

**ONE TWO ACADEMY UNIT TEST - 1**  
**MATHEMATICS(Trigonometry)**

**Total:- 50 Marks**

**HSC 1ST YEAR**

**Answer any 5 the following:-**

**5 x 5 = 25**

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- 1) If  $\tan \frac{\theta}{2} = \sqrt{\frac{1-a}{1+a}} \tan \frac{\phi}{2}$ , then prove that  $\cos \phi = \frac{\cos \theta - a}{1 - a \cos \theta}$ .
- 2) Find  $\sin(x - y)$ , given that  $\sin x = \frac{8}{17}$  with  $0 < x < \frac{\pi}{2}$  and  $\cos y = -\frac{24}{25}$  with  $\pi < y < \frac{3\pi}{2}$ .
- 3) The perimeter of a certain sector of a circle is equal to the length of the arc of a semi-circle having the same radius. Express the angle of the sector in degrees, minutes and seconds.
- 4) In a  $\triangle ABC$ , prove that  $(a^2 - b^2 + c^2) \tan B = (a^2 + b^2 - c^2) \tan C$ .
- 5) If  $A + B + C = 2s$ , then prove that  $\sin(s - A) \sin(s - B) + \sin s \sin(s - C) = \sin A \sin B$ .
- 6) Solve  $\sqrt{3} \tan^2 \theta + (\sqrt{3} - 1) \tan \theta - 1 = 0$
- 7) If  $A + B = 45^\circ$ , show that  $(1 + \tan A)(1 + \tan B) = 2$ .

**Answer then 5 following:- (Question no 13 is compulsory)**

**5 x 3 = 15**

- 8) Explain the different system of measuring angles.
- 9) A rope of length 12 m is given. Find the largest area of the triangle formed by this rope and find the dimensions of the triangle so formed.
- 10) Derive Projection formula from (i) Law of sines, (ii) Law of cosines.
- 11) Prove that  $\cos 5\theta = 16 \cos^5 \theta - 20 \cos^3 \theta + 5 \cos \theta$ .
- 12)  $\left(\frac{5}{7}, \frac{2\sqrt{6}}{7}\right)$  is a point on the terminal side of an angle  $\theta$  in standard position. Determine the six trigonometric function values of angle  $\theta$ .
- 13) Show that  $\cos 10^\circ \cos 30^\circ \cos 50^\circ \cos 70^\circ = \frac{3}{16}$ .
- 14) In any  $\triangle ABC$ , prove that  $a \cos A + b \cos B + c \cos C = \frac{8\Delta^2}{abc}$ .

**Answer the following:- (Question no 17 is compulsory)**

**5 x 2 = 10**

- 15) The largest side of any triangle is opposite to the largest angle. (Prove)
- 16) Derive area of segment formula
- 17) Find the values of (i)  $\sin(-45^\circ)$  (ii)  $\cos(-45^\circ)$
- 18) Prove that  $\tan(315^\circ) \cot(-405^\circ) + \cot(495^\circ) \tan(-585^\circ) = 2$
- 19) If  $\theta$  is an acute angle, then find  
 $\sin\left(\frac{\pi}{4} - \frac{\theta}{2}\right)$ , when  $\sin \theta = \frac{1}{25}$ .
- 20) Simplify  $\frac{\sin 75^\circ - \sin 15^\circ}{\cos 75^\circ + \cos 15^\circ}$
- 21) Solve  $3 \cos^2 \theta = \sin^2 \theta$