175

Booklet Serial No. :

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

TEST BOOKLET

ARO–2016

Time Allowed : 2 Hours] [Maximum Marks : 100

All questions carry equal marks.

INSTRUCTIONS

1. Immediately after the commencement of the examination, you should check that test booklet does not have any unprinted or torn or missing pages or items, etc. If so, get it replaced by a complete test booklet.
2. Write your Roll Number only in the box provided alongside. Do not write anything else on the Test Booklet.
3. This Test Booklet contains **100** items (questions). Each item comprises four responses (answers). Choose only one response for each item which you consider the best.
4. After the candidate has read each item in the Test Booklet and decided which of the given responses is correct or the best, he has to mark the circle containing the letter of the selected response by blackening it completely with Black or Blue ball pen. In the following example, response "C" is so marked :

   Ⓐ Ⓑ ● Ⓓ

5. Do the encoding carefully as given in the illustrations. While encoding your particulars or marking the answers on answer sheet, you should blacken the circle corresponding to the choice in full and no part of the circle should be left unfilled. After the response has been marked in the ANSWER SHEET, no erasing/fluid is allowed.
6. You have to mark all your responses ONLY on the ANSWER SHEET separately given according to 'INSTRUCTIONS FOR CANDIDATES' already supplied to you. *Responses marked on the Test Booklet or in any paper other than the answer sheet shall not be examined.*
7. All items carry equal marks. Attempt all items. Your total marks will depend only on the number of correct responses marked by you in the Answer Sheet. There will be no negative marking.
8. Before you proceed to mark responses in the Answer Sheet fill in the particulars in the front portion of the Answer Sheet as per the instructions sent to you.
9. If a candidate give more than one answer, it will be treated as a wrong answer even if one of the given answers happens to be correct.
10. After you have completed the test, hand over the Answer Sheet only, to the Invigilator.

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P.T.O.

Time Allowed : 2 Hours] [Maximum Marks : 100

1. If $x + \frac{1}{x} = 2$, then the value of $x^4 + \frac{1}{x^4}$ is :

   (A) -1 (B) 0

   (C) 1 (D) 2

2. If the polynomial is divided by $x - 2$, then the remainder is 1 and when it is divided by $x - 3$, the remainder is 2, when the polynomial is divided by $x^2 - 5x + 6$, then remainder will be :

   (A) $x - 1$ (B) $x - 2$

   (C) $x - 3$ (D) $x - 4$

3. If $x = 2 - 2^{1/3} + 2^{2/3}$, then value of $x^3 - 6x^2 + 18x + 18$ is :

   (A) 20 (B) 30

   (C) 40 (D) 50

4. If $(a + b)x = a$ and $(a + b)y = b$, then the value of $\frac{x^2 + y^2}{x^2 - y^2}$ is :

   (A) $\frac{a^2 + b^2}{a^2}$ (B) $\frac{a^2 + b^2}{b^2}$

   (C) $\frac{a^2 + b^2}{a^2 b^2}$ (D) $\frac{a^2 + b^2}{a^2 - b^2}$

5. Total number of points in the plane triangle ABC is equidistant from its vertex is :

(A) 0 (B) 1

(C) 2 (D) 3

6. The sum of the following series $\frac{1}{1.2}+\frac{1}{2.3}+\frac{1}{3.4}+\ldots$ is :

(A) -1 (B) 0

(C) 1 (D) 2

7. In geometry, hexagon has :

(A) 4 diagonals (B) 5 diagonals

(C) 6 diagonals (D) 9 diagonals

8. The sum of internal angles of a regular polygon is 1018°, the number of sides in the polygon is :

(A) 5 (B) 6

(C) 7 (D) 8

9. There are four prime numbers written in ascending order. The product of first three is 2431 and product of last three is 4199. Then the first number is :

(A) 7 (B) 11

(C) 13 (D) 17

10. The constant term in the expansion of $\left(x^2+\frac{1}{x}\right)^{12}$ is :

(A) 490 (B) 495

(C) 500 (D) 505

11. The maximum value of $\sin^6 x + \cos^6 x$ is :

(A) 0 (B) 1

(C) 3/2 (D) 2

12. The angle of elevation of the top of a tower standing on a horizontal plane, from two points on a line passing through the foot of the tower at a distance x any y respectively, are complementary angles. The height of the tower is :

(A) $\sqrt{x}$ (B) $\sqrt{y}$

(C) $\sqrt{xy}$ (D) xy

13. If in two circles, arcs of the same length subtend angle 60° and 75° at the centre, the ratio of their radii is :

(A) 2 : 5 (B) 3 : 5

(C) 4 : 5 (D) 5 : 4

14. The radius of a circle is 13 cm and AB is a chord which is at a distance of 12 cm from the centre. The length of chord is :

(A) 10 cm (B) 12 cm

(C) 15 cm (D) 20 cm

15. If two numbers are in the ratio 3 : 7 and if 6 is added to each of them, then their ratio becomes 5 : 9. The numbers are :

(A) 21 and 49 (B) 6 and 14

(C) 33 and 77 (D) 9 and 21

16. If the salary of Bali is 25 percent less than the salary of Tarun, then the salary of Tarun is more than Bali, is :

(A) 25 percent (B) 28 percent

(C) 30 percent (D) 33.33 percent

17. The population of a village is 4500 in which $\frac{11}{18}$th of them are males and rest females. If 40 percent females are married, then the number of married males is :

(A) 400 (B) 500

(C) 700 (D) 800

18. A labour is engaged for 30 days on the condition that he will get Rs. 50 for every day if he works and he will be fined Rs. 15 if he is absent. At the end of the time he receives Rs. 850 in all. The total number of days, he works are :

(A) 10 (B) 15

(C) 20 (D) 25

19. Ram, Rahim and Shyam enter into a partnership. Ram put Rs. 500 for 3 months, Rahim Rs. 650 for 8 months and Shyam Rs. 300 for 11 months. They gain Rs. 840. The share of Shyam is :

(A) Rs. 270.70 (B) Rs. 277.20

(C) Rs. 278.70 (D) Rs. 279.70

20. If at an election, Ramprasad gets 35 percent of total votes, is defeated by a majority of 150 votes, then the total number of votes recorded are :

(A) 400 (B) 450

(C) 500 (D) 505

21. Few hens and goats are kept in a place. There are total 40 heads and 100 legs. The total number of hens is :

(A) 10 (B) 20

(C) 30 (D) 40

22. The speed of the boat in downstream is 12 km/hr but the speed of the stream is 3 km/hr The time taken by boat to cover a distance of 45 km against the stream, is :

(A) $7\frac{1}{2}$ hrs (B) $8\frac{1}{2}$ hrs

(C) $9\frac{1}{2}$ hrs (D) $10\frac{1}{2}$ hrs

23. A bag contains Rs. 410 in form of Rs. 5, Rs. 2 and Re. 1 coins. The number of coins are in the ratio 4 : 6 : 9. The number of Rs. 2 coin is :

(A) 50 (B) 55

(C) 60 (D) 70

24. Two taps can fill a tank in 30 hrs and 45 hrs respectively. Both taps were opened in the empty tank. After filling $\frac{2}{3}$rd of the tank, there occurs a leak in the bottom of the tank which takes out $\frac{2}{3}$rd of the incoming water. The time taken to fill tank completely is :

(A) 15 hrs (B) 20 hrs

(C) 25 hrs (D) 30 hrs

25. In a class, there are 40 boys and their average age is 16 years. One boy, aged 17 years leaves the class and another boy joins, the average age becomes 15.875 years. The age of the new boy is :

(A) 10 years (B) 12 years

(C) 14 years (D) 17 years

26. If the price of the toy is increased by 20 percent, the total sales of the toy is decreased by 15 percent, then the total revenue will decrease :

(A) 1 percent (B) 2 percent

(C) 3 percent (D) 4 percent

27. Mohan is 50 percent effcient than Shyam and is able to complete a work alone in 25 days. The number of days, they will take to finish 75 percent of the work together, are :

(A) 10 days

(B) $\frac{41}{4}$ days

(C) $\frac{43}{4}$ days

(D) $\frac{45}{4}$ days

28. The MRP of a watch is Rs. 1600. A shopkeeper sold the watch after allowing two successive discounts of 10 percent and x percent respectively. If the selling price of the watch was Rs. 1224, then the value of x is :

(A) 10

(B) 15

(C) 20

(D) 22

29. If $2\cos\theta = x + \frac{1}{x}$, then 2 cos 3θ is equal to :

(A) $x^3 + \frac{1}{x^3}$

(B) $x^3 + \frac{1}{2x^3}$

(C) $x^3 + \frac{1}{3x^3}$

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

30. If 40 men can finish a work in 40 days and they start the work together but after 10 days 5 men leave, then the total work will finish in :

(A) $50\frac{2}{3}$ days

(B) $56\frac{2}{3}$ days

(C) $57\frac{2}{3}$ days

(D) $58\frac{2}{3}$ days

31. A shelf has 6 mathematics books and 4 physics books. The probability that 3 particular mathematics books will be together, is :

(A) 1/15 (B) 2/15

(C) 1/5 (D) 4/15

32. If a ball is drawn at random from a box containing 6 red balls, 4 white balls and 5 blue balls, then the probability for red or white, is :

(A) 1/3 (B) 2/3

(C) 5/6 (D) 1

33. Box I contains 3 red and 2 blue marbles while Box II contains 2 red and 8 blue marbles. A fair coin is tossed. If the coin turns up head, a marble is chosen from Box I; if it turns up tail, a marble is chosen form Box II. Then the probability that a red marble is chosen, is :

(A) 3/10 (B) 1/10

(C) 1/5 (D) 2/5

34. Two people agree to meet between 2 : 00 PM to 3 : 00 PM with the understanding that each will wait no longer for the other. The probability that they will meet, is :

(A) 5/16 (B) 3/8

(C) 7/16 (D) 9/16

35. For the independent random variables X any Y, which one of the following is *not* true ?

(A) $\text{Var}(X + Y) = \text{Var}(X) + \text{Var}(Y)$

(B) $\text{Var}(X - Y) = \text{Var}(X) - \text{Var}(Y)$

(C) $\text{Var}(X - Y) = \text{Var}(X) + \text{Var}(Y)$

(D) $\text{Var}(CX) = C^2\text{Var}(X)$

36. The expectation of a discrete random variable X whose probability function is given by $f(x) = \frac{1}{2^x}$; $x = 1, 2, 3 \ldots$ is :

(A) 1 (B) 2

(C) 3 (D) 4

37. In 900 tosses of a fair coin, the standard deviation is :

(A) 15 (B) 45

(C) 90 (D) 30

38. The variance of the β-distribution is :

(A) $\frac{\alpha\beta}{(\alpha+\beta)^2}$ (B) $\frac{\alpha\beta}{(\alpha+\beta)^2(\alpha+1)}$

(C) $\frac{\alpha\beta}{(\alpha+\beta)^2(\alpha+\beta+1)}$ (D) $\frac{\alpha\beta}{(\alpha+\beta)(\alpha+\beta+1)}$

39. A box contains 6 blue balls and 4 red balls. An experiment in performed in which a ball is chosen at random and its colour is noted, but the ball is not replaced. The probability that after 5 trials of the experiment, 3 blue balls will have been chosen, is :

(A) 2/21 (B) 4/21

(C) 5/21 (D) 10/21

40. The probability that in 120 tosses of a fair coin, between 40 percent and 60 percent will be head, is :

(A) 0.95 (B) 0.96

(C) 0.97 (D) 0.98

41. A random sample of 50 mathematics grades of a total 200 showed a mean of 75 and standard deviation of 10. The 95 percent confidence limits for the mean of grades are :

(A) 75 ± 2.1 (B) 75 ± 2.2

(C) 75 ± 2.3 (D) 75 ± 2.4

42. For a $h \times k$ contingency table ($h > 1$, $k > 1$), the numbers of degrees of freedom is :

(A) $(h - 1)(k - 1)$ (B) hk

(C) $(h - 1)k$ (D) $h(k - 1)$

43. The rank correlation coefficient lies between :

(A) 0 and 2 (B) –2 and 0

(C) –2 and 2 (D) –1 and 1

44. If P is the transition matrix of a Markov chain, then the n step transition matrix is equal to :

(A) P^{n-1} (B) P^n

(C) P^{n+1} (D) P

45. If a box contains 3 coins, two of them are fair and one two headed. A coin is selected at random and tossed twice. If head appears with the time, then the probability that the coin is two headed, is :

(A) 1/3 (B) 2/3

(C) 1 (D) 0

46. Which one of the following matrix is Stochastic ?

(A) $\begin{pmatrix} 0 & 1 & 0 \\ 1/2 & 1/4 & 1/4 \end{pmatrix}$

(B) $\begin{pmatrix} 1/2 & 1/2 \\ 1/2 & 1/2 \end{pmatrix}$

(C) $\begin{pmatrix} 0 & 1 \\ -1/2 & 3/2 \end{pmatrix}$

(D) $\begin{pmatrix} 0 & 1 \\ 1/2 & 1/4 \end{pmatrix}$

47. The curve $y = 3b^x$ is :

(A) parabolic

(B) hyperbolic

(C) exponential

(D) quadratic

48. Let X and Y be random variables having joint density function $f(x, y)$. Then the density function of U = X + Y is :

(A) $g(u) = \int_{-\infty}^{\infty} f(v, u - v)\, dv$

(B) $g(u) = \int_{-\infty}^{0} f(v, u - v)\, dv$

(C) $g(u) = \int_{0}^{\infty} f(u, v)\, dv$

(D) None of the above

49. Let Y and Z be independent random variables where Y is normally distributed with mean 0 and variance 1 while Z is a Chi-square distribution with v degree of freedom. Then the random variable $T = \frac{Y}{\sqrt{Z/v}}$ has the :

(A) Chi-square distribution with v degree of freedom

(B) Normal distribution with mean 0 and variance 1

(C) t-distribution with v degree of freedom

(D) f-distribution with v degree of freedom

50. Chi-square curve :

(A) is a normal curve

(B) lies completely in first quadrant

(C) is symmetrical curve

(D) is not unimodal curve

51. It was Sunday on Jan 1, 2006, then the day of the week on Jan 1, 2010 was :

(A) Monday

(B) Tuesday

(C) Thursday

(D) Friday

52. The digits in the number a = 27561493 are rearranged in the descending order to get the number b. The number of places having identical digits in a and b is :

(A) 1 (B) 2

(C) 3 (D) 4

53. The missing term of the following number series

2, 10, 30, 68, 130, ?, 350

is :

(A) 222 (B) 240

(C) 245 (D) 252

54. Mukesh runs 20 meter towards east and turn to right, runs 10 meter and turn right, runs 9 meter and again turns to left, runs 5 meter and then turns to left, runs 12 meter and finally turns to left and runs 6 meter. Now in which direction is Mukesh facing ?

(A) East (B) West

(C) North (D) South

55. If P means ×, R means +, T means ÷, S means –, then the value of 18T3P9S8R6 is :

(A) 1/3 (B) 46

(C) 52 (D) 58

56. The relative number from the given alternative

BORE : 40 : : HOTEL : ? is

(A) 10 (B) 20

(C) 40 (D) 60

57. Ram is the brother of Mohan. Aman is married to Geeta. If Aman is the nephew of Mohan, then Ram is related to Geeta by :

(A) Father-in-law (B) Mother-in-law

(C) Son-in-law (D) Daughter-in-law

58. If the first and second letter in the word COMMUNICATIONS were interchanged, also the third and fourth letters, and fifth and sixth letters and so on. Then the tenth letter counting from your right is :

(A) U (B) T

(C) A (D) N

59. The word which is least like the other words in the group : BOY, GIRL, LADY, MAN, CHILD is :

(A) BOY (B) GIRL

(C) LADY (D) CHILD

60. If 5 chairs cost as much as 12 stools, 7 stools as much as 2 tables, 3 tables as much as 2 sofas. If the cost of 5 sofas to be Rs. 875, the cost of a chair is :

(A) 80 (B) 90

(C) 100 (D) 110

61. A father's age is equal to the sum of the age of five children. After 15 years, his age will be only half of the sum of their age. Now, father's age is :

(A) 40 years (B) 45 years

(C) 50 years (D) 55 years

62. Some equations are solved on the basis of the certain system :

$$58 \times 12 = 4,\ 37 \times 96 = 5,\ 11 \times 20 = 2.$$

The correct answer for the equation 42×12 on that basis is :

(A) 2 (B) 3

(C) 4 (D) 5

63. If BUILDING is coded as 41527596 and RIVER as 85308, then BRIDGE is coded is :

(A) 485067 (B) 458760

(C) 485670 (D) 485760

64. The missing term in the following series

13, 18, 16, 15, 20, 18, 17, ?, 20, 19 is :

(A) 20 (B) 22

(C) 26 (D) 29

65. If North-East becomes West and South-East becomes North, then West becomes :

(A) South-East (B) South

(C) North-East (D) North-West

66. A clock is set right at 8 am. The clock gains 10 minutes in 24 hours. The true time, when the clock indicates 1 pm on the following day, will be :

(A) 12:40 pm (B) 12:42 pm

(C) 12:44 pm (D) 12:48 pm

67. If four of the following are similar in some respect : 1728, 4913, 13824, 12067, 35937, then the odd one is :

(A) 1728 (B) 4913

(C) 12067 (D) 13824

68. How many meaningful English words can be formed with the letters of the word STOP, each using only once in a word but in different sequence, starting with the letter P ?

(A) 1 (B) 2

(C) 3 (D) 4

69. In a class of 35 students, Kunal is placed seventh from the bottom whereas Sonali is placed ninth from the top. Pulkit is placed exactly in between two. Kunal's position from Pulkit is :

(A) 9 (B) 10

(C) 12 (D) 13

70. The column elements of the following matrix :

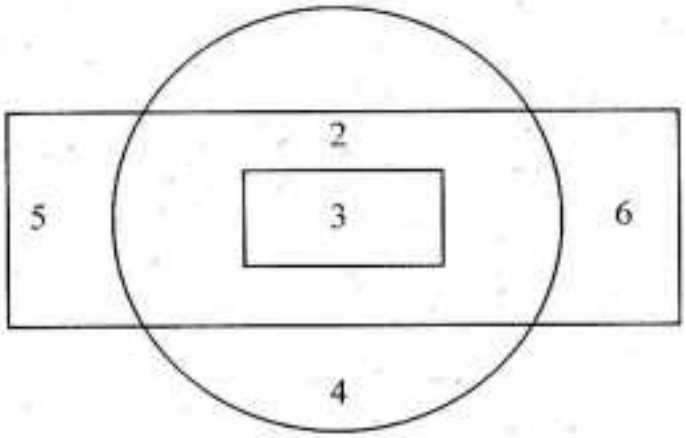
$$\begin{pmatrix} 7 & 4 & 9 \\ 14 & 8 & - \\ 28 & 16 & 36 \\ 56 & 32 & 72 \end{pmatrix}$$

are related in some rule, then the missing element is :

(A) 12 (B) 18

(C) 27 (D) 30

Questions 71-72 are based on the following figure in which the circle represents literate, bigger rectangle represents healthy and smaller rectangle represents rich people.



71. Which one of the following is *correct* ?

(A) All literate are either healthy or rich

(B) Some rich are not literate

(C) all rich are not literate

(D) people represented by 4 are different from the people represented by 2

72. The number represents those literate who are neither rich nor healthy is :

(A) 2 (B) 4

(C) 5 (D) 6

Study the following information carefully and answer questions 73-77 given below :

P, Q, R, S, T, V and W are sitting around a circle facing the centre. V is second to the left of P and second to the right of W. T is third to the right of Q and is not an immediate neighbour of V. S is third to the right of R.

73. Who is the second to right of Q ?

(A) R (B) W

(C) T (D) S

74. Who is the immediate left of S ?

(A) V (B) T

(C) Q (D) W

75. Who is the immediate right to R ?

(A) W (B) T

(C) P (D) V

76. Who is the third to the left of V ?

(A) T (B) S

(C) W (D) R

77. Which of the following groups is the first person sitting between the second and the third person ?

(A) RPQ (B) TWS

(C) QPR (D) PQR

Study the following information carefully and answer questions 78-80 given below :

In a family of 6 person, there are two couples. The lawyer is the head of family and has only two sons, Ram and Rakesh, both are teacher. Mrs. Reena and her mother-in-law both are lawyers. Mukesh's wife is a doctor and they have a son Ajay.

78. Which one of the following is definitely a couple ?

(A) Lawyer-Teacher (B) Doctor-Lawyer

(C) Teacher-Teacher (D) Lawyer-Lawyer

79. The profession of Rakesh's wife is :

(A) Teacher

(B) Doctor

(C) Lawyer

(D) Home maker

80. The total number of male members in the family is :

(A) 2 (B) 3

(C) 4 (D) 5

81. In which region of H.P. is Darati Pass ?

(A) Kullu (B) Chamba

(C) Kinnaur (D) Sirmaur

82. Which of the following glaciers is in Chandra valley of Lahaul-Spiti ?

(A) Pacha (B) Kulti

(C) Shili (D) All of these

83. What is the maximum length of *Dora* worn by adult male gaddis ?

(A) 15 mts (B) 30 mts

(C) 45 mts (D) 60 mts

84. On which day after the death of a person is Shipchu Sherku ritual observed among the Khampas ?

(A) 4th day
(B) 7th day
(C) 13th day
(D) 49th day

85. Who founded the Nurpur princely state ?

(A) Pahari Pal
(B) Bas Pal
(C) Nag Pal
(D) Jeth Pal

86. Around which year was Shimla Development Authority constituted ?

(A) 1972
(B) 1974
(C) 1976
(D) 1978

87. At which place in Kangra District of H.P. are reserves of good quality roofing slates ?

(A) Bhagsu (B) Khaniara

(C) Kharli (D) All of these

88. According to 2015-16 Economic Survey, what is the approximate number of marginal holdings in H.P. (in lakhs) ?

(A) 4.40 (B) 4.80

(C) 5.90 (D) 6.70

89. In which District of H.P. the child sex-ratio is reported to be the lowest in the state (According to 2015-16 Economic Survey) ?

(A) Sirmaur (B) Una

(C) Solan (D) Bilaspur

90. On which river is Shong-Tong Karcham Hydro-Power Project ?

(A) Beas (B) Giri

(C) Andhra (D) Satluj

91. On which date in November 2016 was the birth anniversary of Guru Nanak Dev celebrated ?

(A) November 10 (B) November 14

(C) November 21 (D) None of these

92. Which of the following states does *not* share the National Chambal Sanctuary ?

(A) Madhya Pradesh (B) Uttar Pradesh

(C) Rajasthan (D) Chhattisgarh

93. Which of the following is *not* a tributary of the Ganges ?

(A) Gomati (B) Kosi

(C) Tamsa (D) Kshipra

94. Around which year was Bharat Nirman Project started ?

(A) 2005-06 (B) 2007-08

(C) 2009-10 (D) 2014-15

95. Which was the first movie to be produced in India ?

(A) Pather Panchali (B) Aprajito

(C) Shatranj ke Khilari (D) None of these

96. Where was the epicenter of the earthquake that hit New Zealand in November, 2016 ?

(A) Willington (B) Christ Church

(C) Auckland (D) Hamilton

97. On which date in November 2016 the moon was closest to earth in its elliptical orbit ?

(A) 07 (B) 11

(C) 14 (D) 17

98. 2016 Nobel Prize in Economics is given to two persons, one of whom is of British origin. To which country does the other belong ?

(A) Sweden (B) Finland

(C) Denmark (D) Norway

99. How many electoral college votes did Donald Trump get in the U.S. Presidential poll held in early November, 2016 ?

(A) 279 (B) 288

(C) 289 (D) None of these

100. To which country does Antonio Guterres who became U.N. Secretary General w.e. of January 01, 2017 belong ?

(A) Portugal (B) Italy

(C) France (D) Germany