CHANGE IN QP FOR CLASS XI IN 2019

Q. NOS. 1 – 30 (MCQ'S) WILL BE ASKED FROM THE GIVEN SYLLABUS OF CLASS XI ONLY IN 2019.

Summer Fields School
KAILASH COLONY, NEW DELHI-110048

Roll No.										

A

- Please check that this questionnaire contains **15** printed pages.
- Code A, B or C given on the right hand top corner of the questionnaire should be written on the answer sheet in the space provided.
- Please check that this questionnaire contains **60** questions.

35TH ARYABHATTA INTER-SCHOOL MATHEMATICS COMPETITION – 2018

CLASS - XI

Time Allowed: **2 Hours** Max. Marks: **100**

GENERAL INSTRUCTIONS:

1. Do not write your name on the questionnaire.
2. Write your roll no. on the questionnaire and the Answer Sheet in the space provided.
3. All the questions are compulsory.
4. Read questions carefully; think twice before you write the answer. **No overwriting or cutting is allowed on the Answer Sheet.** Another copy of the questionnaire or answer sheet will not be provided.
5. Do your rough work in the space provided in the questionnaire.
6. The questionnaire contains three sections. **Section A** contains 30 Multiple Choice Questions of 1mark each, **Section B** contains 20 Free Response Type Questions of 2 marks each and **Section C** contains 10 Free Response Type Questions of 3 marks each.
7. No working or descriptive answers of any question is to be given. Only the Answers are to be written on the Separate Answer sheet provided to you.
8. Use Blue or Black pens to write the answer on the Answer Sheet.
9. Answers should be written clearly in the space provided on the Answer sheet.
10. Use of calculator is not allowed.

SECTION-A

Write the correct option (A, B, C or D) in the Answer sheet.

1. The sum of all proper divisors of 9900 is
   (A) 33851 (B) 23951 (C) 23952 (D) none of these
2. Let t_r denotes the r^{th} term of an A. P. If $t_m = \frac{1}{n}$ and $t_n = \frac{1}{m}$ then t_{mn} is equal to
   (A) $\frac{1}{mn}$ (B) 1 (C) $\frac{1}{m}+\frac{1}{n}$ (D) 0
3. The sum of the real roots of the equation $x^2 + |x| - 6 = 0$ is
   (A) –1 (B) 4 (C) 0 (D) none of these
4. If $\sin\theta + \cos ec\theta = 2$ then the value of $\sin^{10}\theta + \cos ec^{10}\theta$ is equal to
   (A) 2^{10} (B) 2 (C) 2^5 (D) none of these
5. The value of k if the points (6, –3), (2, 3) and (4, k) are collinear, is
   (A) 0 (B) 1 (C) $\frac{3}{2}$ (D) $\frac{5}{2}$

SPACE FOR THE ROUGH WORK

6. The number of values of k for which the system of equations $(k+1)x+8y=4k,\quad kx+(k+3)y=3k-1$ has infinitely many solutions is

(A) 0 (B) 1 (C) 2 (D) infinite

7. Let S_r denotes the sum of first r terms of an A. P. then $\frac{S_{3r}-S_{r-1}}{S_{2r}-S_{2r-1}}$ is equal to

(A) $2r-1$ (B) $2r+1$ (C) $4r+1$ (D) $2r+3$

8. The mid points of the sides AB, BC and CA of a ΔABC are D (6, 1), E (3, 5) and F (–1, –2) respectively. The coordinates of the vertex opposite to D are

(A) (2, 3) (B) (–1, 4) (C) (–4, 2) (D) none of these

9. The volume of a container in the shape of a frustum of a cone of height 1.05 m with radii of its lower and upper ends as 30 cm and 70 cm respectively (in litre) is $\left(\text{use } \pi=\frac{22}{7}\right)$

(A) 869 (B) 896 (C) 962 (D) none of these

10. Let $\alpha\neq\beta$ and $\alpha^2+3=5\alpha$ while $\beta^2=5\beta-3$. The quadratic equation whose roots are $\frac{\alpha}{\beta}$ and $\frac{\beta}{\alpha}$ is

(A) $3x^2-31x+3=0$ (B) $3x^2-19x+3=0$ (C) $3x^2+19x+3=0$ (D) none of these

SPACE FOR THE ROUGH WORK

11. Three different numbers are selected at random from the set $A = \{1, 2, 3, ..., 10\}$. The probability that the product of two of the numbers is equal to the third, is

(A) $\frac{1}{40}$ (B) $\frac{3}{4}$ (C) $\frac{1}{8}$ (D) none of these

12. Given that $2^x = 8^{y+1}$ and $9^y = 3^{x-9}$, the value of $x + y$ is

(A) 24 (B) 21 (C) 18 (D) 27

13. A wire in the shape of a sector of a circle of angle 210^o is bent to form a full circle. The ratio of the areas enclosed by the sector and the circle is $\left(\text{use } \pi = \frac{22}{7}\right)$

(A) $\frac{21\pi^2}{289}$ (B) $\frac{36\pi^2}{289}$ (C) $\frac{24\pi^2}{289}$ (D) none of these

14. The sum of two numbers is 16. The sum of their reciprocals is $\frac{1}{3}$. The difference of the numbers is

(A) 6 (B) 7 (C) 3 (D) 8

15. The number of spherical bullets of 4cm diameter that can be made out of a solid cube of lead whose edge is 44cm is

(A) 2521 (B) 2531 (C) 2541 (D) 2532

SPACE FOR THE ROUGH WORK

16. An equilateral triangle of side 24 cm is circumscribing a circle. The area of the remaining portion of the triangle (in square cm) is $\left(\text{use } \pi = \frac{22}{7}, \sqrt{3} = 1.732\right)$

(A) 78.52 (B) 108.5 (C) 98.55 (D) none of these

17. Three letters are to be sent to three persons and an envelope is addressed to each of them. The letters are inserted into the envelopes at random so that each envelope contains exactly one letter. Find the probability that at least one letter is in its proper envelope.

(A) $\frac{1}{3}$ (B) $\frac{3}{4}$ (C) $\frac{2}{3}$ (D) none of these

18. The girl of height 90 cm is walking away from the base of a Lamp Post at a speed of 1.2 m/sec. If the lamp is 3.6m above the ground, then the length of her shadow after 4 seconds (in metre) is

(A) 2.0 (B) 2.4 (C) 1.6 (D) 2.1

19. If the sum of the roots of the equation $\frac{1}{x+a}+\frac{1}{x+b}=\frac{1}{c}$ is zero, then the product of the roots is

(A) $-\frac{1}{2}\left(a^2+b^2\right)$ (B) $-\frac{1}{2}\left(a^2+c^2\right)$ (C) $-\frac{1}{2}\left(b^2+c^2\right)$ (D) none of these

20. If a conical cup contains water equal to $\frac{1}{8}$ of its total volume, then the ratio of the height of the cone to the depth of water is

(A) $\frac{2}{1}$ (B) $\frac{1}{2}$ (C) $\frac{2}{3}$ (D) none of these

SPACE FOR THE ROUGH WORK

21. If x^2-1 is a factor of x^4+ax^3+3x-b then $a+b$ is equal to

(A) 2 (B) –2 (C) 4 (D) none of these

22. A chord AB of a circle of radius 10 cm makes a right angle at the centre of the circle. The area of the major segment (in sq cm) is (use π=3.14)

(A) 256.5 (B) 285.5 (C) 187.5 (D) none of these

23. The length of the tangent drawn from a point 8cm away from the center of a circle of radius 6 cm (in cm) is

(A) $\sqrt{7}$ (B) $2\sqrt{7}$ (C) 10 (D) 5

24. The unit digit of $14^{124}\times 29^{123}$ is

(A) 4 (B) 2 (C) 8 (D) 6

25. In an equilateral ΔABC, AD $\perp$ BC and $\frac{AD^2}{BC^2}=x,$ then x is equal to

(A) 3 (B) $\frac{3}{4}$ (C) $\frac{3}{2}$ (D) $\frac{2}{3}$

SPACE FOR THE ROUGH WORK

26. The value of k for which the equations $x^2 - 11x + k = 0$ and $x^2 - 14x + 2k = 0$ may have a common root, is
(A) 16 (B) 28 (C) 24 (D) none of these

27. The sum of the radii of the two circles is 140cm and the difference of their circumferences is 88 cm. The diameter of the smaller circle (in cm) is
(A) 154 (B) 63 (C) 126 (D) none of these

28. If Reema had walked 1 km/hr faster, she would have taken 10 minutes less to walk 2 km. Then her usual speed (in km/hr) is
(A) 3 (B) 4 (C) 5 (D) 6

29. The remainder when $19^{17} + 15^{17}$ is divided by 17 is
(A) 2 (B) 13 (C) 15 (D) 0

30. The product of two zeros of the polynomial $x^3 - 5x^2 - 2x + 24$ is 12, the smallest zero of all the zeros of the given polynomial is
(A) –4 (B) –2 (C) 3 (D) 4

SPACE FOR THE ROUGH WORK

SECTION-B

Write the Answers only in the space provided on the Answer sheet.

31. If z is a complex number satisfying the relation $|z+1| = z + 2(1+i)$, then find z.

32. A five digit number is written down at random. Find the probability that the number is divisible by 5 and no two consecutive digits are identical.

33. If a ray travelling along the line $x = 1$ gets reflected from the line $x + y = 1$, then find the equation of the line along which the reflected ray travels.

34. Find $\lim_{x\to 2} \dfrac{\sqrt{x-2}+\sqrt{x}-\sqrt{2}}{\sqrt{x^2-4}}$.

SPACE FOR THE ROUGH WORK

35. In a group of 500 persons, 300 like tea, 150 like coffee, 250 like cold drink, 90 like tea and coffee, 110 like tea and cold drink, 80 like coffee and cold drink, and 30 like none of the three drinks. Find the number of persons who like all the three drinks.

36. Write the solution of the following system of inequations in the Interval Form:

$2x-3\le 5,\ \dfrac{2x+5}{x+7}\ge 3.$

37. If the equation of the circle is $ax^2+(2a-3)y^2-4x-1=0$, then find the centre of the circle.

38. Find n, if ${}^{2n}C_1,\ {}^{2n}C_2$ and ${}^{2n}C_3$ are in A.P.

SPACE FOR THE ROUGH WORK

39. Find the number of irrational terms in the expansion of $\left(\sqrt[8]{5}+\sqrt[6]{2}\right)^{100}$.

40. If $0^{o}<\theta<180^{o}$ then $\sqrt{2+\sqrt{2+\sqrt{2+\sqrt{2+\ldots+\sqrt{2(1+\cos\theta)}}}}}$,
there being n numbers of 2's, is equal to _____.

41. Find the general solutions of the equation $\sec^2 x=\sqrt{2}\left(1-\tan^2 x\right)$.

42. The equations of the sides AB, BC and CA of the ΔABC are $y-x=2, x+2y=1$ and $3x+y+5=0$ respectively. Find the equation of the altitude through B.

SPACE FOR THE ROUGH WORK

43. A vertical lamp-post of height 9 metres stands at the corner of a rectangular field. The angle of elevation of its top from the farthest corner is 30^o, while from another corner is 45^o. Find the area of the field (in sq m).

44. The intercept on the line $y = x$ by the circle $x^2 + y^2 - 2x = 0$ is AB. Find the equation of the circle with AB as a diameter.

45. Find the coefficient of x^3 in the expansion of $\left(1 - x + x^2\right)^5$.

46. Find the value of $\sqrt{3}\,\text{cosec}\,20^o - \sec 20^o$.

SPACE FOR THE ROUGH WORK

47. If a vertex of an equilateral triangle is the origin and the side opposite to it has the equation $x+y=1$, then find the orthocenter of the triangle.

48. Find the value of $\left(\sin 78^{\circ}-\sin 66^{\circ}-\sin 42^{\circ}+\sin 6^{\circ}\right)$.

49. Find the range of the function $f(x)=x^{2}+\dfrac{1}{1+x^{2}}$.

50. Two cards are drawn at random from a pack of 52 cards. Find the probability of getting at least a spade and an ace.

SPACE FOR THE ROUGH WORK

SECTION-C

Write the Answers only in the space provided on the Answer sheet.

51. If $z(2-i2\sqrt{3})^2 = i(\sqrt{3}+i)^4$, then find the amplitude of z.
52. Find the equation of the bisector of that angle between the lines $x+y=3$ and $2x-y=2$ which contains the point (1, 1).
53. Find the term independent of x in the expansion of $(1-x)^2\left(x+\frac{1}{x}\right)^{10}$.
54. If $\tan\frac{\alpha}{2}$ and $\tan\frac{\beta}{2}$ are the roots of the equation $8x^2-26x+15=0$, then find the value of $\cos(\alpha+\beta)$.

SPACE FOR THE ROUGH WORK

55. The parabola $y^2 = kx$ makes an intercept of length 4 on the line $x - 2y = 1$. Find the value of k.

56. If $f(x) = \cos x.\cos 2x.\cos 4x.\cos 8x.\cos 16x$ then find $f'\left(\frac{\pi}{4}\right)$.

57. Two sides of a triangle are given by the roots of the equation $x^2 - 2\sqrt{3}x + 2 = 0$. The angle between the sides is $\frac{\pi}{3}$. Find the perimeter of the triangle.

SPACE FOR THE ROUGH WORK

58. The ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ passes through the point (–3, 1) and has the eccentricity $\sqrt{\frac{2}{5}}$. Find the length of the latus rectum.

59. If the 6th, 7th and 8th terms in the expansion of $(x+a)^n$ are respectively 112, 7 and $\frac{1}{4}$; find the value of $(x+n)$.

60. Find the number of ways in which the letters of the word 'ARRANGEMENT' can be arranged so that the two R's and two A's do not occur together.

SPACE FOR THE ROUGH WORK