Question Paper (2015-2016) set 4
CBSE Class XI Mathematics

General Instruction:

- All the questions are compulsory.
- The Question Paper consists of 26 Questions divided into three sections A, B and C
- Section-A comprises of 6 questions of one mark each.
- Section-B consists of 13 questions of four marks each.
- Section-C comprises of 7 questions of Six marks each.
- There is no overall choice. However, an internal choice has been provided in 4 questions of four marks each and 2 questions of six marks each. You have to attempt only one of the alternatives in all such questions.
- Use of calculator is not permitted.

SECTION – A

1. A and B are two sets such that $A \subset B$. Find the value of $A \cup B$.

2. Find the conjugate of $\dfrac{1}{3+4i}$.

3. Write the contra-positive of the following conditional statement. If my grandmother had wheels, then she would be a bus'.

4. Find the length of transverse axis of the hyperbola $9x^2 – 16y^2 = 144$.

5. Write the negation of the following statement Australia is a continent'.

6. Check whether the following statement is true or not. 'If x and y are odd integers, then xy is an odd integer'.

Section B

7. If $f : R \to R$ is defined by f(x) = x and $g : R \to R$ is defined by g(x) = |x|. Then, find

(i) f + g (ii) f – g (iii) f. g (iv) $\dfrac{f}{g}$

OR

In a survey of 400 students in a school, 100 were listed as drinking apple juice, 150 as drinking orange juice and 75 were listed as drinking apple as well as orange juice. Find how many students were drinking neither apple juice nor orange juice?

8. Prove that $\cos 2\theta \cos \dfrac{\theta}{2} - \cos 3\theta \dfrac{9\theta}{2} = \sin 5\theta \sin \dfrac{5\theta}{2}$

9. The longest side of a triangle is twice the shortest side and the third side is 3 cm longer than the shortest side. If the perimeter of the triangle is at least 39 cm, then find the minimum length of the longest side.

10. To prove, $(\cos x - \cos y)^2 + (\sin x - \sin y)^2 = 4 \sin^2 \dfrac{x-y}{2}$

OR

Prove that $\cos^3 A \cos 3A + \sin^3 A \sin 3A = \cos^3 2A$

11. Find real θ, such that $\dfrac{3+2\sin\theta}{1-2i\sin\theta}$ is purely real.

12. The ratio of the sum of n terms of two AP's is (3n +1) : (4n + 3). Find the ratio of their m^{th} terms.

13. Find the mean and standard deviation for the following data using shortcut method.

x_i	60	61	62	63	64	65	66	67	68
f_i	2	1	12	29	25	120	10	4	5

14. How many words each of 3 vowels and 2 consonants can be formed from the letters of the word INVOLUTE?

15. Find the equation of the ellipse having axes along the coordinate axes and passing through the points (4, 3) and (-1, 4).

OR

Find the equation of the circle which passes through the centre of the circle $x^2 + y^2 + + 8x + 10y - 7 = 0$ and is concentric with the circle $2x^2 + 2y^2 - 8x - 12y - 9 = 0$.

16. Find the mean and standard deviation for the following data using shortcut method. Find the equation of the lines which cut-off intercepts on the axes whose sum and product are 1 and - 6, respectively.

17. Determine the values of a and b, so that the points (a, b, 3), (2, 0, -1) and (1, -1, 3) are collinear.

18. A group contains 10 men and 4 women. A three member committee is formed from the group. Find the probability that 2 are women and 1 is man. Write two benefits of including more women in panchayat committees.

19. Find the mean deviation about the median for the following distribution.

Class interval	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency	4	6	10	20	10	6	4

OR

Class interval	0-100	100-200	200-300	300-400	400-500	500-600	600-700	700-800
Frequency	4	8	9	10	7	5	4	3

Section C

20. There are 200 individuals with a skin disorder, 120had been exposed to the chemical C_1, 50 to chemical C_2 and 30 to both the chemicals C_1 and C_2. Find the number of individuals

exposed to

(i) chemical C_2 but not chemical C_1. (ii) chemical C_1 or chemical C_2.

What is the effects of using wrong chemicals on skin?

21. Prove the following by the Principle of Mathematical Induction for all $n \in N$,

$$\frac{1}{1.2.3} + \frac{1}{2.3.4} + \frac{1}{3.4.5} + \ldots + \frac{1}{n(n+1)(n+2)} == \frac{n(n+3)}{4(n+1)(n+2)}$$

OR

By using Principle of Mathematical Induction, prove that n(n + l)(2n + l) is divisible by 6 for all $n \in N$.

22. Solve the following equation $\tan\theta + \tan\left(\theta + \dfrac{2\pi}{3}\right) + \tan\left(\theta + \dfrac{2\pi}{3}\right) = 3$.

23. Solve the following system of linear in equations graphically.
2x + y ≥ 2, x − y ≤ 1, x + 2y ≤ 8, x ≥ 0 , y ≥ 0 .

24. If the coefficients of ar−1, ar , ar+1 in the binomial expansion of $(1+ a)^n$ are in AP, then prove that $n^2 - n(4r + 1) + 4r^2 - 2 = 0$.

25. The sum of two numbers is 6 times their geometric means, show that the numbers are in the ratio $\left(3 + 2\sqrt{2}\right) : \left(3 - 2\sqrt{2}\right)$.

OR

If S is the sum, P is the product and R is the sum of the reciprocals of n terms of a GP, then prove that

26. (i) Evaluate $\displaystyle\lim_{x \to \frac{\pi}{4}} \frac{1 - \tan x}{x - \dfrac{\pi}{4}}$.

(ii) Differentiate $x^3 \sqrt{2 + x}$ with respect to x.