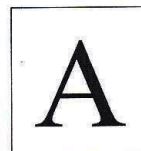




# Summer Fields School

KAILASH COLONY, NEW DELHI-110048

Roll No.							
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- Please check that this questionnaire contains **16** printed pages.
- Please check that the Code A, B or C given on the right hand top corner of the questionnaire is same as on the answer sheet.
- Please check that this questionnaire contains **60** questions.

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## 32<sup>nd</sup> ARYABHATTA INTER-SCHOOL MATHEMATICS COMPETITION – 2015

### CLASS - VIII

Time Allowed: 2 Hours

Max. Marks: 100

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#### GENERAL INSTRUCTIONS:

1. Participant should not write his/her 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 1 mark 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 clearly written in the space provided on the Answer sheet.
10. Use of calculator is not allowed.

### SECTION -A

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

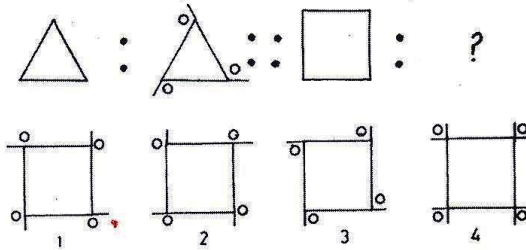
1. If  $84 \div 13 = 8$ ,  $37 \div 13 = 6$ ,  $26 \div 11 = 6$ , then  $56 \div 22$  is equal to  
A) 36                      B) 7                      C) 30                      D) 11
2. Find the next number in the sequence: 0, 2, 24, 252, ...  
A) 620                      B) 1040                      C) 3120                      D) 5430
3. Two candles are of different lengths and thicknesses. The short and the long ones can burn for 3.5 hours and 5 hours respectively. After burning for 2 hours, the lengths of the candles become equal. What fraction of the long candle's height was the short candle initially?  
A)  $\frac{2}{7}$                       B)  $\frac{5}{7}$                       C)  $\frac{3}{5}$                       D)  $\frac{4}{5}$
4. The digits 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 are substituted by  $a, b, c, d, e, f, g, h, i, j$  respectively, then  $(ef \times f - ba) \div ed$  is :  
A) 2                      B) 5                      C) 4                      D) 3
5. Shubhi walks 30m forward towards East, walks 15m right from there and then every time turning towards left she walks 5m, 30m and 25m respectively. How far is she from the starting point and in which direction?  
A) 5m south                      B) 10m west                      C) 15m north                      D) None of these

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SPACE FOR ROUGH WORK

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6. KNOWLEDGE is coded as 256535475. How can GENERAL be coded?  
 A) 7549993 B) 7559913 C) 755591 D) 7555913
7. If the following series of numbers is written in the reversed order which number will be the 7<sup>th</sup> to the right of the 4<sup>th</sup> number from the left?  
 1, 8, 3, 9, 7, 4, 10, 6, 2, 11, 13, 5, 14, 16  
 A) 3 B) 9 C) 13 D) 2
8. If BOY is coded as ACNPXZ, what will be the code for MATHS?  
 A) LNZBSUGIRT B) NLBCUVIJTU C) LNCBSUIGTR D) None of these
9. There is some relationship between two figures given on the left side of sign (::) The same relationship exists between the two figures on the right side of the sign (::) out of which one is missing. Select the correct option from the figures given below:  
 A) 1 B) 2 C) 3 D) 4



10. If > means "add", < means "subtract", ^ means "divide", \* means "multiply" and # means "is equal to", then which one of the following options is correct ?  
 A)  $2 * 4 < 6 > 2 ^ 2 \# 6$  B)  $5 > 7 < 4 ^ 2 * 2 \# 4$   
 C)  $3 * 6 ^ 2 > 3 < 6 \# 6$  D)  $7 < 4 > 1 ^ 6 * 1 \# 4$

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SPACE FOR ROUGH WORK

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### **SECTION - B**

**Write the correct option (A, B, C, D) in the Answer Sheet.**

11. If  $\left(a + \frac{1}{a}\right)^2 = b$ , then  $a^3 + \frac{1}{a^3} =$  \_\_\_\_\_.

A)  $b^{\frac{3}{2}}$

B)  $b^3$

C)  $b^{\frac{3}{2}} - 3b^{\frac{1}{2}}$

D)  $b^{\frac{3}{2}} + 3b^{\frac{1}{2}}$

12. If  $(a - b)$  is 6 more than  $(c + d)$  and  $(a + b)$  is 3 less than  $(c - d)$ , then  $(a - c)$  is :

A) 0.5

B) 1

C) 1.5

D) 2

13. The sum of 18 consecutive natural numbers is a perfect square. The smallest positive value of this sum is :

A) 144

B) 169

C) 225

D) 289

14. Mohan ate half a cake on Monday. He ate half of what was left on Tuesday and so on. He followed this pattern for a week. How much of the cake would he have eaten during the week?

A) 99.2%

B) 99.9%

C) 98.2%

D) None of these

15. A sphere has the same volume as a cylinder whose height is 3 times the radius of its cross-section. The ratio of their radii is :

(A)  $\frac{3}{4}$

B)  $(\frac{9}{4})^{\frac{1}{3}}$

C)  $\frac{2}{3}$

D)  $(\frac{4}{9})^{\frac{1}{3}}$

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SPACE FOR ROUGH WORK

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16. If  $\frac{2a+3b+4c+5d}{2a+3b-4c-5d} = \frac{2a-3b+4c-5d}{2a-3b-4c+5d}$ , then

- A) a, b, c and d are in proportion  
 B) 2a, 3b, 4c and 5d are in proportion  
 C) a, 3b, 2c and 5d are in proportion  
 D) a, 2b, 3c and 4d are in proportion

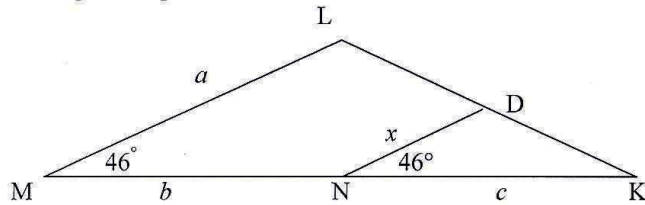
17. The mean proportional between  $(8 + \sqrt{15})$  and  $(32 - 4\sqrt{15})$  is :

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

18. If  $X = ab^2c^3 \dots z^{26}$  and  $Y = zy^2x^3 \dots a^{26}$  where  $abcd \dots z = 54^{\text{th}}$  root of 64, then  $XY$  is :

- A) 6  
 B) 8  
 C) 9  
 D) None of these

19. In the figure x equals :



- A)  $\frac{ab}{a+c}$   
 B)  $\frac{ac}{a+b}$   
 C)  $\frac{ac}{c+b}$   
 D)  $\frac{ab}{c+b}$

20. Train A leaves Mumbai for Delhi at 11 a.m. running at a speed of 60 kmph. Train B leaves Mumbai for Delhi by the same route at 2 p.m. on the same day running at a speed of 72 kmph. The two trains will meet each other at :

- A) 5 a.m. on the next day  
 B) 5 p.m. on the next day  
 C) 2 a.m. on the next day  
 D) 2 p.m. on the next day

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SPACE FOR ROUGH WORK

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21. For which positive integer  $n$ ,  $2^8 + 2^{15} + 2^n$  is a perfect square?

A) 15

B) 20

C) 16

D) 30

22. If  $a + b + c = 1$ ,  $\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = 3$ , where  $a, b, c$  are nonzero real numbers, then

$(a+b)ab + (b+c)bc + (c+a)ca$  is equal to:

A) 3

B) 1

C) 0

D) 9

23. If  $x = 9 + 4\sqrt{5}$ ,  $xy = 1$ , then  $\frac{1}{x^2} + \frac{1}{y^2}$  is equal to:

A) 81

B) 322

C) 97

D) 2

24. If  $2^x = 3^y = 6^{-z}$ , then  $\frac{1}{x} + \frac{1}{y} + \frac{1}{z}$  is equal to:

A) 0

B) 1

C)  $\frac{3}{2}$

D)  $\frac{1}{2}$

25. A pole is to be erected on the boundary of a circular park of diameter 13 metres in such a way that the difference of its distance from two diametrically opposite fixed gates P and Q on the boundary is 7 metres. The sum of the distance of the pole from P and Q is:

A) 8 m

B) 12m

C) 17m

D) None of these

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SPACE FOR ROUGH WORK

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26. The sum of the areas of two circles which touch each other externally is  $153\pi$  sq units. If the sum of their radii is 15 units, the ratio of the larger to the smaller radius is:  
A) 4 : 1                      B) 2 : 1                      C) 3 : 1                      D) None of these
27. If  $(2x+1) : (5x-1)$  is the triplicate ratio of 3:4, then the value of x is:  
A) 5                              B) 8                              C) 13                              D) 1
28. If  $4^x - 4^{x-1} = 24$ , then  $(2x)^x =$  \_\_\_\_\_.  
A) 125                              B)  $25\sqrt{5}$                               C)  $5\sqrt{5}$                               D) 25
29. The rightmost non-zero digit of the number  $30^{2720}$  is  
A) 1                              B) 3                              C) 7                              D) 9
30. If a man cycles at 10 km/hr, then he arrives at a certain place at 1 p.m. If he cycles at 15 km/hr, he will arrive at the same place at 11 a.m. At what speed must he cycle to get there at noon?  
A) 11 km/hr                      B) 12 km/hr                      C) 13 km/hr                      D) 14 km/hr

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SPACE FOR ROUGH WORK

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### SECTION – C

**Write only the answers of the following questions in the Answer Sheet.**

31. A man's age is now four times that of his son's age and is also three times that of his daughter. In six years, it will be three times that of his son. How old was he when his daughter was born?
32. If  $mx^m - nx^n = 0$ , then find the value of  $\frac{1}{x^m + x^n} + \frac{1}{x^m - x^n}$  in terms of  $x^n$ .
33. A sum of money was borrowed at 6% p.a. simple interest. At the end of first year Rs. 6800 was paid off and the rate of interest on the balance was reduced to 5% p.a. If the interest for the second year was  $\frac{11}{20}$  of the interest for the first year, find the original sum borrowed.
34. If  $5\frac{1}{6} - \left[ 1\frac{1}{5} + \left\{ 2\frac{3}{4} \div 5\frac{1}{2} \div x - \left( \frac{5}{6} - \frac{2}{3} \right) \right\} \right] = 2\frac{61}{120}$ , then find the value of  $x$ .

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SPACE FOR ROUGH WORK

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35. Reduce  $\frac{a^2 - b^2 - 2bc - c^2}{a^2 + b^2 + 2ab - c^2}$  in its simplest form.

36. Find the smallest perfect cube natural number which is divisible by each of the numbers 8, 9 and 10.

37. If  $x + y + z = 0$ , then find the value of  $(x + y - z)^3 + (z + x - y)^3 + (y + z - x)^3$ .

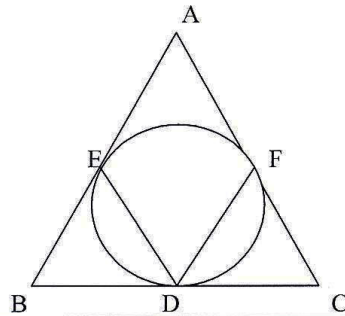
38. The diagonal of a rhombus is double the other diagonal. If the area of the rhombus is  $k$  square units, find the length of the side of the rhombus.

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SPACE FOR ROUGH WORK

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39. If  $x = 999$ , then find the value of  $\sqrt[3]{x(x^2 + 3x + 3)} + 1$ .
40. Pipes X, Y and Z are attached to a cistern. X and Y can fill it in 20 min and 30 min respectively while Z can empty it in 15 min. If X, Y and Z are kept in operation successively for 1 minute each, find the minimum time required to fill the cistern (in minutes).
41. Two circles, both of radii 1 cm, intersect such that the circumference of each one passes through the centre of the circle of the other. What is the area of the intersecting region (in terms of  $\pi$ )?
42. AB, BC and AC are tangents to the circle at E, D and F respectively. If  $\angle EBD = a^\circ$ ,  $\angle FCD = b^\circ$ , then find  $\angle EDF$ .



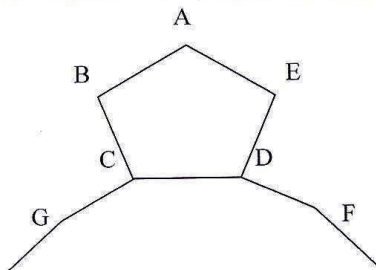

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SPACE FOR ROUGH WORK

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43. If  $x + \frac{1}{x} = 4$ , find the value of  $x^6 + \frac{1}{x^6}$ .

44. ABCDE is a regular polygon with sides of length 6 cm. CD is also a side of a regular polygon with  $n$  sides. If  $\angle EDF = 90^\circ$ , what is the value of  $n$ ?



45. A shopkeeper prefers to sell his goods at the cost price but uses a weight of 800gm instead of 1 kg. Find the percentage profit earned by him.
46. ABCD is a rectangle with  $AB = 24$  cm and area 480 sq cm. If F and E are points on AD and CD respectively such that  $FD = 4$  cm and  $DE = 16$  cm, what is the length of the line segment joining the mid-points of BE and BF?

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SPACE FOR ROUGH WORK

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47. PQRS is a trapezium with  $PQ \parallel SR$ ,  $PQ=10$  cm,  $QR=5$  cm,  $RS=4$  cm,  $SP=5$  cm. Find the area of the trapezium.

48. Evaluate  $\frac{1}{1 + \frac{1}{3 - \frac{4}{2 + \frac{1}{3 - \frac{1}{2}}}}} + \frac{3}{3 - \frac{4}{3 + \frac{1}{1 - \frac{1}{2}}}}$ .

49. In an examination, the average marks obtained by the students who passed was  $x$  while the average of those who failed was  $y$ . The average marks of all the students was  $z$ . What percentage of the students failed in the examination (in terms of  $x, y, z$ )?

50. Evaluate  $\frac{3}{1^2 \cdot 2^2} + \frac{5}{2^2 \cdot 3^2} + \frac{7}{3^2 \cdot 4^2} + \frac{9}{4^2 \cdot 5^2} + \frac{11}{5^2 \cdot 6^2} + \frac{13}{6^2 \cdot 7^2} + \frac{15}{7^2 \cdot 8^2} + \frac{17}{8^2 \cdot 9^2} + \frac{19}{9^2 \cdot 10^2}$ .

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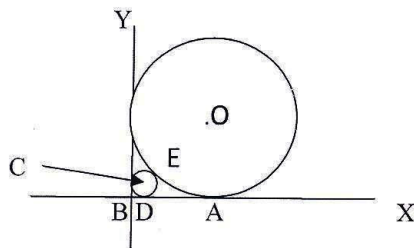
SPACE FOR ROUGH WORK

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### SECTION -D

Write only the answers of the following questions in the Answer Sheet.

51. In the given figure, YB and XB are two mutually perpendicular line segments. Two circles with centers O and C touch each other at a point E and XB at points A and D respectively. If radius of the bigger circle with centre O is 14 cm, what is the radius of the smaller circle?



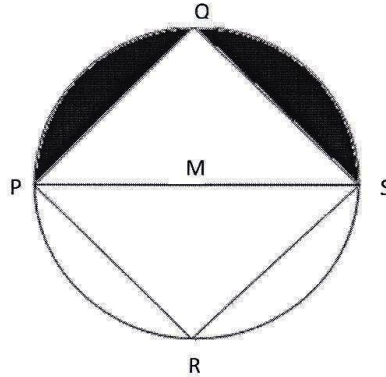
52. At his usual rowing rate X can travel 12 miles downstream in a certain river in 6 hours less than it takes him to travel the same distance upstream. If he doubles his rowing rate, he will travel 12 miles downstream in one hour less than the time taken for upstream. Find the speed of the current in miles per hour.
53. 10% of the voters did not cast their vote in an election between two candidates. 10% of the votes polled were found invalid. The successful candidate got 54% of the valid votes and won by a majority of 1620 votes. Find the total number of voters enrolled on the voters list.

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SPACE FOR ROUGH WORK

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54. M is the centre of the circle. If  $QS=10\sqrt{2}$  cm,  $PR=RS$  and  $PR \parallel QS$ . Find the area of the shaded region. (use  $\pi=3.1$ ).



55. A cylinder of height 31 cm and base radius 7 cm. A hemisphere of radius equal to the base of the cylinder is cut off from one end and a cone of same radius and of maximum height from the remaining part is also cut off. Find the curved surface area of the remaining part (in sq cm).
56. From a number of mangoes, a man sells half the number of existing mangoes plus 1 to the first customer, then sells one-third of the remaining number of mangoes plus one to the second customer, then one-fourth of the remaining mangoes plus one to the third customer and one-fifth of the remaining mangoes plus 1 to the fourth customer. He then finds that he does not have any mango left. How many mangoes did he has originally?

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SPACE FOR ROUGH WORK

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57. If  $x = (\sqrt{5} + \sqrt{4})^{-3}$  and  $y = (\sqrt{5} - \sqrt{4})^{-3}$ , then find the value of  $(x+1)^{-1} + (y+1)^{-1}$ .

58. A hare sees a dog 200m away from her and scuds off in the opposite direction at a speed of 24 kmph. Two minutes later, the dog perceives her and gives a chase at a speed of 32 kmph. Find the distance travelled by the hare before being caught by the dog.

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SPACE FOR ROUGH WORK

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59. Find the least number which when divided by 12,16,18,30 leaves remainder 4 in each case but is completely divisible by 7.

60. A shopkeeper gains 25% by selling an article at a discount of 20%. If he gains Rs.150, then find the marked price of the article.

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SPACE FOR ROUGH WORK

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