Summer Fields School
KAILASH COLONY, NEW DELHI-110048

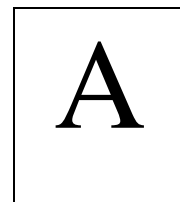Roll No.

A

- Please check that this questionnaire contains **14** 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.

33rd ARYABHATTA INTER-SCHOOL MATHEMATICS COMPETITION – 2016

CLASS - VIII

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 four sections. Section A contains **10** questions on Logical Reasoning of 1mark each, Section B contains **20** Multiple Choice Questions of 1 mark each, Section C contains **20** Free Response Type Questions of 2 marks each and Section D 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. If 10th day after 15th of the month be Thursday, what day was the 1st day of the same month?
   (A) Monday   (B) Sunday   (C) Wednesday   (D) Friday

2. Seen through a mirror, the arms of a clock show 8:50. What is the actual time?
   (A) 4:10   (B) 10:40   (C) 2:20   (D) 8:50

3. Six boys A, B, C, D, E and F play a game of cards. Each has a pack of 10 cards. F borrows 2 cards from A and gives away 5 to C who in his turn gives 3 to B, while B gives 6 to D who passes on 1 to E. How many cards does C have?
   (A) 7   (B) 3   (C) 12   (D) 15

4. While facing East you turn to your left and walk 3 kms , then turn to your left and walk 4 kms , and now you turn 45 ° towards your right and go straight to cover 5 kms . Now, how far are you from your starting point?
   (A) 5 kms East   (B) 6 kms North   (C) 4 kms West   (D) 12 kms North

5. Find which shape would fill the empty square?
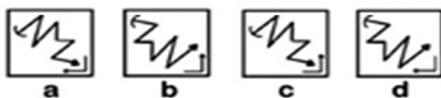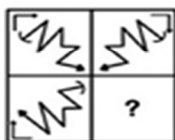
   (A) a   (B) b   (C) c   (D) d

SPACE FOR THE ROUGH WORK

6. M is mother of A and B. C is the only sister of A. R is married to B. R is the daughter-in-law of Q, then Q is:
    (A) Father of C   (B) Brother of A   (C) Father-in-law of B   (D) Father of M

7. Six friends A, B, C, D, E and F are sitting along the sides of a hexagonal table for playing a game, though not necessarily in the same order. F, who is sitting exactly opposite to A, is to the immediate right of B. D is between A and B and is exactly opposite to C. A is sitting between which of the following pair of persons?
    (A) D & F   (B) B & E   (C) E & C   (D) D & E

8. Which letter will come exactly between the 10th letter from your left and the 7th letter from your right without changing any order in the original from the alphabet?
    (A) N   (B) P   (C) O   (D) Q

9. Choose the term which will continue the following series:
    G4T, J9R, M20P, P43N, S90L, . . .
    (A) V183L   (B) V185J   (C) W180J   (D) W143N

10. In the following number series how many such 7's are there which are immediately preceded by a pair of numbers whose product is more than the product of a pair of numbers immediately following 7 ?
    2 2 7 1 3 9 4 8 7 6 5 4 2 8 3 5 7 4 6 5 9 7 8 6 4 3 9 7 4 6 5 2
    (A) 1   (B) 2   (C) 3   (D) 4

SPACE FOR THE ROUGH WORK

SECTION-B

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

11. A data set of n observations has mean $2x$ while another data set of $2n$ observations has mean x. The mean of the combined data of $3n$ observations will be equal to

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

12. The number of prime factors in $(6)^{10} \times (7)^{17} \times (55)^{27}$ is

(A) 54   (B) 64   (C) 81   (D) 91

13. For which integer n is $28 + 101 + 2^n$ a perfect square?

(A) 11   (B) 12   (C) 13   (D) 14

14. The unit's digit of the sum $1+9+9^2+\ldots\ldots\ldots\ldots.9^{1006}$ is

(A) 2   (B) 1   (C) 9   (D) 0

15. There are four prime numbers written in ascending order. The product of the first three is 385 and that of last three is 1001. Find the first number.

(A) 5   (B) 7   (C) 11   (D) 17

SPACE FOR THE ROUGH WORK

16. Find the area (in cm^2) of a right triangle whose inradius is 4cm and circumradius is 10cm.

    (A) 28   (B) 56   (C) 96   (D) 192

17. If a six digit number 93p25q is divisible by 88, then the value of p - q is
    (A) –6   (B) 6   (C) 2   (D) –2

18. If the radius of the right circular cylinder is decreased by 50% and its height is increased by 60%, its volume will be decreased by
    (A) 10%   (B) 60%   (C) 40%   (D) 20%

19. The perimeter of a square S_1 is 12m more than the perimeter of the square S_2. If the area of S_1 equals three times the area of S_2 minus 11, what is the perimeter of S_1?
    (A) 24m   (B) 32m   (C) 36m   (D) 40m

20. When the number N = $0.735\overline{45}$ is written as a fraction in its lowest terms, the denominator exceeds the numerator by:
    (A) 199   (B) 299   (C) 109   (D) 291

SPACE FOR THE ROUGH WORK

21. Find the sum of all 3 digit numbers which are equal to 25 times the sum of their digits.
    (A) 150   (B) 225   (C) 750   (D) 600

22. If both 11^2 and 3^3 are factors of the number $a \times 42 \times 62 \times 1311$, the smallest possible value of a is
    (A) 121   (B) 3267   (C) 363   (D) 33

23. When Sona and Tina went for shopping, initially Sona had twice the money than Tina. They together bought things amounting to ₹250. Out of which Tina's share was 60%. At the end Sona was left with thrice the amount that Tina had. What was the amount (in ₹) with Tina at the beginning?

    (A) 325   (B) 350   (C) 375   (D) 400

24. A takes 4 days to do a work. B takes twice as long as A. C takes twice as long as B and D takes twice as long as C. They are made in groups of two. One of the groups takes two third of the time taken by second pair. What is the combination of the first pair?
    (A) A, C   (B) A, D   (C) B, C   (D) B, D

25. The mean proportional between $\left(2+\sqrt{3}\right)$ and $\left(2-\sqrt{3}\right)$ is:
    (A) 2   (B) 3   (C) 4   (D) 1

SPACE FOR THE ROUGH WORK

26. The perimeters of a regular hexagon and a square are equal. The ratio of the area of the square to that of the hexagon is:
(A) $3:\sqrt{2}$ (B) $2:3\sqrt{3}$ (C) $1:\sqrt{3}$ (D) $3:2\sqrt{3}$

27. If $x - \dfrac{1}{x} = 4$, then find the value of $x^6 + \dfrac{1}{x^6}$.
(A) 1024 (B) 4096 (C) 5778 (D) 5832

28. A ladder lies against a wall. The top of the ladder reaches 8 feet above the ground. When the ladder slips by two feet away from the wall, the top of the ladder touches the foot of the wall. The length of the ladder (in feet) is
(A) 15 (B) 8 (C) 17 (D) 10

29. Consider a square of side 3 cm. Also consider two points on each side of the square trisecting it into equal parts. The area of the octagon made by these eight points will be
(A) 4 cm^2 (B) 6 cm^2 (C) 7 cm^2 (D) 8 cm^2

30. The LCM of two numbers is 495 and their HCF is 5. If the sum of the numbers is 100, then their difference is
(A) 10 (B) 46 (C) 70 (D) 90

SPACE FOR THE ROUGH WORK

SECTION-C

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

31. Train X starts from A towards B. At the same time, train Y start from B towards A. After they meet, the trains reach their destinations after 9 hours and 16 hours respectively. Find the ratio of their speeds.

32. What is the distance (in cm) between two parallel chords (on the same side of the centre of the circle) of lengths 32 cm and 24 cm in a circle of radius 20 cm?

33. In a right triangle ABC, $\angle C = 90^o$. F is the midpoint of AB, CD is perpendicular to AB and CE bisects $\angle C$. Given that $\angle DCE = x^o$, then find $\angle ECF$.

34. In the circle of radius 3cm, the length of the major arc AB is 3 times the length of the minor arc AB. What is the length of the line segment AB?

35. There are two lights. The first light blinks 3 times per minute while the other blinks 5 times in two minutes. Find the number of times they will blink together in an hour.

SPACE FOR THE ROUGH WORK

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36. If the distance from the vertex to the centroid of an equilateral triangle is 6cm, what is the area (in cm^2) of the triangle?

37. What is the simplified value of $\left\{ \dfrac{4^{m+\frac{1}{4}} \times \sqrt{2 \times 2^m}}{2\sqrt{2^{-m}}} \right\}^{\frac{1}{m}}$.

38. MN is the diameter of a semicircle with center O. A and B are on the semicircle and C is a point on ON such that the degree measure of minor arc MA is 40°. If $\angle OAC = 10°$ and $\angle OBC = 10°$, find the degree measure of minor arc BN.

39. If $ab + bc + ca = 0$, then find the value of $\dfrac{1}{a^2 - bc} + \dfrac{1}{b^2 - ac} + \dfrac{1}{c^2 - ab}$.

40. Ram ordered of 6 black toys and some additional brown toys. The price of the black toy is $2\dfrac{1}{2}$ times that of a brown toy. While preparing the bill, the clerk interchanged the number of black toys with number of brown toys, which increased the bill by 45%. Find the number of brown toys.


SPACE FOR THE ROUGH WORK

41. With the given rate of simple interest, the ratio of principal and amount for a certain period of time is 4:5. After 3 years with the same rate of interest, the principal and amount becomes 5:7. Find the rate of interest per annum.

42. Find the area of a circle (in cm^2) inscribed in an equilateral triangle of side 12cm. (use π=3.14)

43. If $\dfrac{x^2 + y^2 + z^2 - 64}{xy - yz - zx} = -2$ and $x + y = 3z$ then find the value of $|z|$.

44. ABCD is a square with the length of its diagonal AC as $8\sqrt{2}$ cm. AB is extended to E such that CE is parallel to BD. What is the area (in cm^2) of the triangle ACE?

45. A milkman claims to sell milk at the cost price but actually mixes water and milk in the ratio 1 : 4. By selling this product, his revenue is ₹600 every day. The amount of milk remains the same every day. One day his revenue is ₹560 by selling the product at its normal fixed price of ₹10 per litre. What is the ratio of water and milk on that day?

SPACE FOR THE ROUGH WORK

46. An equilateral triangle BPC is drawn inside a square ABCD. What is the value of the $\angle$ APD in degrees?

47. The diameter of the smaller circle is equal to the side of the square and the diagonal of the square is equal to the diameter of the bigger circle. If the circles are concentric, then find the ratio of their areas.

48. In triangle ABC, AD is perpendicular to BC and 3BD = 4AD. Also 5DC = 12AD and BD = 56cm – DC. What is the length of AC (in cm)?
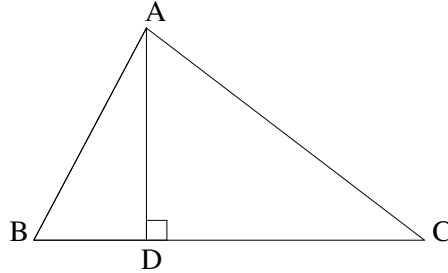
49. The parallel sides of a field in the shape of a trapezium are 20m and 41m and the remaining two sides are 10m and 17m. Find the cost of leveling the field at the rate of ₹30 per square meter?

50. The radius of a circle is 20 cm. Three more concentric circles are drawn inside it in such a manner that it is divided into 4 equal parts. Find the radius (in cm) of the smallest circle?

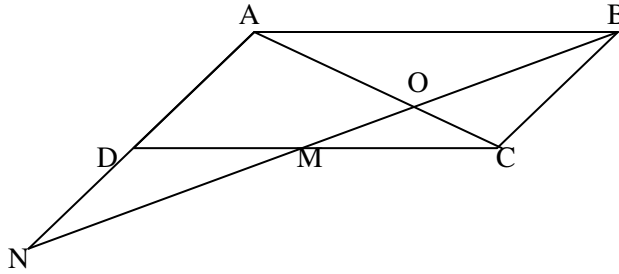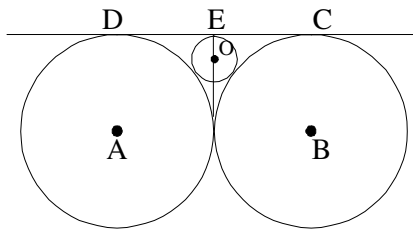SPACE FOR THE ROUGH WORK

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

51. In the given figure, M is the mid-point of the side CD of the parallelogram ABCD. Find the ratio of ON and OB.

52. A square hole of cross sectional area 4cm^2 is drilled across a cube with its length parallel to a side of a cube. If an edge of the cube measures 5 cm, what is the total surface area (in cm^2) of the body so formed?

53. Three circles touch each other externally and all the three touch a line as shown in the figure. If two of them are equal and the third has radius 2 cm, what is the radius (in cm) of the equal circles?

SPACE FOR THE ROUGH WORK

54. The ratio of the area of a circle with centre O and the area of the rectangle ABCD inscribed in it is $\pi : \sqrt{3}$. E is a point on AB such that $\angle ADE = \angle ODC$. Find AE : AD.

55. Two circles, both of radii 1 cm, intersect such that the circumference of each one passes through the centre of the other. What is the area (in sq cm) of the intersecting region? (in terms of π)

56. Ankita bought two watches for ₹1300. She sold one watch at a profit of 20% and the other at a loss of 12%. If the selling price of both the watches is same, find the difference between the cost prices of the two watches.

SPACE FOR THE ROUGH WORK

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57. Find the difference between the greatest and smallest perfect square of 6 digits.

58. A boat takes 11 hours for travelling downstream from point X to point Y and coming back to point Z midway between X and Y. If the speed of the stream is 3 kmph and the speed of the boat is 12 kmph, find the distance (in km) between X and Y.

59. A tap can fill a bath tub in 20 minutes and another can fill it in 30 minutes. A opens both the taps simultaneously. When the bath tub should have been full, he finds that the waste pipe was open. He then closes the waste pipe and in another 4 minutes the bath tub is full. Find the time (in min) in which the waste pipe would empty the full tub.

60. In a triangle ABC, the lengths of the sides AB and AC equal 17.5 cm and 9 cm respectively. Let D be a point on the line segment BC such that AD is perpendicular to BC. If AD = 3 cm, then what is the radius (in cm) of the circle circumscribing the triangle ABC?

SPACE FOR THE ROUGH WORK