

Time : 3 Hours

Statistics

STATISTICS (0135) (E)

BOARD QUESTION PAPER-5

Total Marks : 100

Standard-12

Prepared According to the Course (30% & 70%) in March 2019

Instructions : As per Question Paper-1.

SECTION-A

❖ Choose the correct alternative from the following multiple choice type questions and write it. (Q.No. 1 to 20) Each question carries 1 mark: 20

1. The price of an item increases by 3-5 times in the current year as compared to the base year. What will be the price index number ?

- (A) 45 (B) 450 (C) 550 (D) 350

2. What is the value of r , if all the points plotted in a scatter diagram lie on a single line only ?

- (A) 0 (B) 1 or -1 (C) 0.5 (D) -0.5

3. The regression line always passes through which point ? (\bar{x}, \bar{y})

- (A) $(0, \bar{y})$ (B) $(\bar{x}, 0)$ (C) (\bar{x}, \bar{y}) (D) $(0, 0)$

4. Which variation is shown in 'decrease in the production of company due to strike'?

- (A) Cyclical (B) Trend (C) Seasonal (D) Random

5. Which of the following options is true for any event A of the same space ?

- (A) $P(A) < 0$ (B) $0 \leq P(A) \leq 1$ (C) $0 \leq P(A) \leq 1$ (D) $P(A) > 1$

6. Which of the following variable will be an illustration of discrete variable ?

- (A) Height of a student (B) Weight of a student
(C) Blood pressure of a student (D) Birth year of a student

7. Which of the following are mean and variance of standard normal variable ?

- (A) Mean = 0, Variance = 1 (B) Mean = 1, Variance = 0
(C) Mean = 0, Variance = 0 (D) Mean = -1, Variance = 1

8. Which of the following is approximate value of quartile deviation for standard normal variate ?

- (A) $\frac{2}{3}\sigma$ (B) $\frac{2}{3}$ (C) $\frac{4}{5}\sigma$ (D) $\frac{4}{5}$

9. What is the modulus form of 0.3 neighbourhood of 3 ?

- (A) $|x - 0.3| < 3$ (B) $|x - 3| < 0.3$ (C) $|x + 3| < 0.3$ (D) $|x - 3| > 0.3$

10. What is $\frac{dy}{dx}$ if $y = ax^n$, a is a constant ?

- (A) nx^{n-1} (B) anx^{n-1} (C) 0 (D) anx^{n+1}

11. Which index number is used by the Reserve Bank of India to take necessary steps to control inflation by studying the changes in price levels :
- (A) Index number for Trade (B) Wholesale price index number
(C) Cost of living index number (D) Index number of National Income
12. Which of the following values is not possible as a value of r ?
- (A) 0.999 (B) -1.090 (C) -0.850 (D) 0
13. What is the value of b_{yx} if the regression line Y on X is $2x + 3y - 50 = 0$?
- (A) $\frac{3}{2}$ (B) $-\frac{3}{2}$ (C) $-\frac{2}{3}$ (D) $\frac{2}{3}$
14. State the independent variable of time series :
- (A) y_t (B) S_t (C) t (D) C_t
15. According to the mathematical definition of probability, what is the probability of each outcome among the n outcomes of a random experiment ?
- (A) 0 (B) $\frac{1}{n}$ (C) 1 (D) can not say
16. What are the parameters of Binomial Probability distribution ?
- (A) n and p (B) n and q (C) p and q (D) npq
17. What is the total area under the normal curve to the right hand side of perpendicular line at $X = \mu$?
- (A) 0 (B) 0.5 (C) 1 (D) -0.5
18. Which of the following is approximate value of mean deviation for normal variable?
- (A) $\frac{4}{5}\sigma$ (B) $\frac{4}{5}\mu$ (C) $\frac{2}{3}\sigma$ (D) $\frac{2}{3}\mu$
19. What is the value of $\lim_{x \rightarrow -2} 20$?
- (A) 20 (B) -20 (C) -2 (D) -10
20. What is the derivative of $f(x) = \frac{4}{x^2}$?
- (A) $\frac{4}{2x}$ (B) $\frac{-8}{x^3}$ (C) $\frac{8}{x^3}$ (D) 0

SECTION-B

❖ Answer the following 21 to 30 questions in one sentence each.

Each question carries 1 mark:

10

21. Which index number is used in India to find the rate of dearness allowance ?
22. The correlation co-efficient between X and Y is 0.4. What will be the value of correlation co-efficient if 5 is added in each observation of X and 10 is multiplied to each observation Y ?
23. What is the value of error if a sample point is on the fitted line ?
24. What is a time series ?
25. Write the law of multiplication of probability for two independent events A and B in a sample space.
26. Mean of a symmetrical binomial distribution is 9. Find the value of its parameter n .

27. 'Standard score is independent of unit of measurement'. Is this statement true or false?
28. What percentage of area is covered under the normal curve within the range $\mu - 2\sigma$ to $\mu + 2\sigma$. *CH-3, P-2*
29. Find the value of $\lim_{x \rightarrow 5} (3x+5)$ *CH-4, P-2*
30. Find $f'(x)$ if $f(x) = 7x^2 - 6x + 5$.

SECTION-C

- ❖ Answer Any 7 of the following questions 31 to 39 as directed.
Each question carries 2 marks :

14

31. The wholesale price index number of the year 2015 and 2016 are found to be 150.2 and 165.7 respectively. Find the rate of inflation using index numbers of both the years. *TRB -44*
32. Find the value of correlation co-efficient r from the following data and interpret it:
CH-3 $n = 10, \sum (x - \bar{x})(y - \bar{y}) = 60, S_x = 5, S_y = 6$ *TRB 110*
33. The linear equation fitted using the data of 7 weeks for a variable y is $\hat{y} = 25.1 - 1.3t$, Estimate the value of y for the eighth and ninth week. *CH-4*
34. If the following distribution is a probability distribution of variable X , then find the constant C . *CH-2*

$$P(x) = C \left(\frac{1}{4} \right)^x, x = 1, 2, 3, 4.$$

35. The extreme quartiles of a normal variable are 10 and 30, Find its mean deviation.
36. Find the value of $\lim_{x \rightarrow 1} \frac{2x^2 + x - 3}{x^2 - 1}$ *CH-4, P-2*
37. Find the value of $\lim_{x \rightarrow 2} \frac{x^5 - 32}{x - 2}$ *CH-4, P-2*
38. Differentiate $y = (3x + 7)^8$ with respect to x .
39. Find the derivative of $y = (3x^2 + 4x - 2)(3x + 2)$ with respect to x .

SECTION-D

- ❖ Answer Any 8 of the following questions from, 40 to 51 as directed.
Each question carries 3 marks.

40. Obtain the chain base index number from the fixed base index numbers given below with the year 2007-08 as the base year for the wholesale prices of machines and equipments : *CH-2*

Year	2008-09	2009-10	2010-11	2011-12	2012-13
Index number of machines and equipments	117.4	118	121.3	125.1	128.4

41. The following information is obtained by a survey conducted by a town planning committee of a state. (H-2)

City	A	B	C	D	E
Population (lakh)	57	45	14	18	8
Rate of growth (per thousand)	13	20	10	15	5

Find the rank correlation co-efficient between the population of the cities and the rate of growth of the population.

42. To study the relation between two variables, yearly income (X) of a family and their yearly investment (Y) in mutual funds, the following information is shown for a sample of 100 families of a city : (H-3)

X = Annual income of a family (lakh ₹)

Y = Annual investment in mutual fund of a family (thousand ₹).

$\bar{x} = 5.5, \bar{y} = 40.5, S_x = 1.2, S_y = 12.8, r = 0.65.$

Obtain the regression line of annual investment in mutual fund of a family on their annual income. Estimate the annual investment in mutual fund of a family whose annual income is ₹ 4.5 lakh.

43. The following results are obtained from the information of average rain and yield of a crop per acre in the last 10 years of an arid region : (H-3)

Particulars	Rainfall (cm)	Yield of crop (Kg.)
Mean	18	970
Standard Deviation	2	38
Correlation co-efficient = 0.6		

Estimate the yield of the crop if it rains 22 cms.

44. Fit a linear equation from the following data for variable (y) of a time series: $n = 5, \Sigma y = 190, \Sigma ty = 602.$ (H-4)

45. One number is randomly selected from the natural number 1 to 100. Find the probability that the number selected is either a single digit number or a perfect square. (H-2, P-2)

46. Two cities A and B of different states have rains on 60% and 75% days respectively during the monsoon. For the cities A and B, find the probability on a certain monsoon day : (H-1, P-2) TB-46

- (1) both the cities have rains,
 (2) at least one city has rains.

Note : The events of rains on a day in these two cities are independent.

47. If $P(A) = \frac{2}{3}, P(B) = \frac{3}{5}, P(B/A) = \frac{3}{4}$ for two events in the sample space of a random experiment, then find $P(A/B).$ (P-2) (H-1)

48. The probability distribution of the monthly demand of laptop in a store is as follows:

Demand of laptop	1	2	3	4	5	6
Probability	0.10	0.15	0.20	0.25	0.18	0.12

Determine the expected monthly demand or laptop and find variance of the demand.

49. The probability that a person living in a city is a non-vegetarian is 0.20. Find the probability of at the most two persons out of 6 persons randomly selected from the city is non-vegetarian. (H-I)

-2 50. The mean and variance of the binomial distribution are 2 and $\frac{6}{5}$ respectively. Find $P(x \leq 1)$ for this binomial distribution. (H-3)

P-2, CH-2
51. There are one dozen mangoes in a box of which 3 mangoes are rotten. 3 mangoes are randomly selected from the box with replacement. If X denotes the number of rotten mangoes in the selected mangoes, obtain the probability distribution of X and hence find the expected value of the rotten mangoes in the selected mangoes.

SECTION-E

❖ Answer Any 3 of the following questions 52 to 55 as directed.

Each question carries 4 marks:

12

P-2, CH-2
52. (A) Find the probability of getting vowels in the first, third and sixth place when all the letters of the word ORANGE are arranged in all possible ways.

(B) Draw the Venn diagram for events $A - B$ and $A \cap B$.

P-2, CH-3
53. In a city, daily sale of petrol at a petrol pump follows normal distribution and its mean and standard deviation are 33,000 litre and 3,000 litre respectively.

(1) Obtain the percentage of days of a month during which the daily sale of petrol is less than 30,000 litre.

(2) During the month of May, how many days are expected so that the sale of petrol is between 32,000 litre to 35,000 litre ?

54. Find the value of $\lim_{x \rightarrow 2} \frac{\sqrt{x+7}-3}{x-2}$ P-2, CH-4

55. The demand function of a watch is $p = 6000 - 2x$. Find the demand which maximizes the revenue and also find the corresponding price.

SECTION-F

❖ Answer Any 4 of the following questions 56 to 61 as directed.

Each question carries 5 marks:

20

56. Compute the Laspayre's, Paasche's and Fisher's index numbers for the year 2016 from the data given below :

Item	Quantity		Price	
	Year 2015	Year 2016	Year 2015	Year 2016
A	25 Kg	32 Kg	42	45
B	15 Litre	20 Litre	28	30
C	10 Pieces	20 Pieces	30	36
D	8 meter	15 meter	20	25
E	30 litre	36 litre	60	65

57. Find the correlation co-efficient between the density of population and death rate from the following information (Use Karl Pearson's method) : *CH-3*

Density (Per Sq.Km.) x	200	500	400	700	600	300
Death rate (per thousand) y	10	12	10	15	9	12

58. In order to study the relationship between the repairing time of accident damaged cars and the cost of repair, the following information is collected :

Repairing time of a car (man hours)	32	40	25	29	35	43
Repairing cost (thousand ₹)	25	35	18	22	28	46

Obtain the regression line of Y (repairing cost) and X (repairing time). If the time taken to repair a car is 50 hours, find an estimate of the repairing cost.

59. The data about goods transported in different years by a division of railway are given below. Fitting a linear equation find the estimate for the year 2017 : *CH-4*

Year	2011	2012	2013	2014	2015
Good transported (tons)	180	192	195	204	202

60. The quantity index numbers consumption of edible oil in a state are given in the following table. Find the trend using five yearly moving averages : *CH-4*

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Index No.	115	121	119	120	117	119	120	118	116	124	125

61. Find the trend using five yearly moving averages for the following data about yearly production (in tons) of a factory :

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Production (tons)	212	206	193	190	214	259	270	230	208	213	215

