I. *Proving Trigonometric identities*

1. Prove that $\sin^2 A - \cos^2 A = 2\sin^2 A - 1 = 1 - 2\cos^2 A$.

2. Prove that $\sin x(\operatorname{cosec} x - \sin x) = \cos^2 x$.

3. Prove that $(\sin A + \cos A)^2 + (\sin A - \cos A)^2 = 2$.

4. Prove that $(1 + \tan A)^2 + (1 - \tan A)^2 = 2\sec^2 A$.

5. Prove that $(\cot A - 1)^2 + (\cot A + 1)^2 = 2\operatorname{cosec}^2 A$

6. Prove that $\dfrac{\operatorname{cosec} A}{\operatorname{cosec} A - 1} + \dfrac{\operatorname{cosec} A}{\operatorname{cosec} A + 1} = 2\sec^2 A$.

7. Prove that $\dfrac{\sec A}{\sec A - 1} + \dfrac{\sec A}{\sec A + 1} = 2\operatorname{cosec}^2 A$.

8. Prove that $\dfrac{1 + \sin\theta}{\cos\theta} + \dfrac{\cos\theta}{1 + \sin\theta} = 2\sec\theta$.

9. Prove that $\dfrac{\sin A}{1 + \cos A} + \dfrac{1 + \cos A}{\sin A} = 2\operatorname{cosec} A$.

10. Prove that $\dfrac{1 + \sin A}{\cos A} = \dfrac{\cos A}{1 - \sin A}$.

11. Prove that $\tan x + \cot x = \sec x \cdot \operatorname{cosec} x$.

12. Prove that $\sec^2 x + \operatorname{cosec}^2 x = \sec^2 x \cdot \operatorname{cosec}^2 x$.

II. *Finding values of other T-function(Given one function)*

1. If $\sin\theta = \dfrac{3}{5}$, find $\cos\theta$ and $\tan\theta$ (θ is acute).

2. If $\cos\theta = \dfrac{\sqrt{3}}{2}$, find $\sin\theta$ and $\tan\theta$ (θ is acute).

3. If $\sin\theta = \dfrac{5}{13}$, find $\sec\theta$ (θ is acute)

4. If $\cos\theta = \dfrac{4}{5}$ and θ is in the first quadrant, find $\sin\theta$ and $\tan\theta$.

5. If $\tan\theta = \dfrac{3}{4}$ and θ is in the third quadrant, find $\sec\theta$ and $\sin\theta$.

6. If $\sin A = \dfrac{1}{2}$ and B is in the first quadrant, find other t-functions.

7. If $\cos\theta = \dfrac{-4}{5}$ and θ is in the third quadrant, find the remaining t-functions of θ.

8. If $\cos x = \dfrac{-4}{5}$ and x is in the second quadrant, find the remaining t-functions of x.

9. If $\cot A = \dfrac{-15}{8}$ and A lies in the fourth quadrant, find the remaining t-functions.

10. If $\sin B = \frac{3}{5}$ and B is in the second quadrant, find other t-functions.

11. If $\sin\theta = \frac{-3}{5}$, θ is in the third quadrant, find the value of $\frac{4\sec\theta + 3\cot\theta}{4\tan\theta + 5\cos\theta}$.

III. *Values of T- functions at standard angles*

1. Show that $\sin 60^\circ \cdot \cos 30^\circ - \cos 60^\circ \cdot \sin 30^\circ = \frac{1}{2}$.

2. Find the value of $\cos 30^\circ \cdot \cos 60^\circ + \sin 30^\circ \cdot \sin 60^\circ$.

3. Find the value of $\cos 45^\circ \cdot \cos 60^\circ - \sin 45^\circ \cdot \sin 60^\circ$.

4. Find the value of $\sin 30^\circ \cdot \cos 60^\circ + \cos 30^\circ \cdot \sin 60^\circ$.

5. Prove that $\tan^2 30 + \tan^2 45 + \tan^2 60 = \frac{13}{3}$.

6. Evaluate $\tan^2 60^0 + 3\tan^2 45^0$.

7. Verify that $\sin 2\theta = \frac{2\tan\theta}{1+\tan^2\theta}$ if $\theta = 30^0$.

8. Verify that $\tan 2\theta = \frac{2\tan\theta}{1-\tan^2\theta}$ if $\theta = 30^0$.

9. Evaluate $4\sin^3\frac{\pi}{3} - 3\cos\frac{\pi}{6}$.

10. Evaluate $\frac{\sin^2\frac{\pi}{3} + \cos^2\frac{\pi}{6}}{2\sin\frac{\pi}{6} + 3\tan\frac{\pi}{4}}$.

11. Prove that $\frac{\tan 60 - \tan 45}{1 + \tan 60 \cdot \tan 45} = 2 - \sqrt{3}$.

IV. *Signs of T-functions in different quadrants*

1. Determine the sign of the following:

   (i) $\cos 140^0$ (ii) $\sin 340^0$ (iii) $\text{cosec}(-20^0)$ (iv) $\tan 500^0$ (v) $\cos(-420^0)$

2. Determine the sign of the following, if $0 < \theta < 90$,

   (i) $\sin(180^0 - \theta)$ (ii) $\tan(270^0 + \theta)$ (iii) $\text{cosec}(90^0 + \theta)$ (iv) $\sec(810^0 + \theta)$ (v) $\cos(\theta - 540^0)$

3. Write down the signs of the following

   (i) $\cot(1080^0 + x),\ 0 < x < 90^0$ (ii) $\cot(-97^0)$ (iii) $\sec(360^0 - x),\ 0 < x < 90^0$

V. *Graph of T-functions*

1. Draw the graph of $y = \sin 2x$. 2. Draw the graph of $y = \sin 3x$. 3. Draw the graph of $y = \cos 2x$.