

**INDIAN SCHOOL SOHAR**  
**UNIT TEST**  
**SUB: MATHEMATICS**

STD: XI

MARKS: 50

DATE: 14.05.15

TIME: 2hrs

**General Instructions:**

1. All questions are compulsory.
2. The question paper consists of 15 questions divided into three sections A, B and C. Section A comprises of 6 questions of one mark each, section B comprises of 5 questions of four marks each and section C comprises of 4 questions of six marks each.
3. All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.
4. There is no overall choice. However, an internal choice has been provided in 2 questions of four marks each and 1 question of six marks. You have to attempt only one of the alternatives in all such questions.
5. Use of calculators is not permitted.

**SECTION – A**

1. Write the following set in set builder form,  $B = \left\{ \frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6} \right\}$
2. If  $A = \{1, 2, 3, 4\}$ ,  $B = \{3, 4, 5, 6\}$  and  $C = \{6, 7, 8, 9, 10\}$   $D = \{2, 4, 6\}$   
Find i)  $(A \cap B) \times D$     ii)  $C - B$
3. A function  $f : R \rightarrow R$  is defined by  $f(x) = x^2$ . Determine (i) Range of  $f$  (ii)  $\{y : f(y) = -1\}$
4. Determine the domain and range of the following relation:  
 $R = \{(a, b) : b = |a - 1|, a \in Z \text{ and } |a| \leq 3\}$
5. A circular wire of radius 7.5 cm is cut and bent so as to lie along the circumference of a hoop whose radius is 120 cm. Find in degrees the angle which is subtended at the centre of the hoop.
6. Evaluate:  $\cos 570^\circ \sin 510^\circ + \sin (-330^\circ) \cos (-390^\circ)$

**SECTION- B**

7. Find the domain and range of the real valued function  $f(x)$  given by;  $f(x) = \frac{x}{1+x^2}$

**OR**

Find the domain and range of the function  $f = \left\{ \left( x : \frac{1}{1-x^2} \right) : x \in R, x \neq \pm 1 \right\}$

8. a) Let  $R$  be the subset of  $Z \times Z$  defined by  $R = \{ (p + q, pq) : p, q \in Z \}$ . Is  $R$  a function from  $Z$  to  $Z$ ? Justify your answer.
- b) Let  $R$  be a relation on  $N$  defined by  $R = \{ (a, b) : a, b \in N \text{ and } a = b^2 \}$ . Are the following true (i)  $(a, a) \in R$  for all  $a \in N$  (ii)  $(a, b) \in R, (b, c) \in R \Rightarrow (a, c) \in R$ .
9. If  $A, B$  and  $C$  are any three sets, then prove that:  $A - (B \cup C) = (A - B) \cap (A - C)$
10. Solve the equation:  $\cot \theta + \operatorname{cosec} \theta = \sqrt{3}$

**OR**

Find the general solution for the following equation:  $\sqrt{3} \cos x + \sin x = \sqrt{2}$

11. There are 40 students in a chemistry class and 60 students in a physics class. Find the number of students which are either in physics class or chemistry class in the following cases: i) the two classes meet at the same hour ii) the two classes meet at different hours and 20 students are enrolled in both the subjects.

### SECTION- C

12. In any triangle  $ABC$ , prove that:  $(b - c) \cot \frac{A}{2} + (c - a) \cot \frac{B}{2} + (a - b) \cot \frac{C}{2} = 0$
13. In a survey of 25 students, it was found that 15 had taken Mathematics, 12 had taken Physics and 11 had taken Chemistry, 5 had taken Mathematics and Chemistry, 9 had taken Mathematics and Physics, 4 had taken physics and chemistry and 3 had taken all the three subjects. Find the number of students that had i) only Mathematics ii) Physics and chemistry but not Mathematics iii) none of the subjects iv) at least one of the subjects. *Explain the importance of studying mathematics and science in senior secondary stage.*
14. Prove that:  $\sin A \sin(60^\circ - A) \sin(60^\circ + A) = \frac{1}{4} \sin 3A$
15. Prove that:  $\cos(A + B) = \cos A \cos B - \sin A \sin B$

**OR**

Prove that:  $\cos(A - B) = \cos A \cos B + \sin A \sin B$

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