

# TRIGONOMETRY

## Activity – 8

### 1. What we have to do?

To verify experimentally that  $\sin^2 \theta + \cos^2 \theta = 1$

### 2. What is required?

Graph paper, geometry box, colour pens, glue stick

### 3. Time required: 30 min

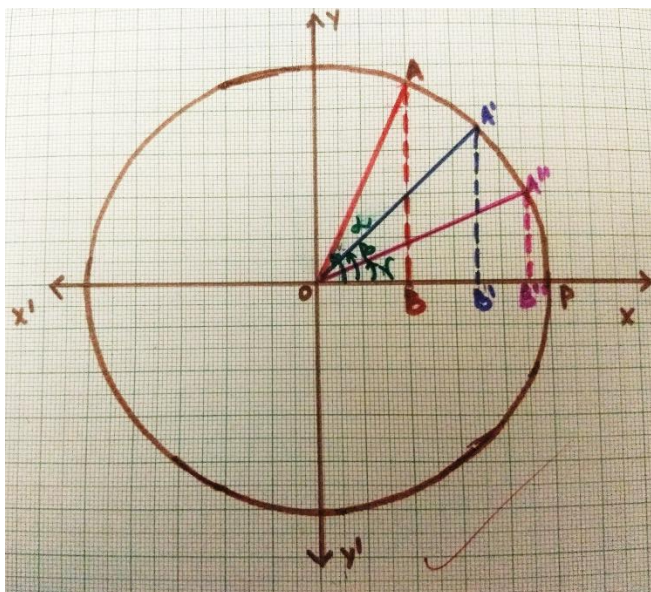
### 4. What do we need to know?

Definition of T-Ratios in a right triangle

### 5. How will you proceed?

- 1) On a graph paper draw co-ordinate system XOY, with origin as centre draw a circle of unit radius (say 5 cm)
- 2) Draw three right triangles namely  $\triangle OAB$ ,  $\triangle OA'B'$  and  $\triangle OA''B''$  with OB, OB' and OB'' as base and points A, A' and A'' all lying on the circumference of the circle. Also note that  $\angle B = \angle B' = \angle B'' = 90^\circ$
- 3) Represent  $OB = x$ ,  $OB' = x'$ ,  $OB'' = x''$  and  $AB = y$ ,  $AB' = y'$  and  $AB'' = y''$
- 4) Mark  $\angle AOB = \alpha$ ,  $\angle A'OB' = \beta$ ,  $\angle A''OB'' = \gamma$ .
- 5) By Pythagoras theorem we get  $x^2 + y^2 = 1$ ,  $(x')^2 + (y')^2 = 1$ ,  $(x'')^2 + (y'')^2 = 1$
- 6) By definition  $\sin \theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$ ,  $\cos \theta = \frac{\text{base}}{\text{hypotenuse}}$ , hence  

$$\cos \alpha = \frac{x}{1} = x, \sin \alpha = \frac{y}{1} = y$$
- 7) Similarly get  $x'$ ,  $x''$  and  $y'$ ,  $y''$  in terms of sin and cos of  $\beta$  &  $\gamma$



6. **What have you observed?**

It is observed that \_\_\_\_\_ for  $\theta = \alpha, \beta, \gamma$

7. **What have you learnt?**

8. **What would you be interested in doing?**

Repeat the above steps to verify  $1 + \tan^2 \theta = \sec^2 \theta$  &  $1 + \cot^2 \theta = \operatorname{cosec}^2 \theta$

**Real Life Applications:**

The above concept is used in Astronomy, Geography, Satellite Navigation system, Study of Sound and Light waves etc...

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