CLASS 9 – NCERT

PROPOSITION AND THEIR CONVERSE

(With Counterexample)



1 KEY CONCEPTS

- **Proposition:** A statement that can be true or false.
- **Converse:** The statement obtained by interchanging the hypothesis and conclusion of a proposition.
- **Counterexample:** An example that shows a statement is false.
- **Note:** A proposition and its converse may both be true, both be false, or one may be true and the other false.

2 HOW TO WRITE

Proposition

If p, then q.

$p \Rightarrow$ hypothesis
$q \Rightarrow$ conclusion

Converse

If q, then p,

$q \Rightarrow$ hypothesis
$p \Rightarrow$ conclusion

3 EXAMPLE

Proposition:
If two triangles have the same area, then they are congruent.

Converse:
If two triangles are congruent, then they have the same area.

Both are false.
(A triangle with same area need not be congruent, and congruent triangles always have the same area, but the converse of the proposition is false as well.)

4 MORE EXAMPLES WITH COUNTEREXAMPLES

	Proposition	Converse	Counterexample (for converse)
1	If a number is divisible by 24, then it is divisible by 4 and 6.	If a number is divisible by 4 and 6, then it is divisible by 24.	12 is divisible by 4 and 6, but not by 24.
2	If n is a perfect square, then it has an odd number of factors.	If n has an odd number of factors, then it is a perfect square.	The converse is true (so no counterexample).
3	If two lines are parallel, then the corresponding angles are equal.	If the corresponding angles are equal, then the lines are parallel.	The converse is true (so no counterexample).
4	If the product of two numbers is zero, then at least one of the numbers is zero.	If at least one of the numbers is zero, then the product is zero.	The converse is true (so no counterexample).
5	If a quadrilateral is a square, then it is a rectangle.	If a quadrilateral is a rectangle, then it is a square.	A rectangle with sides 6 m and 4 m is not a square.

5 EXTRA EXAMPLES (FOR PRACTICE)

1. If a quadrilateral is a square, then all four of its angles are equal.
   (Every square has four 90° angles).
   Converse: If all four angles of a quadrilateral are equal, then it is a square.
   Counterexample: A rectangle also has four equal angles (all 90°), but it is not necessarily a square (its adjacent sides can have different lengths, such as 6 cm × 4 cm).
2. If a number is a multiple of 6, then it is a multiple of 3.
   (Any number divisible by 6 is also divisible by 3, because $6k = 3 \times 2k$).
   Converse: If a number is a multiple of 3, then it is a multiple of 6.
   Counterexample: 9 is a multiple of 3, but not a multiple of 6).
3. If a and b are perfect squares, then a + b is a perfect square.
   Converse: If a + b is a perfect square, then a and b are perfect squares.
4. If a figure is a square, then its diagonals are equal.
   Converse: If a figure has equal diagonals, then it is a square.
5. If two triangles have the same perimeter, then they are congruent.
   Converse: If two triangles are congruent, then they have the same perimeter.

6 IMPORTANT POINTS

- ✓ A proposition and its **converse** may **both be true, both be false,** or one may be true and the other false.
- ✓ To show a statement is false, **give a counterexample.**
- ✓ A counterexample must satisfy the given condition but not the conclusion (for the converse).
- ✓ In geometry, diagrams and clear reasoning help in identifying counterexamples.

7 COMMON VARIATIONS (FOR PRACTICE)

1. Rewrite the converse of the given proposition.
2. Find the counterexample for the converse.
3. Give a proposition and its converse for the given statement.
4. Determine whether the converse is true/false, and justify.
5. Form a counterexample for a given converse statement.

8 QUICK REVISION

Proposition → $p \Rightarrow q$
Converse → $q \Rightarrow p$

To prove false → Give a counterexample.

Remember →
Both can be true, both can be false, or one can be true and the other false.

9 KEY TAKEAWAY

- A proposition is a statement that can be true or false.
- The converse is formed by interchanging the hypothesis and conclusion.
- A counterexample shows a statement is false.
- Always check both directions before concluding.

★ Think ★ Apply ★ Score Higher ★