

EXPERIENTIAL LEARNING

SUBJECT: MATHEMATICS

CLASS: X

CHAPTER 8: INTRODUCTION TO TRIGONOMETRY

Curiosity Questions

1. What would you do if you want to find the height of a mountain without actually measuring it?
2. Which branch of Mathematics studies the relationship between the sides and angles of a triangle?

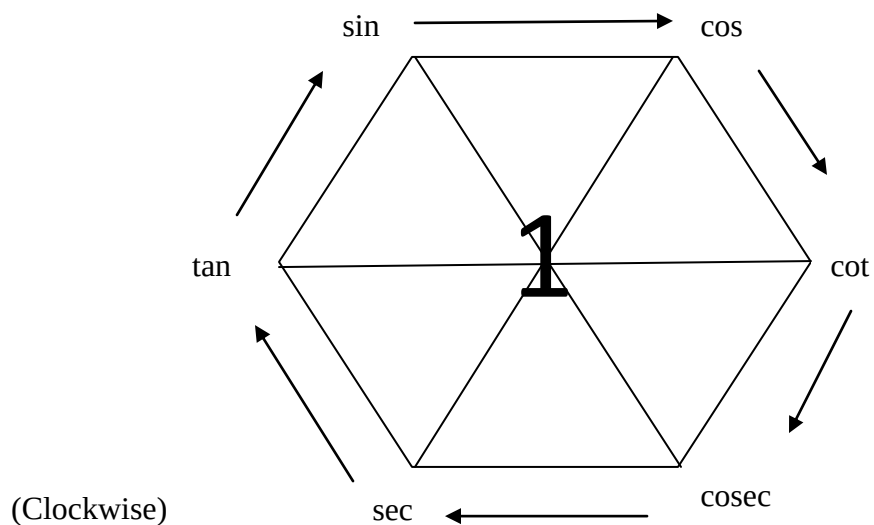
Answer Guide:

- What is the need to introduce Trigonometry?
- Where is trigonometry used in real life situations?
- What is the relationship between the altitude and the base of an equilateral triangle?

Experiential Learning:

Trigonometric ratios can be taught with the help of ‘Super Hexagon’.

1. Draw a hexagon and join all the opposite vertices to get 3 diagonals. Use a particular way to name the vertices in terms of trigonometric ratios.



$$\tan \theta = \sin \theta / \cos \theta$$

$$\sin \theta = \cos \theta / \cot \theta$$

$$\cos \theta = \cot \theta / \operatorname{cosec} \theta$$

$$\cot \theta = \operatorname{cosec} \theta / \sec \theta$$

$$\operatorname{cosec} \theta = \sec \theta / \tan \theta$$

$$\sec \theta = \tan \theta / \sin \theta$$

Experiential Learning:

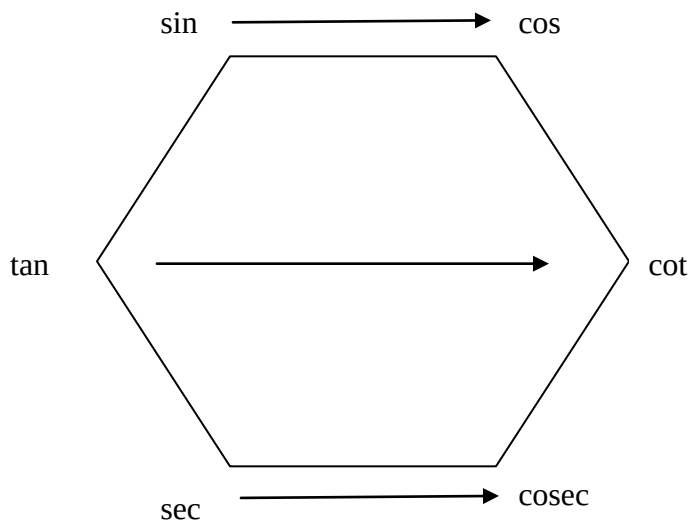
2. Multiply the ratios on the opposite vertices

$$\sin \theta \times \operatorname{cosec} \theta = 1$$

$$\cos \theta \times \sec \theta = 1$$

$$\tan \theta \times \cot \theta = 1$$

3. Complementary Angles: Using the Super Hexagon concept of complementary angles can be taught.



$$\sin \theta = \cos (90^\circ - \theta)$$

$$\tan \theta = \cot (90^\circ - \theta)$$

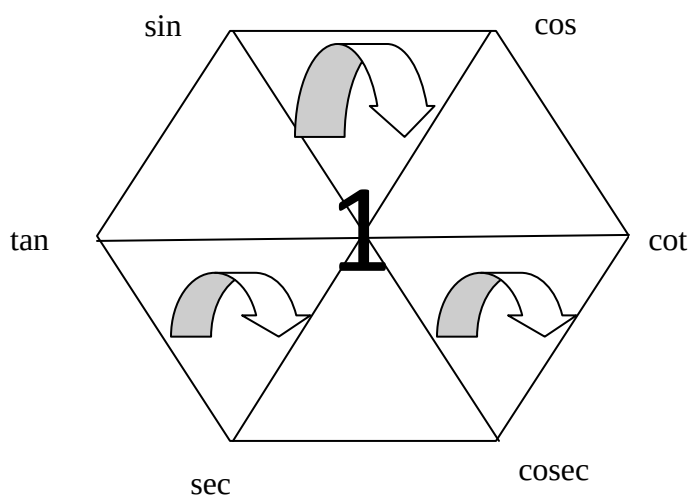
$$\sec \theta = \csc (90^\circ - \theta)$$

$$\cos \theta = \sin (90^\circ - \theta)$$

$$\cot \theta = \tan (90^\circ - \theta)$$

$$\csc \theta = \sec (90^\circ - \theta)$$

Trigonometric Identities: Trigonometric Identities can be easily taught using ‘Super Hexagon’. This technique helps students to remember the concept



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

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

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

- Trigonometric ratios of some specific angles like 0° , 30° , 45° , 60° , 90° can be taught to the students with Palm Trick technique.
- Students find it difficult to memorise the values. Hence Palm Trick method is a good teaching aid

Methodology: Look at your left hand palm

- The thumb denotes 0°
- The index finger denotes 30°
- The middle finger denotes 45°
- The ring finger denotes 60°
- The little finger denotes 90°

Let us find the values of sine and cosine. In this method, depending on whether it is sine or cosine, count the number of fingers towards left or right respectively. Then divide the number by 4 and take the square root of this ratio

Trigonometric ratios	Angles				90°
	0°	30°	45°	60°	
$\sin \theta$	0	$1/2$	$1/\sqrt{2}$	$\sqrt{3}/2$	1
$\cos \theta$	1	$\sqrt{3}/2$	$1/\sqrt{2}$	$1/2$	0

Now that you know the values of $\sin \theta$ and $\cos \theta$, we can easily find the other ratios

$$\tan \theta = \sin \theta / \cos \theta$$

$$\operatorname{cosec} \theta = 1 / \sin \theta$$

$$\sec \theta = 1 / \cos \theta$$

$$\cot \theta = 1 / \tan \theta$$

Demonstration of the above concept through the video

<https://www.youtube.com/watch?v=S9SVxRYD25k>