MATHEMATICS *for* **Class XI**

ANNUAL EXAMINATION PAPER 2009
KVS

Max. Time : 3 hrs.   **Max. Marks : 100**

General Instructions :
(i)   All questions are compulsory.
(ii)   The question paper consists of 34 questions divided into 4 sections — A, B and C. **Section A** comprises of **ten questions** of **01 mark** each, **Section B** comprises of **twelve questions** of **04 marks** each, **Section C** comprises of **seven questions** of **06 marks** each.
(iii)   Use of calculators is not permitted. However you may ask for mathematical tables.

SECTION - A

Q1. Write power set of the set A = {a, b, c}.

Q2. Express – 47°30′ in radian measure.

Q3. What is the value of $\cot\left(\dfrac{-15\pi}{4}\right)$?

Q4. What is the probability that a letter choosen at random from word 'EQUATIONS' is a consonant?

Q5. A card is drawn from the pack of 52 cards. What is the probability that it is a king or queen?

Q6. Find the derivative of x sin x with respect to x.

Q7. Find the derivation of $\dfrac{1}{ax^2 + b}$ with respect to x.

Q8. Write the component statements of the compound statement "All prime numbers are either even or odd".

Q9. Write contraposivie of the statement "If you are born in India, then you are a citizen of India".

Q10. What is the eccentricity of hyperbola whose vertices and foci are $(\pm 2, 0)$ and $(\pm 3, 0)$ respectively?

SECTION - B

Q11. Evaluate : $\displaystyle\lim_{x \to \pi/2} \dfrac{1 + \cos 2x}{(\pi - 2x)^2}$

         Or

For the function $f(x) = \begin{cases} a + bx & , x < 1 \\ 4 & , x = 1 \\ b - ax & , x > 1 \end{cases}$

Q12. Find the equation circle which passes through (2, –2) and (3, 4) and whose centre lies on the line x + y = 2.

Q13. If $\sin x = \dfrac{3}{5}, \dfrac{\pi}{2} < x < \pi$ then find the value of cos x, tan x, sec x, and cot x.

Q14. Find the value of sin 15°.

Q15. Find the ratio in which yx-plane divides the line segment joining points (–2, 4, 7) and (3, –5, 8). Also find the coordinates of the point of intesection.

Q16. Using principle of mathematical induction, porve that:

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

Or

Using principle of mathematical induction. Prove taht:

$$(1+x)^n \geq (1+nx) \forall n \in N; x > -1$$

Q17. Write the complex number $\dfrac{1+2i}{1-3i}$ in its polar form.

Q18. Find image of the point P(–8, 12) with respect to the line mirror 4x + 7y + 13 = 0.

Or

Find the equation of the lines through the point (3, 2) which make an angle of 45° with the line x – 2y = 3.

Q19. Two students Anil and Ashima appeared in an examination. The probability that Anil will qualify the examination is 0.05 and that Ashima will qualify the examination is 0.10. The probability that atleast one of them qualify the examination is 0.13. Find the probability that only one of them will qualify the examination.

Q20. How many words can be made by using all letters of the word 'MATHEMATICS' in which all vowels are never together?

Q21. A mathematics question paper consists of 10 questions divided into two parts I and II, each containing 5 questions. A students is required to attempt 6 questions in all, taking at least 2 questions from each part. In how many ways can the student select the questions.

Q22. Find the sum of n terms of the series :

0.5 + 0.55 + 0.555 + ...n terms.

Or

Find the value of n so tath $\dfrac{a^{n+1} + b^{n+1}}{a^n + b^n}$ may be G.M. between a and b.

SECTION - C

Q23. Prove that :

$$\sin^2 A + \sin^2 \left(A + \dfrac{\pi}{3} \right) + \sin^2 \left(A + \dfrac{\pi}{3} \right) = \dfrac{3}{2}$$

Q24. In the expansion of $\left(x^2 - \dfrac{1}{x} \right)^{12}$, find (i) 4th term (ii) middle term and (iii) term independent of x.

Or

Find $(a+b)^4 - (a-b)^4$. Hence, evaluate $(\sqrt{3} + \sqrt{2})^4 - (\sqrt{3} - \sqrt{2})^4$.

Q25. The ratio of the A.M. and G.M. of two positive numbers a and b is m : n, show that :

$$a : b = \left(m + \sqrt{m^2 - n^2} \right) : \left(m - \sqrt{m^2 - n^2} \right).$$

Q26. In a survey of 5000 people in a town, 2250 were listed as reading English Newpaper, 1750 as reading Hindi News papaper and 875 were listed as reading both Hindi as well as English. Find how many people do not read Hindi or English Newspaper. Find how many people read only English Newspaper.

Q27. Draw the graph of $f(x) = |x - 2|, x \in R$. What are the domain and range of $f(x) = |x - 2|$?

Q28. Solve the following system of inequalities graphically:

$x + 2y \le 10$, $x + y \ge 1$, $x - y \le 0$, $x \ge 0$, $y \ge 0$

Q29. Calculate mean and standard deviation for the following data :

Classes	30 − 40	40 − 50	50 − 60	60 − 70	70 − 80	80 − 90	90 − 100
Frequency	3	7	12	15	8	3	2

Or

The mean and standard deviation of 20 observations are found to be 10 and 2 respectively. On rechecking, it was found that an observation 8 was incorrect. Calculat the correct mean and standard deviation if the wrong item is replaced by 12.

ANSWERS

1. $P(A) = \{\phi, \{a\}, \{b\}, \{c\}, \{a,b\}, \{b,c\}, \{c,a\}, \{c,a\}, \{a,b,c\}\}$ **2.** $-\dfrac{19\pi}{72}$ radian **3.** 1 **4.** $\dfrac{4}{9}$ **5.** $\dfrac{2}{13}$ **6.** $\sin x + \cos x$

7. $\dfrac{-2ax}{(ax^2+b)^2}$. **9.** "If you are not a citizen of India, then you were not born in India". **10.** $\dfrac{3}{2}$

11. $\dfrac{1}{2}$ **Or** $a = 0$ and $b = 4$. **12.** $\left(x - \dfrac{7}{10}\right)^2 + \left(y - \dfrac{13}{10}\right)^2 = \dfrac{1258}{100}$

13. $\cos x = -\dfrac{4}{5},\ \tan x = -\dfrac{3}{4},\ \sec x = -\dfrac{5}{4},\ \cot x = -\dfrac{4}{3}$ **14.** $\dfrac{\sqrt{3}-1}{2\sqrt{2}}$ **15.** 2 : 3 **17.** $\dfrac{1}{\sqrt{2}}\left(\cos\dfrac{3\pi}{4} + i\sin\dfrac{3\pi}{4}\right)$.

18. (–16,–2) **Or** $3x - y = 7$ and $x + 3y = 9$ **19.** 0.11 **20.** 4868640 **21.** 200 **22.** $\dfrac{5}{9}n - \dfrac{5}{81} + \dfrac{5}{81}(10)^n$. **Or** $-\dfrac{1}{2}$

24. $-220x^{15}$, $924x^6$, 495 **Or** $40\sqrt{6}$ **25.** $a : b = \left(m + \sqrt{m^2 - n^2}\right) : \left(m - \sqrt{m^2 - n^2}\right)$. **26.** 1375

27. R and R_0^+.

28. Region represented by $x + 2y \leq 10$

Region represented by $x + y \geq 1$

Region represented by $x - y \leq 0$

Region represented by $x \geq 0$

Region represented by $y \geq 0$

29. 201, 14.18 **Or** 2160, 1.99