CLASS IX – MATHEMATICS

Chapter Test: Propositions and their Converses

(Ganita Manjari, Grade 9, Part II – Chapter 9)

Time: 1½ Hours **M. M.: 40**

General Instructions:

1. This paper contains 21 questions. All questions are compulsory.
2. This paper is divided into 5 sections: **A, B, C, D** and **E**.
3. In **Section A**, Questions no. **1** to **10** are MCQs and questions no. **11** and **12** are Assertion-Reason based questions of 1 mark each.
4. In **Section B**, Questions no. **13** to **16** are Very Short Answer type questions carrying 2 marks each.
5. In **Section C**, Questions no. **17** and **18** are Short Answer type questions carrying 3 marks each.
6. In **Section D**, Questions no. **19** and **20** are Long Answer type questions carrying 5 marks each.
7. In **Section E**, Question no. **21** is a case based question carrying 4 marks. Internal choice is provided in the 2 marks part of the case study.
8. There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 2 questions in Section C, 2 questions in Section D and 1 part of Section E.
9. Justify every true statement and give a counterexample for every false one. Figures are not drawn to scale.
10. Use of calculator is **not** allowed.

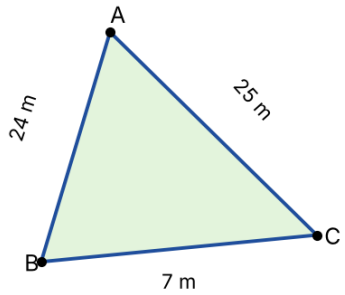
Q. No.	Section – A	Marks
1.	The converse of the proposition "If a number is divisible by 10, then it is divisible by 5" is (A) If a number is not divisible by 10, then it is not divisible by 5 (B) If a number is divisible by 5, then it is divisible by 10 (C) If a number is divisible by 10, then it is not divisible by 5 (D) If a number is divisible by 5, then it is divisible by 2	**[1]**
2.	Which of the following is the converse of "If it is Sunday, then the school is closed"? (A) If it is not Sunday, then the school is open (B) If the school is open, then it is not Sunday (C) If the school is closed, then it is Sunday (D) If it is Sunday, then the school is open	**[1]**
3.	Which value of n is a counterexample to the statement "If n is an odd number greater than 1, then n is prime"? (A) 3 (B) 7 (C) 11 (D) 9	**[1]**
4.	For which of the following propositions is the converse also true? (A) If a number is divisible by 6, then it is divisible by 3 (B) If a number is a perfect square, then it has an odd number of factors (C) If a quadrilateral is a square, then it is a rectangle (D) If $x = y$, then $x^2 = y^2$	**[1]**
5.	A counterexample to the converse of "If $x = y$, then $x^2 = y^2$" (x, y real numbers) is (A) $x = 3, y = -3$ (B) $x = 3, y = 3$ (C) $x = 2, y = 5$ (D) $x = 0, y = 0$	**[1]**
6.	Which of the following numbers has an odd number of factors? (A) 24 (B) 50 (C) 36 (D) 60	**[1]**
7.	The number of divisors of 77 (a product of two unequal primes) is (A) 4 (B) 2 (C) 3 (D) 6	**[1]**

Q. No.	Section – A	Marks
8.	The statement "A number has an odd number of factors when it is a perfect square" has the same meaning as (A) If a number has an odd number of factors, then it is a perfect square (B) If a number is not a perfect square, then it has an odd number of factors (C) If a number has an even number of factors, then it is a perfect square (D) If a number is a perfect square, then it has an odd number of factors	**[1]**
9.	A triangle has sides 9 cm, 12 cm and 15 cm. By the converse of the Baudhāyana–Pythagoras theorem, it is right-angled at the vertex opposite the side of length (A) 9 cm (B) 15 cm (C) 12 cm (D) it is not right-angled	**[1]**
10.	A counterexample to "If a quadrilateral has equal diagonals, then it is a rectangle" is a (A) square (B) rhombus (C) isosceles trapezium (D) parallelogram	**[1]**
	Questions number 11 and 12 are Assertion and Reason based questions. Two statements are given, one labelled as Assertion (A) and the other labelled as Reason (R). Select the correct answer from the options (A), (B), (C) and (D) as given below. (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A). (B) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion (A). (C) Assertion (A) is true but Reason (R) is false. (D) Assertion (A) is false but Reason (R) is true.	
11.	**Assertion (A):** The converse of a true proposition is always true. **Reason (R):** "If it rains, then the road is wet" is true, but "If the road is wet, then it has rained" may be false.	**[1]**
12.	**Assertion (A):** If n is the square of a prime number, then n has exactly 3 factors. **Reason (R):** The square of a prime p has exactly the factors 1, p and p^2.	**[1]**

Q. No.	Section – B	Marks
13.	Write the converse of "If two lines are parallel, then the alternate interior angles formed by a transversal are equal." Is the converse true?	**[2]**
14.	(A) Give a counterexample to the statement "If n is a prime number, then n is odd." **OR** (B) Give a counterexample to the claim "All numbers of the form $n^2 + n + 41$ are prime."	**[2]**
15.	Consider the proposition "If a number is divisible by 54, then it is divisible by both 6 and 9." Frame its converse. Is the converse true? Give a counterexample if it is false.	**[2]**
16.	(A) Is a triangle with sides 8 cm, 15 cm and 17 cm right-angled? Give a reason and name the theorem you use. **OR** (B) Is a triangle with sides 9 cm, 12 cm and 16 cm right-angled? Give a reason.	**[2]**

Q. No.	Section – C	Marks
17.	(A) Frame the converse of "If n is the square of a prime number, then n has exactly 3 factors." Is the converse true? Justify your answer. **OR** (B) Frame the converse of "If two triangles are congruent, then they have equal perimeters." Is the converse true? Justify, or give a counterexample.	**[3]**
18.	(A) Prove that if two angles of a triangle are equal, then the sides opposite to them are equal. (Hint: draw the altitude from the third vertex.) **OR** (B) Consider "If a number ends in 5, then it is divisible by 5." Justify this statement, frame its converse and show that the converse is false.	**[3]**

Q. No.	Section – D	Marks
19.	(A) (i) Frame the converse of "If a triangle is equilateral, then it is isosceles." Is it true? Give a counterexample if it is false. [2] (ii) Frame the converse of "If a quadrilateral is a square, then it is a rhombus." Is it true? Give a counterexample if it is false. [2] (iii) Give one proposition of your own for which both the proposition and its converse are true. [1] **OR** (B) State the converse of the Baudhāyana–Pythagoras theorem and prove it: if $a^2 + b^2 = c^2$ for the sides a, b, c of a triangle ABC, then the triangle is right-angled. (Hint: construct a right triangle XYZ with perpendicular sides a and b.)	**[5]**
20.	(A) (i) List all the factors of 36 as factor-partner pairs. How many factors does it have, and which pair is special? [2] (ii) State the proposition "If n is a perfect square, then it has an odd number of factors" and its converse. Using 49 and 50, show how the two statements behave. [2] (iii) Without listing factors, decide whether 200 has an odd or an even number of factors. [1] **OR** (B) Find a counterexample to each claim. (i) All numbers of the form $6n + 1$ are prime. [2] (ii) If n is a prime number, then $2^n - 1$ is a prime number. [2] (iii) If n is an even number, then $2^n + 1$ is a prime number. [1]	**[5]**

Q. No.	Section – E	Marks
21.	**Case Study:** A mason is laying out a triangular flower bed ABC in a park. To check whether one corner is a right angle, he measures the sides: AB = 24 m, BC = 7 m and AC = 25 m.  (i) State the converse of the Baudhāyana–Pythagoras theorem. **[1]** (ii) Using it, show that the bed is right-angled and name the vertex of the right angle. **[1]** (iii) (A) A second bed has sides 10 m, 11 m and 15 m. Is it right-angled? Justify. **[2]** **OR** (iii) (B) A third bed has sides 6 m, 8 m, 10 m and a fourth has sides 9 m, 12 m, 15 m. Both are right-angled. Is the statement "If two triangles are right-angled, then they are congruent" true? Justify. **[2]**	**[4]**