NTS GAT General Past Papers Questions

Quantitative – Exam No. 17

Trigonometry

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Formulas:

$$\sin\theta = \frac{1}{\csc\theta} \quad \text{OR} \quad \csc\theta = \frac{1}{\sin\theta}$$

$$\cos\theta = \frac{1}{\sec\theta} \quad \text{OR} \quad \sec\theta = \frac{1}{\cos\theta}$$

$$\tan\theta = \frac{1}{\cot\theta} \quad \text{OR} \quad \cot\theta = \frac{1}{\tan\theta}$$

$$\tan\theta = \frac{\sin\theta}{\cos\theta} \quad \text{OR} \quad \cot\theta = \frac{\cos\theta}{\sin\theta}$$

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

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

$$\cot^2\theta + 1 = \csc^2\theta \text{ (PP)}$$

$$\sin 2\theta = 2\sin\theta\cos\theta \text{ (PP)}$$

Angle	sin	cos	tan
0	0	1	0
30	1/2	$\sqrt{3}/2$	$1/\sqrt{3}$
45	$1/\sqrt{2}$	$1/\sqrt{2}$	1
60	$\sqrt{3}/2$	1/2 (PP)	$\sqrt{3}$
90	1	0	$\propto$

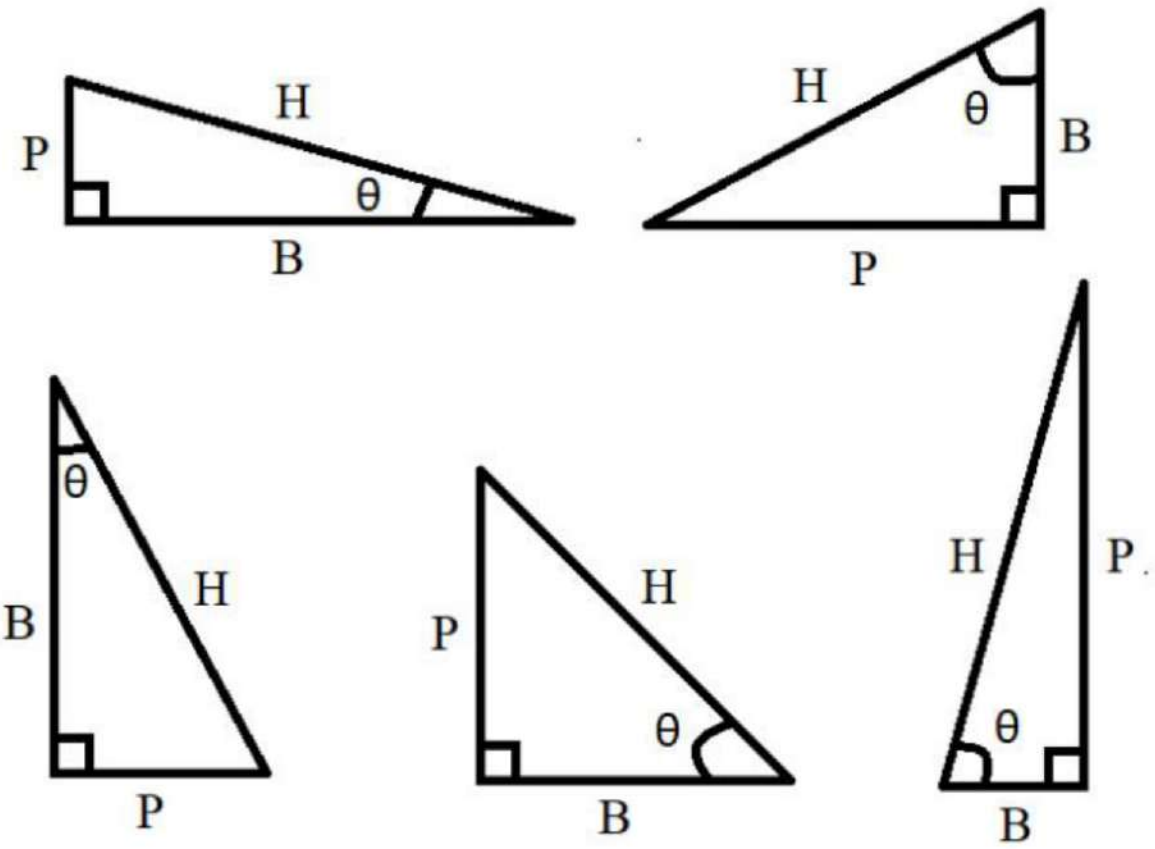
$$\sin\theta = \frac{Perpendicular}{Hypotenuse} \quad \text{OR} \quad \csc\theta = \frac{Hypotenuse}{Perpendicular}$$

$$\cos\theta = \frac{Base}{Hypotenuse} \quad \text{OR} \quad \sec\theta = \frac{Hypotenuse}{Base}$$

$$\tan\theta = \frac{Perpendicular}{Base} \quad \text{OR} \quad \cot\theta = \frac{Base}{Perpendicular}$$

Recognition of Hypotenuse, Perpendicular and Base:

The side of the triangle which is in front of 90 degree angle is called hypotenuse. The side of the triangle which is in front of angle θ is called perpendicular. The remaining side of the triangle will be base of the triangle. The following examples will clarify the concept of hypotenuse, perpendicular and base.



Exercise:

1. Simplify: (PP)

$$\cot\theta \times \frac{1}{\csc\theta} \times \frac{2}{\sin 2\theta}$$

Solution:

$$= \frac{\cos\theta}{\sin\theta} \times \sin\theta \times \frac{2}{2\sin\theta\cos\theta}$$

$$= \frac{1}{\sin\theta} = \csc\theta$$

2. Simplify: (PP)

$$\frac{1}{\sec\theta} \times \cot\theta \times \sin^2\theta$$

Solution:

$$= \cos\theta \times \frac{\cos\theta}{\sin\theta} \times \sin^2\theta$$

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

3. Simplify:

$$\sec\theta \times \frac{1}{\cos\theta} - 1$$

Solution:

$$= \sec\theta \times \sec\theta - 1$$

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

4. Simplify: (PP)

$$(\sec\theta - \tan\theta)(\sec\theta + \tan\theta)$$

Solution:

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

5. Simplify: (PP)

$$\frac{1}{1+\sin\theta} + \frac{1}{1-\sin\theta}$$

Solution:

$$= \frac{1 - \sin\theta + 1 + \sin\theta}{(1 + \sin\theta)(1 - \sin\theta)}$$

$$= \frac{2}{1 - \sin^2\theta}$$

$$= \frac{2}{\cos^2\theta} = 2\sec^2\theta$$

6. Simplify: (PP)

$$\sec\theta \csc\theta \cos\theta \sin\theta$$

Solution:

$$= \frac{1}{\cos\theta}\frac{1}{\sin\theta}\cos\theta \sin\theta = 1$$

7. Simplify: (PP)

$$\cos\theta \times \cot\theta \times \sin\theta$$

Solution:

$$= \cos\theta \times \cot\theta \times \sin\theta$$

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

$$= \cos\theta \times \cos\theta$$

$$= \cos^2\theta$$

8. If $a = \cos\theta$ and $b = \sin\theta$, then for all θ, $a^2 + b^2 = ?$ (PP)

Solution:

We have to find the value of $a^2 + b^2$. By putting the value of a and b, we get:

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

$$a^2 + b^2 = \cos^2\theta + \sin^2\theta$$

$$a^2 + b^2 = 1$$

9. Simplify: (PP)

$$(1 + \cos x)(1 - \cos x)$$

Solution:

$$= (1 + \cos x)(1 - \cos x)$$
$$= 1 - \cos^2 x = \sin^2 x$$

10. Simplify: (PP)

$$\frac{1}{\cos x} \times \frac{1}{\tan x} \times \sin^2 x$$

Solution:

$$= \frac{1}{\cos x} \times \frac{1}{\tan x} \times \sin^2 x$$
$$= \frac{1}{\cos x} \times \frac{1}{\frac{\sin x}{\cos x}} \times \sin^2 x$$
$$= \frac{1}{\cos x} \times \frac{\cos x}{\sin x} \times \sin^2 x$$
$$= \sin x$$

11. Simplify: (PP)

$$\tan x + \cot x$$

Solution:

$$= \tan x + \cot x$$
$$= \frac{\sin x}{\cos x} + \frac{\cos x}{\sin x}$$
$$= \frac{\sin^2 x + \cos^2 x}{\cos x \sin x}$$
$$= \frac{1}{\cos x \sin x}$$
$$= \frac{1}{\cos x} \cdot \frac{1}{\sin x}$$
$$= \sec x \cdot \csc x$$

12. Find the value of $\cos A$ if: (PP)

$$\frac{\cos A}{\sin A \times \tan A} = 16$$

Solution:

$$\frac{\cos A}{\sin A \times \frac{\sin A}{\cos A}} = 16$$

$$\frac{\cos^2 A}{\sin^2 A} = 16$$

$$\sqrt{\frac{\cos^2 A}{\sin^2 A}} = \sqrt{16}$$

$$\frac{\cos A}{\sin A} = 4$$

$$\cos A = 4 \sin A$$

$$\frac{Base}{Hypotenuse} = \frac{4 \times Perpendicular}{Hypotenuse}$$

$$Base = 4 \times Perpendicular$$

$$\frac{1}{4} = \frac{Perpendicular}{Base}$$

We know that:

$$(Hypotenuse)^2 = (Base)^2 + (Perpendicular)^2$$

$$\sqrt{(Hypotenuse)^2} = \sqrt{(4)^2 + (1)^2}$$

$$Hypotenuse = \sqrt{16 + 1} = \sqrt{17}$$

We have to find the value of $\cos A$, so:

$$\cos A = \frac{Base}{Hypotenuse}$$

$$\cos A = \frac{4}{\sqrt{17}}$$