Mathematics — Ganita Manjari

Chapter 9 Test 1

Propositions and their Converses

Class IX | 2026–27

Time Allowed: 45 Minutes | Maximum Marks: 25

General Instructions

1. All 13 questions are compulsory. The paper has four sections: A, B, C and D.
2. Section A: 5 × 1 = 5 marks; Section B: 4 × 2 = 8 marks; Section C: 3 × 3 = 9 marks; Section D: 1 × 3 = 3 marks.
3. Select one correct option in Section A. Follow the directions given in each later section.
4. Give clear reasons or counterexamples wherever asked. Use of calculators is not allowed.

SECTION A

(5 questions × 1 mark = 5 marks)

1. Which of the following is a proposition?

(A) Draw a triangle.

(B) Is 7 a prime number?

(C) Every square has four equal sides.

(D) Find the factors of 12.

2. Which is the converse of "If n is divisible by 6, then n is divisible by 3"?

(A) If n is divisible by 6, then n is divisible by 3.

(B) If n is divisible by 3, then n is divisible by 6.

(C) If n is not divisible by 6, then n is not divisible by 3.

(D) If n is divisible by 6, then n is divisible by 2.

3. If p is a prime number, how many positive factors does p^2 have?

(A) 2 (B) 3

(C) 4 (D) 5

4. Which statement is true for all real numbers x and y?

(A) $x^2 = y^2$ implies $x = y$. (B) $x + y = 0$ implies $x = y$.

(C) $xy = 1$ implies $x = y$. (D) $x^3 = y^3$ implies $x = y$.

5. Which value of n gives a counterexample to the claim "$4n^2 + 1$ is prime for every positive integer n"?

(A) 1 (B) 2

(C) 3 (D) 4

SECTION B

(4 questions × 2 marks = 8 marks)

For Questions 6–9, write the converse and state whether the original proposition and its converse are true or false. Justifications are not required in this section.

6. If a quadrilateral is a square, then all its angles are equal.

7. For real numbers x and y: if $x = y$, then $x^2 = y^2$.

8. For a positive integer n: if n is divisible by 60, then it is divisible by both 5 and 12.

9. For a positive integer n: if n is the product of two distinct prime numbers, then it has exactly four positive factors.

SECTION C

(3 questions × 3 marks = 9 marks)

10. Let a and b be nonnegative integers. Consider the proposition: "If a and b are perfect squares, then ab is a perfect square."

(i) Justify the proposition. (1 mark)

(ii) Write its converse. (1 mark)

(iii) Is the converse true? If not, give a counterexample. (1 mark)

11. Prove both of the following statements using factor pairs:

(i) If a positive integer is a perfect square, it has an odd number of positive factors.

(ii) If a positive integer has an odd number of positive factors, it is a perfect square.

12. In triangle ABC, $BC = a$, $CA = b$ and $AB = c$, with $a^2 + b^2 = c^2$. Prove that $\angle C = 90°$.

SECTION D

(1 application question × 3 marks = 3 marks)

13. Riya wants to construct a quadrilateral of type Q using two sticks as its diagonals. Consider these two possible rules separately:

Rule I: If a quadrilateral is of type Q, then its diagonals are equal.
Rule II: If a quadrilateral has equal diagonals, then it is of type Q.

(i) Under Rule I, must the two sticks have equal lengths? Give a reason. (1 mark)

(ii) Using only Rule I, can Riya conclude that equal sticks guarantee a quadrilateral of type Q? Give a reason. (1 mark)

(iii) Under Rule II, do equal sticks guarantee a quadrilateral of type Q, provided their endpoints form a valid quadrilateral? Give a reason. (1 mark)