Question Paper (2016-2017)

CBSE Class XI Mathematics

General Instruction:

- All sections are compulsory
- The question paper of 28 questions divided into four sections A, B, C and D. Section A comprises of 4 questions of one mark each, Section B of 7 questions of two marks each, Section C comprises of 11 questions of three marks each and Section D comprises of 6 questions of four marks each.
- There is no overall choice. However, an internal choice has been provided in three questions of three marks each and three questions of four marks each. You have to attempt only one of the alternatives in all such questions.
- Use of calculator is not permitted.

SECTION – A

1. If $A = \{(x, y) : x^2 + y^2 = 25$ where $x, y \in W\}$, write a set of all possible ordered pairs.

2. Find the value of $X - y$ if $X = \{a, b, c, d\}$ and $Y = \{b, d, f, g\}$.

3. Solve 24 x < 100 where x is an integer.

4. If $\dfrac{1}{6!} + \dfrac{1}{8!} = \dfrac{1}{9!}$, find the value of x.

SECTION B

5. Find the multiplicative inverse of $4 - \sqrt{-9}$.

6. Prove that $\tan 15° + \cot 15° = 4$.

7. If $A = \{1, 2, 3\}$, $B = \{4, 5, 6\}$ and verify that $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$.

8. Solve $\dfrac{x}{4} > \dfrac{5x-2}{3} - \dfrac{7x-3}{5}$ and graph the solution set on the number line.

9. If $^{34}C_{r-6} = ^{34}C_{2r-2}$, find r.

10. How many different words can be formed with the letters of the word 'BHARAT'? How many of these begin with B and end with T?

11. Let $f\left(x+\dfrac{1}{x}\right) = x^2 + \dfrac{1}{x^2}, x \neq 0$ then find the value of f(x).

SECTION C

12. From the adjoining venn diagram, write the value of the following:

(i) A'

(ii) B'

(iii) $(A \cap B)'$

13. Let X and Y be two sets. X = {x: x is a nutural number and 1 < x ≤ 6}, : 1 6, Y = {X: x is natural number and 6 < x < 10. Find the value of:

(i) $X \cap Y$

(ii) $X \cup Y$

14. Let R be the relation on the set N of natural numbers defined by a + 3b + = 12. Find:

(i) R

(ii) Domain of R

(iii) Range of R

Here, $a, b \in N$

15. Find the domain of the real function F given by:

$$F(x) = \dfrac{1}{\sqrt{[x]^2 - [x] - 6}}$$

Find the range of the real function f if:

$$f(x) = \sqrt{25 - x^2}$$

16. Find the value of $\tan \dfrac{\pi}{8}$.

OR

Draw the graph of $y = \tan x, -\pi \le x \le \pi$

17. Prove that : $\cos\theta\cos\dfrac{\theta}{2} - \cos 3\theta\cos\dfrac{9\theta}{2} = \sin\dfrac{7\theta}{2}\sin 4\theta$

18. Find the general solution of the equation $\sqrt{3}\cos\theta + \sin\theta = \sqrt{2}$

OR

Find the general solutions of the equation sin 2x – sin4x + sin 6x = 0.

19. Using the principle of mathematical induction prove that for all $n \in N$:

$$1.3 + 2.3^2 + 3.3^3 + ... + n.3^n = \dfrac{(2n-1).3^{n+1} + 3}{4}$$

20. Convert the complex number $3\left(\cos\dfrac{5\pi}{3} - i\sin\dfrac{\pi}{6}\right)$ into polar form.

21. If $\dfrac{(1+i)^2}{2-i} = x + iy,$ then find the value of x y +

22. Solve the following system of inequalities graphically:

3x + 4y ≤ 60, x + 3y ≤ 30, x ≥ 0, y ≥ 0.

SECTION D

23. In an office, out of 3000 employees, the manager classified his employees on the basic of

sincerity, experience and productive. Out of these, 680 employees are sincere, 620 employees are experience and 650 employees are productive. 420 employees are both sincere and experienced, 450 employees are both experienced and productive and 600 employees are both sincere and productive. Also 400 employees are sincere, experienced and productive all. Find the number of employees who are either sincere or experienced of productive. What are the basic qualities required in an employee for the progress of an organization?

OR

Prove that : $2\sin^2\beta + 4\cos(\alpha+\beta)\sin\alpha\sin\beta + \cos 2(\alpha+\beta) = \cos 2\alpha$

25. Prove using principle of mathematical induction $\forall n \in N$, x^n - y^n is divisible by x – y.

OR

Prove by the principle of mathematical induction for all $n \in N$, $7^{2n} + 2^{3n-3}3^{n-1}$ is divisible by 25.

26. Solve the quadratic equation:

$2x^2 – (3 + 7i)x – 3(3 – 9i) = 0$

27. A manufactures has 600 litres of 12% solution of acid. How many litres of 30% acid solution must be added to its so that acid content in the resulting mixture will be more then 15% but less than 18% acid.

28. There was 10 points lie on a circle. By joining points how many lines and how many tringles can be drawn through these 10 points?

OR

A group consists of 4 girls and 7 boys. In how many ways can a team of 5 members be selected if the team has (i) no girl, (ii) at least 3 gi**rls?**