Trigonometric Ratios Ex 5.1 Q30

**Answer :**

Given: $3\cos\theta - 4\sin\theta = 2\cos\theta + \sin\theta$

To find: $\tan\theta$

Now consider the given expression

$3\cos\theta - 4\sin\theta = 2\cos\theta + \sin\theta$

Now by dividing both sides of the above expression by $\cos\theta$

We get,

$$\frac{3\cos\theta - 4\sin\theta}{\cos\theta} = \frac{2\cos\theta + \sin\theta}{\cos\theta}$$

Now by separating the denominator for each terms

We get,

$$\frac{3\cos\theta}{\cos\theta} - \frac{4\sin\theta}{\cos\theta} = \frac{2\cos\theta}{\cos\theta} + \frac{\sin\theta}{\cos\theta}$$

Now in the above expression $\cos\theta$ present in both numerator and denominator gets cancelled

Therefore,

$$3 - \frac{4\sin\theta}{\cos\theta} = 2 + \frac{\sin\theta}{\cos\theta} \quad \ldots\ldots (1)$$

Now we know that,

$$\frac{\sin\theta}{\cos\theta} = \tan\theta$$

Therefore by substituting $\frac{\sin\theta}{\cos\theta} = \tan\theta$ in equation (1)

We get,

$$3 - 4\tan\theta = 2 + \tan\theta$$

Now by taking $\tan\theta$ on L.H.S

We get,

$$-\tan\theta - 4\tan\theta = 2 - 3$$

Therefore,

$$-5\tan\theta = -1$$

$$5\tan\theta = 1$$

$$\tan\theta = \frac{1}{5}$$

Hence $\tan\theta = \frac{1}{5}$

Trigonometric Ratios Ex 5.1 Q31

**Answer :**

Given:

$$\tan\theta = \frac{20}{21} \quad \text{...... (1)}$$

To show that:

$$\frac{1-\sin\theta+\cos\theta}{1+\sin\theta+\cos\theta} = \frac{3}{7}$$

Now we know $\tan\theta$ is defined as follows

$$\tan\theta = \frac{\text{Perpendicular side opposite to}\angle\theta}{\text{Base side adjacent to}\angle\theta} \quad \text{...... (2)}$$

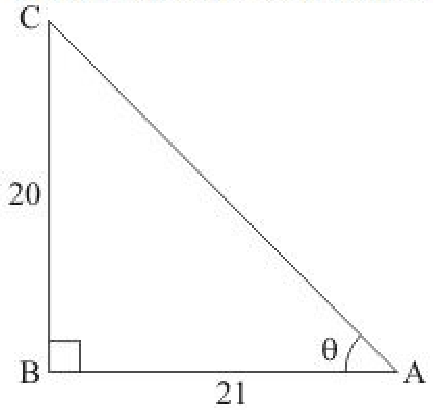
Now by comparing equation (1) and (2)

We get

Perpendicular side opposite to $\angle\theta$ = 20

Base side adjacent to $\angle\theta$ = 21

Therefore triangle representing angle $\theta$ is as shown below




Side AC is unknown and can be found using Pythagoras theorem

Therefore,

$$AC^2 = AB^2 + BC^2$$

Now by substituting the value of known sides from figure (a)

We get,

$$\begin{aligned} AC^2 &= 21^2 + 20^2 \\ &= 441 + 400 \\ &= 841 \end{aligned}$$

Now by taking square root on both sides

We get,

$$\begin{aligned} AC &= \sqrt{841} \\ &= 29 \end{aligned}$$

Therefore Hypotenuse side AC = 29 ...... (3)

Now we know, $\sin\theta$ is defined as follows

$$\sin\theta = \frac{\text{Perpendicular side opposite to}\angle\theta}{\text{Hypotenuse}}$$

Therefore from figure (a) and equation (3)

We get,

$$\begin{aligned} \sin\theta &= \frac{BC}{AC} \\ &= \frac{20}{29} \end{aligned}$$

$$\sin\theta = \frac{20}{29} \quad \text{...... (4)}$$

Now we know, $\cos\theta$ is defined as follows

$$\cos\theta = \frac{\text{Base side adjacent to} \angle\theta}{\text{Hypotenuse}}$$

Therefore from figure (a) and equation (3)

We get,

$$\cos\theta = \frac{AB}{AC}$$

$$= \frac{21}{29}$$

$$\cos\theta = \frac{21}{29} \quad \text{...... (5)}$$

Now we need to find the value of expression $\frac{1-\sin\theta+\cos\theta}{1+\sin\theta+\cos\theta}$

Therefore by substituting the value of $\sin\theta$ and $\cos\theta$ from equation (4) and (5) respectively, we get,

$$\frac{1-\sin\theta+\cos\theta}{1+\sin\theta+\cos\theta} = \frac{1-\frac{20}{29}+\frac{21}{29}}{1+\frac{20}{29}+\frac{21}{29}}$$

Now by taking L.C.M on R.H.S of above equation

We get

$$\frac{1-\sin\theta+\cos\theta}{1+\sin\theta+\cos\theta} = \frac{\frac{29-20+21}{29}}{\frac{29+20+21}{29}}$$

$$= \frac{\frac{29+1}{29}}{\frac{70}{29}}$$

$$= \frac{\frac{30}{29}}{\frac{70}{29}}$$

$$= \frac{30}{29} \times \frac{29}{70}$$

$$= \frac{30}{70}$$

$$= \frac{3\times 10}{7\times 10}$$

Now as 10 is present in numerator as well as denominator of R.H.S of above equation, it gets cancelled and we get

$$\frac{1-\sin\theta+\cos\theta}{1+\sin\theta+\cos\theta} = \frac{3}{7}$$

Hence $\frac{1-\sin\theta+\cos\theta}{1+\sin\theta+\cos\theta} = \frac{3}{7}$

*********** END **********