NCERT – GRADE 10 CHEAT SHEET

TRIGONOMETRIC IDENTITIES

(TRIGONOMETRIC RATIOS, FUNDAMENTAL IDENTITIES AND SIMPLIFICATION)

Pumpa

1 CHAPTER SNAPSHOT

This chapter covers:

- Trigonometric ratios of an acute angle;
- Relationships between $\sin A$, $\cos A$, $\tan A$, $\cot A$, $\sec A$, $\operatorname{cosec} A$;
- Proving and applying trigonometric identities.

An identity is true for every angle for which both sides are defined.

2 KEY CONCEPTS

★ **Reciprocal Ratios:**

$$\operatorname{cosec} A = \frac{1}{\sin A}, \quad \sec A = \frac{1}{\cos A}, \quad \cot A = \frac{1}{\tan A}$$

★ **Quotient Ratios:**

$$\tan A = \frac{\sin A}{\cos A}, \quad \cot A = \frac{\cos A}{\sin A}$$

★ **Important Identities (Examples):**

$$\sin^2 A + \cos^2 A = 1, \quad 1 + \tan^2 A = \sec^2 A,$$
$$1 + \cot^2 A = \operatorname{cosec}^2 A$$

3 FUNDAMENTAL TRIGONOMETRIC IDENTITIES

$$\sin^2 A + \cos^2 A = 1$$
$$1 + \tan^2 A = \sec^2 A$$
$$1 + \cot^2 A = \operatorname{cosec}^2 A$$

Note:

Divide $\sin^2 A + \cos^2 A = 1$ by $\cos^2 A$ to get $1 + \tan^2 A = \sec^2 A$; divide by $\sin^2 A$ to get $1 + \cot^2 A = \operatorname{cosec}^2 A$.

Example:

$$\frac{1 - \sin^2 A}{\cos^2 A} = \frac{\cos^2 A}{\cos^2 A} = 1$$

4 FORMULA BOX

Reciprocal Identities:

$$\sin A = \frac{1}{\operatorname{cosec} A}$$
$$\cos A = \frac{1}{\sec A}$$
$$\tan A = \frac{1}{\cot A}$$

Quotient Identities:

$$\tan A = \frac{\sin A}{\cos A}$$
$$\cot A = \frac{\cos A}{\sin A}$$

Pythagorean Identities:

$$\sin^2 A + \cos^2 A = 1$$
$$\sec^2 A - \tan^2 A = 1$$
$$\operatorname{cosec}^2 A - \cot^2 A = 1$$

5 FORMULAE & PROPERTIES

1. $\sin^2 A + \cos^2 A = 1$
2. $\sec^2 A - \tan^2 A = 1$
3. $\operatorname{cosec}^2 A - \cot^2 A = 1$
4. $\tan A \times \cot A = 1$ (where defined)
5. $\sec A \times \cos A = 1$ and $\operatorname{cosec} A \times \sin A = 1$ (where defined)

Denominators must not be zero.

6 BOARD EXAM FOCUS & HOTSPOTS

Common Question Types:

- Prove an identity by simplifying one side.
- Convert all ratios to sin and cos.
- Simplify algebraic expressions using fundamental identities.
- Find an unknown ratio given one ratio and an angle in the acute-angle context.
- True/False and Assertion–Reason questions on identities.

Example:

$$\frac{\sec^2 A - 1}{\tan^2 A} = \frac{\tan^2 A}{\tan^2 A} = 1$$

7 APPLICATIONS

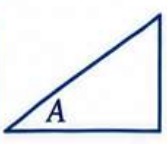
1. Simplifying expressions: reduce complex ratios to a simple value.
2. Proving identities: establish equality of two trigonometric expressions.
3. Finding unknown ratios: use one identity to calculate related ratios for acute angles.
4. Checking equivalent forms: rewrite identities using reciprocal and quotient relationships.

8 VISUAL MEMORY AID

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

Divide by $\cos^2 A$ → $1 + \tan^2 A = \sec^2 A$

Divide by $\sin^2 A$ → $1 + \cot^2 A = \operatorname{cosec}^2 A$



$$\tan A = \frac{\sin A}{\cos A}$$
$$\cot A = \frac{\cos A}{\sin A}$$

9 30-SECOND RAPID REVISION

- Fundamental identity: $\sin^2 A + \cos^2 A = 1$.
- From it:
  - $\sec^2 A - \tan^2 A = 1$
  - $\operatorname{cosec}^2 A - \cot^2 A = 1$.
- $\tan A = \frac{\sin A}{\cos A}$, $\cot A = \frac{\cos A}{\sin A}$.
- Use one side at a time when proving. Avoid dividing by an expression that may be zero.

10 KEY TAKEAWAY

Fundamental identities connect all six trigonometric ratios and help simplify expressions and prove identities accurately.

★ **Remember:** Start with one side, use a suitable identity, simplify carefully, and never divide by zero.