 = 0$

$\sqrt{3}\tan\theta = 1$

$\tan\theta = \frac{1}{\sqrt{3}}$

$\therefore \theta = 30°$

$\sin^2\theta - \cos^2\theta = \sin^2 30° - \cos^2 30°$

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

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