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.

37th ARYABHATTA INTER-SCHOOL MATHEMATICS COMPETITION – 2020

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 $47.2506 = 4A + \dfrac{7}{B} + 2C + \dfrac{5}{D} + 6E$, then the value of $5A + 3B + 6C + D + 3E$ is :

    A) 53.6003   B) 53.603   C) 153.6003   D) 213.0003

2. Rahul has a wonderful machine. If you put any number in that machine, it first multiply the number by 4 then subtract 8 from the result and then add the successor of the number inserted to the result. If Martin puts the greatest three digit number into the machine, what will be the result?

    A) 4988   B) 8894   C) 4899   D) 9488

3. Sania started walking from her home towards South. She walked a distance of 15m and then took a left turn and walked a distance of 27m. Then she took a right turn and walked a distance of 17m to reach her academy. In which direction is her home with respect to her academy?

    A) North-west   B) South   C) North-east   D) East

4. B is less than C, C is less than D, A is less than B, D is greater than E and E is equal to B. Choose the correct combination of the greatest and the smallest respectively, amongst A, B, C, D and E.

    A) DC   B) AD   C) DA   D) DB

5. From the numbers given in the following figure, Anika multiplies the smallest prime number and the greatest number and then add the remaining numbers to the product. The resulting number is :

    A) 20   B) 30   C) 24   D) 25
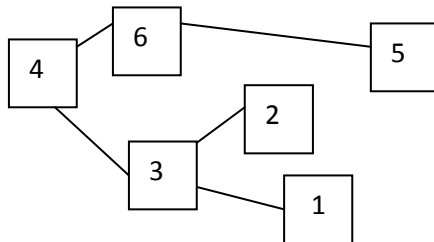
SPACE FOR THE ROUGH WORK

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6. A number 774958x96y is divisible by 8 and 9. The values of y and x respectively will be :

   A) 7, 8   B) 5, 7   C) 0, 8   D) 6, 7

7. The symbol $@\,a$ means $a+4$ and the symbol $\blacktriangle b$ means b^2, where a and b are numbers. Then evaluate: $\blacktriangle(@\,3) + @\,2 - @\,(\blacktriangle 4)$

   A) 32   B) 9   C) 75   D) 35

8. Find the number at the place of the 'x' :
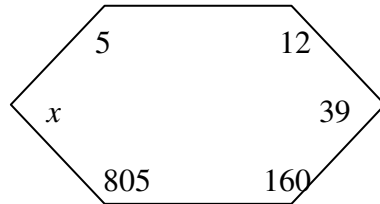
   A) 1   B) 4836   C) 0   D) 4386

9. If $AB \times BA = BCB$, where A, B and C represent only one digit such that $A \neq B \neq C$. Then the value of $A + B + C$ is :

   A) 9   B) 8   C) 6   D) 10

10. Following boxes are filled with consecutive prime numbers :

43		53			67	71	

Sum of the missing numbers is:

   A) 300   B) 250   C) 240   D) 350

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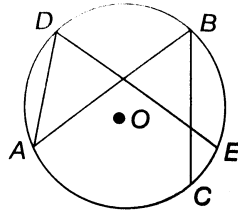
Write the correct option (A, B, C or D) in the Answer sheet.

11. $2^{21} + (1024)^2 + 16^6$ is divisible by :

   A) 31   B) 19   C) 13   D) 17

12. In the given figure, the angles $\angle ADE$ and $\angle ABC$ differ by $15°$. Then measure of $\angle CAE$ is :

   A) $10°$ B) $30°$ C) $\left(7\dfrac{1}{2}\right)°$ D) $15°$

13. How many twin prime numbers are less than 100?

   A) 5   B) 8   C) 10   D) 3

14. The maximum possible product of four different integers each of which has a value between -5 and 6, both inclusive, is :

   A) 800   B) 750   C) 600   D) 360

15. *X* is the product of all the integers from 300 to 400, both inclusive. *Y* is the product of all integers from 300 to 401 , both inclusive. The value of $\dfrac{1}{X} + \dfrac{1}{Y}$ is :

   A) $\dfrac{401}{Y^2}$ B) $\dfrac{(401)(402)}{Y^2}$ C) $\dfrac{401}{Y}$ D) $\dfrac{402}{X(401)}$

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16. The number of diagonals of a regular polygon is 27. Each of the interior angle of the polygon is of measure :

A) $140°$ B) $128°$ C) $154°$ D) $150°$

17. In $\triangle ABD$, AC is the median as well as the altitude to BD. BD is extended to a point E. In $\triangle ACE$, AD is the median to CE. Which of the following is true ?
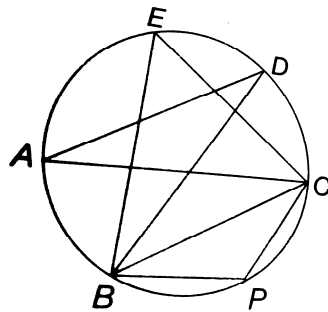
A) $AB + CD > AE$ B) $AB + BC = AE$ C) $AB + DE < AE$ D) $AB > CD + AE$

18. If the selling price is doubled, the profit triples. Then the profit percent is :

A) $66\dfrac{2}{3}$ B) 100 C) $105\dfrac{1}{3}$ D) 120

19. In the given figure, AC is the diameter of the circle and $\angle ADB = 20°$, then $\angle BPC$ is:

A) $50°$ B) $70°$ C) $90°$ D) $110°$

20. If $\dfrac{a}{b} = \dfrac{b}{c} = \dfrac{c}{d}$, then $\dfrac{b^3 + c^3 + d^3}{a^3 + b^3 + c^3}$ is :

A) $\dfrac{a}{b}$ B) $\dfrac{b}{c}$ C) $\dfrac{c}{d}$ D) $\dfrac{d}{a}$

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21. The ratio $5^{20.20} : 5^{20.19}$ is same as :

   A) $5^{100} : 1$ B) $5^{0.1} : 1$ C) $5^{0.01} : 1$ D) $5^{10} : 1$

22. In $\triangle ABC, AC = BC$ and S is the circumcentre. If $\angle ASB = 150°$, then $\angle CAB$ is:

  A) $\left(55\dfrac{1}{2}\right)^{\circ}$ B) $\left(52\dfrac{1}{2}\right)^{\circ}$ C) $\left(62\dfrac{1}{2}\right)^{\circ}$ D) $\left(35\dfrac{1}{2}\right)^{\circ}$

23. The digit at unit's place of the simplified form of $(261)^{2020} + (103)^{2021} - (576)^{2019} + (6205)^{2018}$ is :

  A) 1   B) 2   C) 3   D) 4

24. When a positive integer a is divided by b, the remainder comes out to be 24. If $\dfrac{a}{b} = 3.75$, then the value of $a + b$ is :

  A) 124   B) 136   C) 148   D) 152

25. The minimum value of $\dfrac{2x^2 - 12x + 3}{1 + 18x - 3x^2}$ is :

  A) $\dfrac{-15}{29}$ B) $\dfrac{-15}{28}$ C) $\dfrac{15}{29}$ D) $\dfrac{15}{28}$
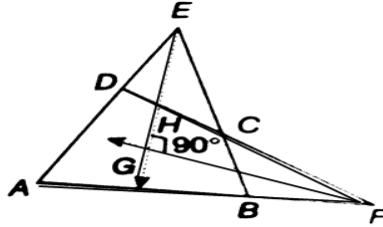

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26. In a triangle mean of any two sides is 6cm more than half of the third side. Area of the triangle (in sq. cm) is :

A) $64\sqrt{3}$ B) $48\sqrt{3}$ C) $74\sqrt{3}$ D) $36\sqrt{3}$

27. The ratio of the volume of a sphere to that of a cube which will fit inside the sphere completely is:

A) $2:\sqrt{3}\pi$ B) $\sqrt{3}\pi:2$ C) $3:\sqrt{2}\pi$ D) $\sqrt{2}\pi:3$

28. The H.C.F. of $(a-1)(a^3+m), (a+1)(a^2-1)$ and $(a+1)(a^3-n)$ is $a^2-1,$ then $m-n$ is:

A) 0   B) 1   C) 2   D) 3

29. Area of a right angled triangle is 6 sq. cm and its perimeter is 12cm. Length of its hypotenuse (in cm) is :

A) 5   B) 6   C) 7   D) 8

30. In $\Delta PQR, PQ = QR.$ A and B are the mid-points of QR and PR respectively. A circle passes through P, Q, A and B. Then which of the following is necessarily true:

A) ΔPQR is equilateral   B) ΔPQR is a right triangle

C)   PQ is a diameter   D) ΔPQR is equilateral and PQ is a diameter

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SECTION-C

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

31. Find the difference between the product of the smallest three digit prime number with the greatest one digit prime number and the product of the greatest two digit prime number with the smallest one digit prime number.

32. In the given figure, ABCD is a cyclic quadrilateral.

    $\angle ABC = 70°. \overrightarrow{FG}$ bisects $\angle CFA$, $\overrightarrow{EG}$ bisects $\angle DEB, \angle DCE = 60°$ and $\angle EGF = 90°$.

    If H is the point of intersection of EG and DF, then find measure of the angle HEC.

33. For the given data, 6, 2, 5, 4, 3, 4, 4, 2, 3, 8 , calculate the mean of x and y , where x is the sum of mean, median and mode of the data and y is the mean of its range and median.

34. If $(a+b):(b+c):(a+c) = 6:7:8$ and $a+b+c = 14,$ then find $a-b.$

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35. What would be the length of the longest stick which can measure the lengths (given in cm) of the boundary in exact number of times in the figure below ? (in cm)
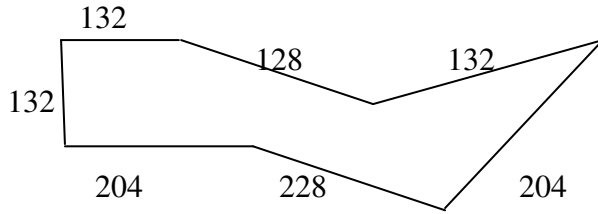
36. If S is the surface area, P and A are lateral surface area and area of the base of a cuboid respectively, then find A (in terms of S and P).

37. A,B and C divide a certain amount among themselves. The average of the amount with them is Rs.1180. A's share is $33\frac{1}{3}\%$ more than that of B's share and $16\frac{2}{3}\%$ less than that of C's share. Find A's share.

38. Evaluate: $\sqrt[6]{15-2\sqrt{56}}\ \sqrt[3]{\sqrt{7}+2\sqrt{2}}$.

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39. The diameter of a right circular cone is 14m, while its slant height is 9m. Find the ratio of its volume to surface area.

40. Write the square root of: $(x^2-8x+15)(2x^2-11x+5)(2x^2-7x+3)$ (in factorized form).

41. If $9x-3y+z=0$, then evaluate $\dfrac{y}{2x}+\sqrt{\dfrac{y^2-4xz}{4x^2}}$ (where x, y and z are constants).

42. In the given figure, AB is the diameter of the circle with area π sq. units. Another circle is drawn with C as centre (which is on the circumference of the first circle) and passes through A and B. Find the area of the shaded region (in sq. units).
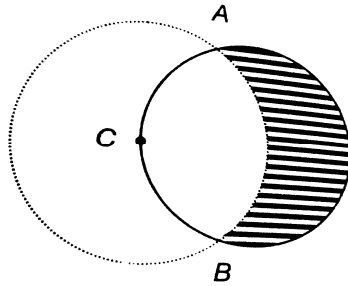
SPACE FOR THE ROUGH WORK
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43. Three years ago, the mean age of Harry's family of 5 members was 17 years. After some time, a baby was born in his family. If the average age of his family remains same today, find the present age of the baby (in years).

44. Mohan and Sohan started a business. Mohan was a sleeping partner in the business. Sohan being the working partner, took a certain monthly salary. At the end of the first year, the ratio of Mohan and Sohan's shares was 9:11and the total amount of profit was Rs. 3,00,000. "If Sohan's annual salary was excluded, the ratio of their shares become 9:7. Find the monthly salary of Sohan. (in Rs.)

45. E and D are the mid-points of the sides AB and BC of ΔABC respectively. Also $\angle B = 90°, AD = \sqrt{292}$cm and $CE = \sqrt{208}$cm . Find the length of AC(in cm).

46. A sum of Rs. 6250 at 8% per annum is compounded annually. Find the amount after $2\dfrac{3}{4}$ years. (in Rs.)

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47. Shop **A** offers a discount of "Buy three and get one free" on its winter collection, while shop **B** offers a discount of "Buy 5 , get 3 free". Find the difference in their discount percentage?

48. *X* runs twice as fast as *Y* and *Y* runs thrice as fast as *Z*. Some distance is covered by *Z* in 72 minutes. Find the difference of the time taken by *X* and *Y* to cover double the distance covered by *Z* .(in minutes)

49. Find the value of : $\sqrt{\sqrt[x]{2^x} \ \sqrt[x^2]{3^{x^3}} \ \sqrt[x^3]{6^{x^6}} \ \sqrt[x^4]{9^{x^{10}}}}$

50. If $4(2^{x-1}) + 9(3^{y-1}) = 17$ and $3(2^x) - 2(3^y) = 6$, then find $x + y$.

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SECTION-D

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

51. If $x + \dfrac{1}{x} = 5$, then find the value of : $\dfrac{x^4 + 3x^3 + 5x^2 + 3x + 1}{x^4 + 1}$.

52. **X** and **Y** are two cylinders having equal total surface areas. The radius of each cylinder is equal to the height of the other cylinder. The sum of the volumes of both the cylinders is $250\pi \, \text{cm}^3$. Find the sum of their curved surface areas (in cm^3 in terms of π).

53. What is the remainder when $x + x^9 + x^{25} + x^{49} + x^{81}$ is divided by $x^3 - x$.

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54. In the given figure, the points M, R, N, P, S and Q are concyclic. If O is the centre of the circle and RS and NQ are diameters of the circle, find $\angle PQR + \angle OPR + \angle NMS + \angle OSN$.
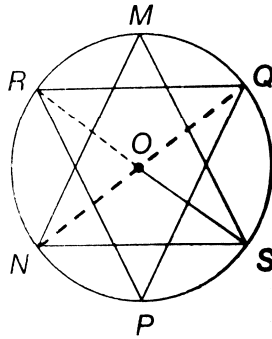
55. From each corner of a square sheet of side 8cm, a square of side y cm is cut. The remaining sheet is folded into a cuboid. The minimum possible volume of the cuboid formed is M cubic cm. If y is an integer, find the value of M.

56. A, R, S and V together produced 392 pieces of an item in 6 hours. S is four times as efficient as A and is one-third less efficient than V. R is half efficient as V. How many pieces would R produce, if he worked for 8 hours?

SPACE FOR THE ROUGH WORK

57. A and B started from P and Q respectively towards each other. They meet after 5 hours. After meeting, A increased his speed by 1 kmph and B decreased his speed by 1 kmph. Both of them proceeded to their destinations Q and P respectively, at their new speeds and reach their destinations simultaneously. Thrice the initial speed of B was 12 kmph more than the initial speed of A. Find the initial speed of A in kmph.

58. Train X leaves Hyderabad at 5 p.m. and reaches Bangalore at 5 a.m. Another train Y leaves Bangalore at 6 p.m. and reaches Hyderabad at 6 a.m. Both trains travel the entire journey at their uniform speeds. Find the time at which both the trains cross each other.

59. Factorize : $a(b^2 - c^2) + b(c^2 - a^2) + c(a^2 - b^2)$

60. A boat covers a round trip in a river in a certain time. If its speed in still water is doubled and the speed of the stream is tripled, it would take the same time for the round trip journey. Find the ratio of the speed of the boat in still water to the speed of the stream?

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