## **Exemplar Problem**

## Trigonometric Functions

## 7. If a cos $\theta$ + b sin $\theta$ = m and a sin $\theta$ - b cos $\theta$ = n, then show that a $^2$ + b $^2$ = m $^2$ + n $^2$ .

## Solution:

According to the question,

a 
$$\sin \theta - b \cos \theta = n ...(ii)$$

Squaring and adding equation 1 and 2, we get,

$$(a \cos \theta + b \sin \theta)^2 + (a \sin \theta - b \cos \theta)^2 = m^2 + n^2$$

$$\Rightarrow$$
 a  $^2$  cos  $^2$   $\theta$  + b  $^2$  sin  $^2$   $\theta$  + 2ab sin  $\theta$  cos  $\theta$  + a  $^2$  sin  $^2$   $\theta$  + b  $^2$  cos  $^2$   $\theta$  - 2ab sin  $\theta$  cos  $\theta$  = m  $^2$  + n  $^2$ 

$$\Rightarrow$$
 a  $^{2}$  cos  $^{2}$   $\theta$  + b  $^{2}$  sin  $^{2}$   $\theta$  + a  $^{2}$  sin  $^{2}$   $\theta$  + b  $^{2}$  cos  $^{2}$   $\theta$  = m  $^{2}$  + n  $^{2}$ 

$$\Rightarrow$$
 a  $^{2}$  (sin  $^{2}$   $\theta$  + cos  $^{2}$   $\theta$ ) + b  $^{2}$  (sin  $^{2}$   $\theta$  + cos  $^{2}$   $\theta$ ) = m  $^{2}$  + n  $^{2}$ 

Using, 
$$\sin^2 \theta + \cos^2 \theta = 1$$
,

We get,

$$\Rightarrow$$
 a <sup>2</sup> + b <sup>2</sup> = m <sup>2</sup> + n <sup>2</sup>