

Question Paper

Quantitative Methods – I (MSF1B1): July 2007

- Answer all questions.
- Marks are indicated against each question.

1. $\frac{1}{x} = \frac{1}{20}$

[< Answer >](#)

- (a) 20
(b) 25
(c) 18
(d) 32
(e) 36.

(1 mark)

2. A bag contains 5 white and 3 black balls. Two balls are drawn at random one after the other without replacement, then the probability that both balls drawn are black is

[< Answer >](#)

- (a) $\frac{1}{10}$
(b) $\frac{3}{10}$
(c) $\frac{1}{5}$
(d) $\frac{3}{5}$
(e) $\frac{9}{10}$

(2 marks)

3. $\frac{1}{x} = \frac{1}{20}$

[< Answer >](#)

- (a) $\frac{1}{20}$
(b) $\frac{3}{20}$
(c) $\frac{1}{10}$
(d) $\frac{3}{10}$
(e) 1.

(1 mark)

4. If $y = \frac{1}{x}$, then $\frac{dy}{dx} =$

[< Answer >](#)

- (a) $\frac{1}{x^2}$
(b) $\frac{1}{x}$
(c) 20
(d) 5
(e) 8

(1 mark)

5. The maximum value of the function $f(x) = -x^2 + 14x - 49$ is attained at

[< Answer >](#)

- (a) 7
(b) 9
(c) 14
(d) 19
(e) 28

(2 marks)

6. $f(x) = ax^2 + bx + c$ is a function of x , if a is positive and b is negative, then the function is

[< Answer >](#)

- (a) Increasing at an increasing rate
(b) Increasing at a decreasing rate
(c) Decreasing at an increasing rate
(d) Decreasing at a decreasing rate
(e) Minimum or maximum.

(1 mark)

7. $\frac{1}{x} = \frac{1}{20}$

[< Answer >](#)

- (a) $\frac{1}{20}$
(b) $\frac{3}{20}$
(c) $\frac{1}{10}$
(d) $\frac{3}{10}$
(e) 1.

(1 mark)

8. The letters of the word **article** are arranged at random , probability that the vowels may occupy the even places is

[< Answer >](#)

- (a)
- (b)
- (c)
- (d)
- (e)

(1 mark)

9. A person is known to hit the target in 3 out of 4 shots, whereas another person is known to hit the target in 2 out of 3 shots. What is the probability of the target being hit at all when they both try?

[< Answer >](#)

- (a)
- (b)
- (c)
- (d)
- (e)

(1 mark)

10. A man wants to marry a girl having qualities: white complexion, the probability of getting such a girl is one in forty; handsome dowry, the probability of getting this is one in sixty; westernized manners and etiquette's, the probability here is one in hundred. Find out the probability of his getting married to such a girl when the possession of these three attributes is independent.

[< Answer >](#)

- (a) 0.000003
- (b) 0.000004
- (c) 0.000007
- (d) 0.000009
- (e) 0.000001.

(1 mark)

11. The value of X, Y and Z for the following linear equations

[< Answer >](#)

- (a) X = 1, Y = 3, Z = 2
- (b) X = 1, Y = 2, Z = 3
- (c) X = 3, Y = 2, Z = 1
- (d) X = 3, Y = 1, Z = 2
- (e) X = 2, Y = 1, Z = 3.

(2 marks)

12. How many different numbers can be formed by using three out of seven digits 1, 2, 3, 4, 5, 6 and 7?

[< Answer >](#)

- (a) 210
- (b) 220
- (c) 235
- (d) 240
- (e) 360.

(1 mark)

13. If the sum of three numbers in an A.P. is 42, and the sum of their squares is 686, then the numbers are

[< Answer >](#)

- (a) 6, 13 and 23
- (b) 8, 15 and 19
- (c) 7, 14 and 21
- (d) 5, 14 and 22
- (e) 8, 13 and 21.

(1 mark)

14. Which of the following statement(s) is/are **not true** regarding Mode?

[< Answer >](#)

- I. It can be used as a central location for qualitative data.
 - II. It can be used as a central location for quantitative data.
 - III. It is affected by extreme values.
 - IV. If all items are having the same frequency it is not possible to calculate Mode.
- (a) Only (I) above
 - (b) Only (II) above
 - (c) Only (III) above
 - (d) Only (IV) above
 - (e) All (I), (II), (III) and (IV) above.

(1 mark)

15. Which of the following statement(s) is/are **true** regarding Quartile Deviation (Q.D.)?

[< Answer >](#)

- I. It can be used as a measure of variation to open-ended distributions.
- II. It is a better measure of variation for highly skewed distribution.
- III. It is not a real measure of variation as it does not measure the scatter of observation from the average.
- IV. It is only a positional average.

- (a) Only (I) above
- (b) Only (II) above
- (c) Both (I) and (II) above
- (d) Both (III) and (IV) above
- (e) All (I), (II), (III) and (IV) above.

(1 mark)

16. Which of the following measures of dispersion is/are calculated by using all the data?

[< Answer >](#)

- I. Range.
- II. Quartile Deviation.
- III. Mean Deviation.
- IV. Variance.

- (a) Only (I) above
- (b) Only (II) above
- (c) Both (I) and (II) above
- (d) Both (III) and (IV) above
- (e) All (I), (II), (III) and (IV) above.

(1 mark)

The value of _____, when $X = 3$ and $Y = 1$ is

[< Answer >](#)

- 17.
- (a) 34
 - (b) 27
 - (c) 45
 - (d) 54
 - (e) 62.

(1 mark)

18. If a series is in arithmetic progression, whose first term is 3, last term 171 and the sum of the series is 2175, then the number of terms and common difference of the series respectively are

[< Answer >](#)

- (a) 23 and 7
- (b) 24 and 6
- (c) 6 and 24
- (d) 7 and 25
- (e) 25 and 7.

(2 marks)

19. Which of the following statement(s) is/are **true** regarding the uses of extrapolation in financial analysis?

[< Answer >](#)

- I. Forecasting future sales cost and profit.
- II. Long-term capital requirements.
- III. Production of financial statements for financial institutions, banks, etc.

- (a) Only (I) above
- (b) Only (II) above
- (c) Both (I) and (II) above
- (d) Both (II) and (III) above
- (e) All (I), (II) and (III) above.

(1 mark)

20. At $K = 19\%$, present value of cash flow of a project is equal to Rs.33.42 and at $K = 20\%$ the present value of cash flow is Rs.29.82. At what percent the present value of cash flow is Rs.30?

[< Answer >](#)

- (a) 19.18%
- (b) 19.24%
- (c) 19.32%
- (d) 19.81%
- (e) 19.95%.

(1 mark)

21. A finance company offers to pay a sum of Rs.32,000 at the end of 6 years to investors who deposit Rs.4,000 annually for 6 years. The implicit interest rate is

[< Answer >](#)

- (a) 11.75%
- (b) 12.50%
- (c) 11.43%
- (d) 10.62%
- (e) 14.15%.

(2 marks)

22. Which of the following statement(s) is /are **true** regard to unbounded intervals?

[< Answer >](#)

If "a" is a real number

- I. (a,) is the set of real numbers x such that $a < x$.
- II. (, a) is the set of all real numbers x such that $x < a$.

III. $[a, \infty)$ is the set of all real numbers x such that $a \leq x$.

IV. $(-\infty, a]$ is the set of all real numbers x such that $x \leq a$.

- (a) Both (I) and (II) above
- (b) Both (II) and (III) above
- (c) Both (III) and (IV) above
- (d) (I), (II) and (III) above
- (e) All (I), (II), (III) and (IV) above.

(1 mark)

[< Answer >](#)

The value of $\frac{7}{8} \times \frac{3}{4}$ is

- 23.
- (a) $\frac{21}{32}$
 - (b) $\frac{21}{16}$
 - (c) $\frac{21}{8}$
 - (d) $\frac{21}{4}$
 - (e) $\frac{21}{2}$

(1 mark)

[< Answer >](#)

24. In finance, statistics can be used to

- (a) Reveal long-term trends
- (b) Test the validity of various tools
- (c) Examine real life situations
- (d) Study the demand
- (e) Find the future performance.

(1 mark)

[< Answer >](#)

25. Which of the following statement(s) is/are **true** regard to the number and size of class interval?

- I. Every item of data or data point should be included in one and only one class.
 - II. Class intervals should be of same length to the extent possible.
 - III. The number of classes may be equal to the square root of the number of data points.
- (a) Only (I) above
 - (b) Only (II) above
 - (c) Only (III) above
 - (d) Both (I) and (II) above
 - (e) All (I), (II) and (III) above.

(1 mark)

[< Answer >](#)

26. In a skewed distribution curve

- (a) Mean, median and mode are equal
- (b) The values are not equally distributed
- (c) The values are not concentrated at the lower end
- (d) The values are not concentrated at the higher end
- (e) A vertical line drawn from the peak of the curve to the horizontal axis will divide the area into two equal parts.

(1 mark)

[< Answer >](#)

27. Which of the following statements is **true**?

- (a) The tallest rectangle in a histogram represents the modal class of the distribution
- (b) In a symmetrical distribution the mean, median and mode are unequal
- (c) The medians of two sets of data can be combined mathematically
- (d) The median cannot be determined graphically
- (e) The mode is always uniquely defined.

(1 mark)

[< Answer >](#)

28. Which of the following statement(s) is/are **true** regard to the disadvantages of mode?

- I. The value of mode cannot always be determined in some cases we may have bimodal series.
 - II. The value of mode is not based on each and every item of the series.
 - III. Mode is not capable of algebraic manipulations.
- (a) Only (I) above
 - (b) Only (II) above
 - (c) Both (I) and (II) above
 - (d) Both (II) and (III) above
 - (e) All (I), (II) and (III) above.

(1 mark)

[< Answer >](#)

29. A sum of Rs.1,500 deposited today in a bank gets doubled in a period of 7 years. Find the annual rate of interest?

- (a) 12.21%
- (b) 10.41%
- (c) 13.36%

- (d) 10.75%
(e) 14.50%.

(1 mark)

[< Answer >](#)

30. The algebraic sum of deviations of a set of observations from their arithmetic mean is always

- (a) Greater than or equal to one
(b) Equal to one
(c) Equal to zero
(d) Less than or equal to one
(e) Not equal to two.

(1 mark)

[< Answer >](#)

31. The appropriate mean for a set of ratios using the numerators of the ratios as weights is

- (a) Geometric mean
(b) Harmonic mean
(c) Weighted arithmetic mean
(d) Weighted harmonic mean
(e) Median.

(1 mark)

[< Answer >](#)

32. If by mistake you have added 35 to each of the biggest 200 numbers in a set of 399 numbers, how the median of the numbers is affected?

- (a) The median will increase by 35
(b) The median will increase by 200
(c) The median will increase by 35×200
(d) The median will increase by
(e) The median will increase by .

(1 mark)

[< Answer >](#)

33. Average rainfall of city from Monday to Saturday is 0.5 inches. Due to heavy rainfall for the week, the average increased to 0.7 inches. What was the rainfall on Sunday?

- (a) 3.2 inches
(b) 2.5 inches
(c) 1.9 inches
(d) 1.4 inches
(e) 1.3 inches.

(1 mark)

[< Answer >](#)

34. From the following simultaneous equations, the value of y will be equal to

- (a) 4
(b) 9
(c) 5
(d) 3
(e) 2.

(1 mark)

[< Answer >](#)

35. If $\frac{x}{a} + \frac{y}{b} = \frac{1}{c}$ and $\frac{x}{a} - \frac{y}{b} = \frac{1}{d}$ then $\frac{m}{n} =$

- (a) $\frac{c}{d}$
(b) $\frac{d}{c}$
(c) $\frac{a}{b}$
(d) $\frac{b}{a}$
(e) $\frac{1}{c}$.

(1 mark)

[< Answer >](#)

36. Which of the following is **true** with regard to the simplex method of solving linear programming problems?

- (a) This method cannot be applied for solving problems involving two decision variables
(b) At the optimal solution all the decision variables assume zero values
(c) Slack variables are used to convert 'greater than or equal to' type constraints into equations
(d) At the optimal solution all the slack variables assume zero values
(e) The $Z_j - C_j$ values indicate the variable to enter solution.

(1 mark)

[< Answer >](#)

37. Which of the following **cannot** be determined by graphical method?

- (a) Mean
(b) Median
(c) Mode

- (d) Quartiles
- (e) Deciles.

(1 mark)

38. According to the Bienayme-Chebyshev rule, the percentage of data that will fall between ± 3 standard deviations from the mean is at least

[< Answer >](#)

- (a) 50.75%
- (b) 65.50%
- (c) 75.00%
- (d) 82.75%
- (e) 93.75%.

(1 mark)

39. The logarithm of a number

[< Answer >](#)

- (a) Is always expressed with respect to base 10
- (b) Is always expressed with respect to base 1
- (c) Is always expressed with respect to base e
- (d) Is equal to the base which must be raised to a given exponent in order to get the number
- (e) Is equal to the exponent to which a given base must be raised in order to get the number.

(1 mark)

40. Which of the following statement(s) is/are **true** regarding the rules of probability?

[< Answer >](#)

- I. The probability of the entire sample space is one.
 - II. The probability of the event A must be greater than or equal to zero and less than or equal to one.
 - III. Two events A and B are mutually exclusive if the occurrence of one implies the non-occurrence of the other.
- (a) Only (I) above
 - (b) Only (III) above
 - (c) Both (I) and (II) above
 - (d) Both (II) and (III) above
 - (e) All (I), (II) and (III) above.

(1 mark)

41. Consider the following data:

[< Answer >](#)

Months	1	2	3	4	5	6	7	8	9	10	11	12
Sales('000 Rs.)	78	80	80	82	82	84	84	86	86	88	88	90

The Coefficient of quartile deviation is

- (a) 0.02
- (b) 0.04
- (c) 0.06
- (d) 0.08
- (e) 0.10.

(2 marks)

42. A man travels first 900 km of his journey by train at an average speed of 80 kmph, next 2,000 km by plane at an average speed of 300 kmph and finally 20 km by taxi at an average speed of 30 kmph .What is his average speed for the entire journey?

[< Answer >](#)

- (a) 157.24 kmph
- (b) 175.65 kmph
- (c) 185.75 kmph
- (d) 117.45 kmph
- (e) 102.35 kmph.

(2 marks)

43. Which of the following statement(s) is/are **true** regarding the computer?

[< Answer >](#)

- I. A computer is an electronic device.
 - II. Computer can perform long sequences of computations without human interventions.
 - III. Computer has the ability of storing and executing a given set of instructions for solving a particular problem.
- (a) Only (I) above
 - (b) Both (I) and (II) above
 - (c) Both (I) and (III) above
 - (d) Both (II) and (III) above
 - (e) All (I), (II) and (III) above.

(1 mark)

44. Which of the following is/are the major elements in every computer solution?

[< Answer >](#)

- I. Data.
- II. Hardware.
- III. Software.

- (a) Only (I) above
- (b) Only (II) above
- (c) Only (III) above
- (d) Both (I) and (III) above
- (e) All (I), (II) and (III) above.

(1 mark)

45. Which of the following statements is **not true** regarding the dual formation?

[< Answer >](#)

- (a) For every LP formulation there exists another unique linear programming formulation
- (b) The dual can be considered as inverse of the primal in every respect
- (c) If the primal objective function is 'Maximization' function then the dual objective function is 'Maximization' function
- (d) The direction of the inequalities are reversed
- (e) Same data can be used for both 'Dual' and 'Primal' formulation.

(1 mark)

46. The derivative of a function $f(x)$ at $x = a$ is

[< Answer >](#)

- (a) Always equal to $f(a)$
- (b) Always equal to a
- (c) The rate of change in the value of the function at $x = a$
- (d) The limit of $f(x)$ as x approaches a
- (e) The ratio of $f(a)$ to a .

(1 mark)

47. $\ln 2$
- (a) $\ln 2$
 - (b) $\ln 4$
 - (c) $\ln 15$
 - (d) $\ln 25$
 - (e) $\ln 35$.

[< Answer >](#)**(1 mark)**

48. Which of the following indicates that the distribution curve of the data is positively skewed?

[< Answer >](#)

- (a) Arithmetic Mean < Median < Mode
- (b) Median < Mode < Arithmetic Mean
- (c) Mode < Arithmetic Mean < Median
- (d) Mode < Median < Arithmetic Mean
- (e) Median < Arithmetic Mean < Mode.

(1 mark)

49. The variance of a set of data is 81 and the arithmetic mean is 6. What is the coefficient of variation?

[< Answer >](#)

- (a) 6%
- (b) 20%
- (c) 60%
- (d) 90%
- (e) 150%.

(1 mark)

50. Find the sum of all natural numbers between 350 and 1000 which are exactly divisible by 5.

[< Answer >](#)

- (a) 87,075
- (b) 3,12,750
- (c) 1,56,250
- (d) 1,56,375
- (e) 1,56,500.

(1 mark)

51. The sum of three numbers in an arithmetic progression is 27 whereas the sum of their cubes is 2673. The lowest of the three numbers is

[< Answer >](#)

- (a) 2
- (b) 6
- (c) 9
- (d) 12
- (e) 15.

(2 marks)

52. If a , b , and c be the sums of p , q , and r terms respectively of an A.P., the expression

is equal to

[< Answer >](#)

- (a) -1
- (b) 0
- (c) 1
- (d) abc
- (e) pqr .

(2 marks)

53. A die is loaded so that probability of getting face x is proportional to x . When the die is rolled the probability of getting less than or equal to three would be

[< Answer >](#)

- (a)
- (b)
- (c)
- (d)
- (e) .

(2 marks)

54. In a simultaneous tossing of two unbiased coins, the probability of having at least one tail is

[< Answer >](#)

- (a) 0.250
- (b) 0.375
- (c) 0.500
- (d) 0.750
- (e) 1.000.

(1 mark)

55. In a card game, 4 players are distributed with one card each by turn so that each player gets 13 cards. Find out the possibility of a specified player getting a king and a black ace. (There are 4 aces and 4 kings in a pack of 52 cards).

[< Answer >](#)

- (a) 0.168
- (b) 0.179
- (c) 0.206
- (d) 0.258
- (e) 0.279.

(2 marks)

56. A husband and wife appeared for an interview for two vacancies in the same company. The probability of selecting husband is $1/9$ and that of selecting wife is $1/3$. What is the probability that both of them be selected?

[< Answer >](#)

- (a) 1.3%
- (b) 2.6%
- (c) 3.7%
- (d) 5.8%
- (e) 7.9%.

(1 mark)

57. The mean marks of 100 students were found to be 45. Later on it was discovered that a score of 65 was misread as 80. The correct mean corresponding to the correct score is

[< Answer >](#)

- (a) 22.35
- (b) 35.85
- (c) 44.85
- (d) 47.85
- (e) 49.55.

(1 mark)

58. An incomplete distribution is given below:

[< Answer >](#)

Variable	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70
Frequency	4	16	f_1	100	f_2	6	4

The total frequency is 230. The median value is 33.5. The value of f_1 is

- (a) 15
- (b) 26
- (c) 35
- (d) 40
- (e) 60.

(2 marks)

59. If $f(x) = x^2 - 4x + 9$, the value of $f(x^2 + 3)$ is

[< Answer >](#)

- (a) $x^2 - 2x + 2$
- (b) $x^4 - x + 3$
- (c) $x^4 + 2x^2 + 6$
- (d) $x^4 - 2x + 15$
- (e) $x^4 - 2x^2 + 10$.

(1 mark)

60. A series of numbers is said to be in a geometrical progression if

[< Answer >](#)

- (a) The successive numbers in the series differ by a constant value
- (b) The numbers in the series are all equal

- (c) The successive numbers in the series increase or decrease by a common ratio
- (d) The numbers in the series assume positive and negative signs alternately
- (e) The numbers in the series are all multiples of 10.

(1 mark)

[< Answer >](#)

61. Which of the following is **not** an assumption underlying linear programming?

- (a) The objective to be accomplished can be expressed as a linear function of the decision variables
- (b) The constraints on the use of resources can be expressed as linear equations or inequations
- (c) The amount of resources consumed by each unit of the decision variables is uncertain
- (d) The decision variables can take non-negative values only
- (e) The total consumption of a resource is the sum of the resources consumed by each decision variable.

(1 mark)

[< Answer >](#)

62. A privately owned lake contains two types of game fish, bass and trout. The owner provides two types of food, A and B for these fish. Bass requires 2 units of food A and 4 units of food B, and trout requires 5 units of food A and 2 units of food B. If the owner has 800 units of each food, the maximum number of fish that the lake can support would be

- (a) 100
- (b) 150
- (c) 250
- (d) 300
- (e) 350.

(2 marks)

[< Answer >](#)

63. Which of the following is/are **not** the basic requirement(s) of Linear Programming Problem technique?

- I. Decision variables and their relationship.
- II. Well-defined objective function.
- III. Absence of constraints or restrictions.
- IV. Alternative courses of action.
- V. Non-negative restriction.

- (a) Only (I) above
- (b) Only (III) above
- (c) Only (IV) above
- (d) Both (I) and (III) above
- (e) Both (II) and (V) above.

(1 mark)

[< Answer >](#)

64. In the graphical method of solving linear programming problems, if there is a unique optimal solution, then the optimal solution

- (a) Is always found at the center of the feasible region
- (b) Is always at the origin
- (c) Lies outside the feasible region
- (d) Is located at one of the corner points of the feasible region
- (e) Always lies on one of the two axes.

(1 mark)

[< Answer >](#)

65. Consider the following linear programming problem:

Which of the following is **true** from the Initial simplex table of above linear programming problem?

- (a) The incoming vector is X_1 and the outgoing vector is S_2
- (b) The incoming vector is X_2 and the outgoing vector is S_2
- (c) The incoming vector is X_3 and the outgoing vector is S_3
- (d) The incoming vector is X_2 and the outgoing vector is S_1
- (e) The incoming vector is X_3 and the outgoing vector is S_2 .

(2 marks)

[< Answer >](#)

66. The dual of the following linear programming problem is

- (a) (b)
- (c) (d)
- (e)

(2 marks)

[< Answer >](#)

67. Which of the following statement(s) is/are **not true** regarding the linear programming problem?

- I. Every primal has one and only one dual.
- II. The solution of dual provides all the essential information about the solution of the primal problem.

III. It is always easier to solve the dual rather than a primal.

- (a) Only (I) above
- (b) Only (II) above
- (c) Only (III) above
- (d) Both (I) and (II) above
- (e) All (I), (II) and (III) above.

(1 mark)

[< Answer >](#)

68. A bimodal distribution has

- (a) One mode
- (b) Two modes
- (c) Three modes
- (d) Four modes
- (e) More than four modes.

(1 mark)

[< Answer >](#)

69. Which of the following is a measure of dispersion?

- (a) Median
- (b) Mean deviation
- (c) Mode
- (d) Arithmetic mean
- (e) Geometric mean.

(1 mark)

[< Answer >](#)

70. To determine the appropriate width of each class interval in a grouped frequency distribution, we

- (a) Take the square of the number of observations
- (b) Divide the number of desired class intervals by the range of the data
- (c) Take the square root of the number of observations
- (d) Divide the range of the data by the number of desired class intervals
- (e) Divide the range of data by 2.

(1 mark)

[< Answer >](#)

71. If

- (a) $x y z$
- (b) $x + y + z$
- (c) $(x + y + z)^{-1}$
- (d) 1
- (e) 0.

(2 marks)

[< Answer >](#)

- 72.
- (a) $(m + n)$
 - (b) $(m - n)$
 - (c) $2mn$
 - (d) $(2m + n)$
 - (e) $(m - 2n)$.

(1 mark)

[< Answer >](#)

73. If events A and B are mutually exclusive then which of the following is **true**?

- (a) $P(A \text{ and } B) = 0$
- (b) $P(A) = 0$
- (c) $P(B) = 0$
- (d) $P(A \text{ or } B) = 0$
- (e) $P(A \text{ or } B) = 1$.

(1 mark)

74. From a city population, $P(\text{male or a smoker}) = 0.60$, $P(\text{a male smoker}) = 0.30$ and $P(\text{a male/when a smoker is already selected}) = 0.57$. Then the probability of selecting a non-smoker is

[< Answer >](#)

- (a) 0.35
- (b) 0.40
- (c) 0.47
- (d) 0.52
- (e) 0.60.

(1 mark)

75. Which of the following is a method of solving interpolation problems?

[< Answer >](#)

- (a) Simplex method
- (b) Dual simplex method
- (c) Graphical method

- (d) Census method
(e) Revised simplex method.

(1 mark)

76. A multiple choice test consists of three problems. For each problem, there are five choices, out of which one is correct. One student comes totally unprepared and decides to answer by sheer guessing. What is the probability that he will answer at least one problem correctly?

[< Answer >](#)

- (a)
(b)
(c)
(d)
(e) .

(2 marks)

77. A pair of fair dice is thrown. Find the probability of getting a sum of 7, when it is known that the digit in the first die is greater than that of the second.

[< Answer >](#)

- (a) 5/12
(b) 1/5
(c) 1/12
(d) 5/8
(e) 7/10.

(2 marks)

78. Anjali Engines Inc. produces two models of car engines X and Y.

[< Answer >](#)

The following information is available:

Particulars	X	Y
Selling Price	Rs. 800	Rs. 1,000
Variable cost per unit	Rs. 560	Rs. 625
Assembly hours per engine	2 hours	5 hours
Testing hours per engine	1 hour	0.5 hours
Total assembly hours available	600 hours	
Total testing hours available	120 hours	

Anjali Engines Inc. has to decide how many of the X and Y engines it should produce if it wants to maximize the profit.

The constraints of the above linear programming problem is/are

- I. $2X+5Y \leq 120$.
 II. $2X+5Y \leq 600$.
 III. $2X+Y \leq 240$.
 (a) Only (I) above
 (b) Only (II) above
 (c) Only (III) above
 (d) Both (I) and (II) above
 (e) Both (II) and (III) above.

(2 marks)

79. Which of the following statement(s) is /are **true** regarding histogram?

[< Answer >](#)

- I. Histogram indicates the fluctuations in frequencies from class to class.
 II. It does not clearly reveal the rate of change in frequency from one class to the next.
 III. Rectangles have been erected with their bases equal to the lengths of the class intervals.
 (a) Only (I) above
 (b) Only (II) above
 (c) Both (I) and (II) above
 (d) Both (II) and (III) above
 (e) All (I), (II) and (III) above.

(1 mark)

80. A box contains 20 light bulbs, 5 of which are known to be defective. Three light bulbs are selected at random without replacement. Which of the following is/are **correct**?

- (a) The probability that all the three bulbs selected at random are defective is
- (b) The probability that exactly one of the three bulbs selected at random is defective is
- (c) The probability that at least one of the three bulbs selected at random is defective is
- (d) The probability that at least two of the three bulbs selected at random are not defective is
- (e) The probability that at least one of the three bulbs selected at random is not defective is

(2 marks)

END OF QUESTION PAPER

Suggested Answers

Quantitative Methods – I (MSF1B1): July 2007

1. Answer : (a) $\frac{5}{20} \times \frac{4}{19} \times \frac{3}{18} = \frac{1}{116}$
Reason : $\frac{5}{20} \times \frac{4}{19} \times \frac{3}{18} = \frac{1}{116}$ [< TOP >](#)
[≥](#)
2. Answer : (e)
Reason : Probability of drawing a black ball in the first attempt is $\frac{1}{4}$
 $P(A) = \frac{1}{4}$
Probability of drawing the second black ball given that the first ball drawn is black:
 $P(B|A) = \frac{1}{3}$
The Probability that both balls drawn are black is given by
 $P(AB) = P(A) \times P(B|A) = \frac{1}{4} \times \frac{1}{3} = \frac{1}{12}$ [< TOP >](#)
[≥](#)
3. Answer : (b) $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$
Reason : $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$ [< TOP >](#)
[≥](#)
4. Answer : (d) $y = \frac{1}{2}x^2 - 3x + 4$
Reason : $y = \frac{1}{2}x^2 - 3x + 4$
Let $u = \frac{1}{2}x^2 - 3x + 4$
 $\frac{du}{dx} = x - 3$
 $\frac{d^2u}{dx^2} = 1$
 $\frac{d^2u}{dx^2} > 0$ [< TOP >](#)
[≥](#)
5. Answer : (d)
Reason : The function will be maximum or minimum, when $\frac{dy}{dx} = 0$
Here,
The value of function will be maximum, where the second derivative $\frac{d^2y}{dx^2} < 0$.
So, (d) is the correct answer. [< TOP >](#)
[≥](#)
6. Answer : (b)
Reason : y is a function of x , $\frac{dy}{dx}$, $\frac{d^2y}{dx^2}$ are the first and second derivatives of y with respect to x .
positive $\frac{dy}{dx}$ positive $\frac{d^2y}{dx^2}$ Increasing at an increasing rate
positive $\frac{dy}{dx}$ negative $\frac{d^2y}{dx^2}$ Increasing at a decreasing rate
negative $\frac{dy}{dx}$ positive $\frac{d^2y}{dx^2}$ Decreasing at an increasing rate
negative $\frac{dy}{dx}$ negative $\frac{d^2y}{dx^2}$ Decreasing at a decreasing rate [< TOP >](#)
[≥](#)
7. Answer : (b) $\frac{1}{2}x^2 - 3x + 4$
Reason : $\frac{1}{2}x^2 - 3x + 4$ [< TOP >](#)
[≥](#)

8. Answer : (d) [< TOP](#)
Reason : the word 'article' contains 7 distinct letters which can be arranged among themselves in 7! Ways .Hence, associating these two operations, the number of favorable cases for the vowels to occupy even places is $3! \times 4!$ Ways.
Therefore , the required probability = $\frac{3! \times 4!}{7!}$. [≥](#)
9. Answer : (a) [< TOP](#)
Reason : The probability that the first person hits the target = $\frac{1}{2}$
The probability that the second person hits the target = $\frac{1}{3}$
The events are not mutually exclusive because both of them may hit the target .
 $P(AB) = P(A).P(B)$ Since A and B are independent events.
The required probability is, $P(A \text{ or } B) = P(A) + P(B) - P(AB)$
 $= \frac{1}{2} + \frac{1}{3} - \frac{1}{6} = \frac{2}{3}$. [≥](#)
10. Answer : (b) [< TOP](#)
Reason : Probability of a girl with white complexion = $\frac{1}{100} = 0.01$
Probability of a girl with handsome dowry = $\frac{1}{100} = 0.01$
Probability of a girl with westernized manners = $\frac{1}{100} = 0.01$
Since the events are independent, the probability of simultaneous occurrence of all these qualities = $\frac{1}{100} \times \frac{1}{100} \times \frac{1}{100} = 0.000001$. [≥](#)
11. Answer : (b) [< TOP](#)
Reason : Given equations are
Now multiply equation (1) with -2 and add it to equation (2).
Now multiply equation (1) with -8 and add it to equation (3).

Now multiply equation (4) with -9 and add it to equation (5).
To get y value, substitute z value in equation (5) or equation (4). We will get y =2.
Substitute this y = 2 and z = 3 in equation (1) or (2) or (3) we get x = 1. [≥](#)
12. Answer : (a) [< TOP](#)
Reason : Using 3 out of 7 digits we can form 210 different numbers. [≥](#)
13. Answer : (c) [< TOP](#)
Reason : [≥](#)
14. Answer : (c) [< TOP](#)
Reason : Since,
Mode can be used as a central location for qualitative data and quantitative data. If all items are having the same frequency it is not possible to calculate the mode.
Mode is **not** affected by extreme values.
So, option (c) is the correct answer. [≥](#)
15. Answer : (e) [< TOP](#)
Reason : All the statements are true. [≥](#)
Merits of Q.D.:
(I) It can be used as a measure of variation to open-ended distributions.
(II) It is a better measure of variation for highly skewed distribution.
Limitations:
(III) It is not a real measure of variation as it does not measure the scatter of observation from the average.
(IV) It is only a positional average.
Hence option (e) is the correct answer.
16. Answer : (d) [< TOP](#)
Reason : Since, [≥](#)
Range is dependent on only extreme values. (i.e., Maximum and Minimum value).
Quartile Deviation is calculated from observations obtained after discarding one quartile of the observations at the lower end and another quartile of the observations at the upper end of the distribution.
But **Mean Deviation** and **Variance** are calculated from each observation in the dataset.
Hence option (d) is the correct answer.

17. Answer : (d)

[< TOP](#)

[≥](#)

Reason : Since

18. Answer : (e)

[< TOP](#)

[≥](#)

Reason : Let 'n' be the number of terms in the series.

Given the first term of the series is 3 i.e. $a=3$ and the last term is 171 i.e. $T_n=171$.

Then the sum of the terms of the series is given by

■

The number of terms in the series is 25.

'd' denote the common difference of the series.

Then the 25th term of the series becomes $a+24d$.

19. Answer : (e)

[< TOP](#)

[≥](#)

Reason : In financial analysis extrapolation is widely used for

- i. Forecasting future sales, cost and profit.
- ii. Long-term capital requirements.
- iii. Production of financial statements for financial institutions, banks, etc.

Hence option (e) is the true.

20. Answer : (e)

[< TOP](#)

[≥](#)

Reason : at $K = 19\%$, present value of cash flow is equal to 33.42

at $K = 20\%$, present value of cash flow is equal to 29.82

so, $\quad \quad \quad = 19.95\%$.

21. Answer : (c)

[< TOP](#)

[≥](#)

Reason : We know that $32,000 = 4000 \times FVIFA(k,6)$

Where FVIFA is future value interest factor of an annuity, and k is the implicit rate.

$FVIFA(k,6) = \quad \quad = 8$

If we refer to the FVIFA tables,

At $k = 11\%$, $FVIFA(11,6) = 7.913$ and

At $k = 12\%$, $FVIFA(12,6) = 8.115$

So, k must be greater than 11% but lower than 12%.

For an ascent of $(8.115 - 7.913)$, the ascent in rate is 1. For a required ascent of $(8.000 - 7.913)$, the ascent rate is

The implicit rate of interest = $11 +$

$= 11 + 0.43 = 11.43\%$.

22. Answer : (a)

[< TOP](#)

[≥](#)

Reason : If "a" is a real number

(I) $(a, \quad)$ is the set of real numbers x such that $a < x$ is true

(II) $(\quad, a)$ is the set of all real numbers x such that $x < a$ is true.

(III) Given statement $[a, \quad)$ is the set of all real numbers x such that $a \geq x$ is wrong Hence the correct one is $[a, \quad)$ is the set of all real numbers x such that $a \leq x$.

(IV) Given statement $(\quad, a]$ is the set of all real numbers x such that $x \geq a$ is wrong Hence the correct one is $(\quad, a]$ is the set of all real numbers x such that $x \leq a$.

Option (a) is the correct answer.

23. Answer : (d)

[< TOP](#)

[≥](#)

Reason :

24. Answer : (a)

[< TOP](#)

[≥](#)

Reason : In finance, statistics can be used to reveal long-term trends and seasonal variations in sales, expenses and incomes.

25. Answer : (e)

[< TOP](#)

[≥](#)

Reason : There are no hard and fast rules regarding the number and size of class intervals

(i) Every item of data or data point should be included in one and only one class.

(ii) Class intervals should be of same length to the extent possible.

(iii) The number of classes may be equal to the square root of the number of data points.

Since all statement are true. Hence option (e) is correct.

26. Answer : (b)

[< TOP](#)

[≥](#)

Reason : In a skewed distribution curve ,

a. mean ,median ,mode are not equal.

b. the values are **not equally** distributed

c. the values are concentrated at the lower end

d. The values are not concentrated at the higher end.

e a vertical line drawn from the peak of the curve to the horizontal axis will divide the area into two equal parts.

So, option (b) is the correct answer.

27. Answer : (a)

[< TOP](#)

[≥](#)

Reason : The tallest rectangle in a histogram represents the modal class.

In a symmetrical distribution mean, median and mode are equal.

The median can not be mathematically manipulated; hence medians of two sets of data can not be combined.

The median can be determined graphically.

The mode is not uniquely determined when more than one observation have the highest frequency.

28. Answer : (e)

[< TOP](#)

[≥](#)

Reason : The disadvantages of mode are

I. the value of mode cannot always be determined. In some cases we may have a bimodal series.

II. it is not capable of algebraic manipulations

III. The value of mode is not based on each and every item of the series.

All are true, hence option (e) is the correct answer.

29. Answer : (b)

[< TOP](#)

[≥](#)

Reason : let r be the interest.

$$P_n = P_0(1+r)^n$$

$$\text{i.e., } 3000 = 1500 (1+r)^7$$

$$\text{so, } (1+r)^7 = 2$$

$$1+r = 2^{1/7} = 1.1041$$

$$r = 0.1041 = 10.41\%$$

The annual rate of interest per annum =10.41%.

30. Answer : (c)

[< TOP](#)

[≥](#)

Reason : The algebraic sum of deviations of a set of observations from their arithmetic mean is always equal to zero.

31. Answer : (d)

[< TOP](#)

[≥](#)

Reason : The appropriate mean for a set of ratios using the numerators of the ratios as weights is **weighted harmonic mean**

32. Answer : (a)

[< TOP](#)

[≥](#)

Reason : Here, 35 is being added to all the numbers 200 numbers in a set of 399 numbers. The median of these numbers is the 200th term. As it is being increased by 35, the median will also increase by 35.

Hence, the option (a) is correct.

33. Answer : (c)

[< TOP](#)

[≥](#)

Reason :

Now $\sum_{i=1}^6$ for six days (i.e., Monday to Saturday)

$$= 0.5 \times 6 = 3 \text{ inches}$$

And $\sum_{i=1}^7$ for seven days (i.e., Monday to Sunday)

$$= 0.7 \times 7 = 4.9 \text{ inches}$$

Hence, rainfall on Sunday = 4.9 inches – 3 inches = 1.9 inches.

34. Answer : (a)

[< TOP](#)

Reason :

$$3x + 4y + 3z = 9 \text{ -----(i)}$$

$$x + 2y + 2z = 3 \text{ -----(ii)}$$

$$2x + y + z = 2 \text{ -----(iii)}$$

By doing (i) – (ii) – (iii) we get

$$Y = 9 - 3 - 2 = 4.$$

35. Answer : (b)

[< TOP](#)

Reason :

36. Answer : (e)

[< TOP](#)

Reason : The following are the true with regard to simplex method of solving linear programming problems:

- This method can be applied for solving problems involving two decision variables
- At the optimal solution all the decision variables assume non-negative values
- Slack variables are used to convert 'less than or equal to' type constraints into equations
- At the optimal solution all the slack variables assume non-negative values
- The $Z_j - C_j$ values indicate the variable to enter solution.

So, option (e) is the correct answer.

37. Answer : (a)

[< TOP](#)

Reason : Median, quartiles, deciles and mode can be determined by graphical method but mean cannot be determined by graphically .

38. Answer : (e)

[< TOP](#)

Reason : According to the Bienayme-Chebyshevs rule, at least 75% of the values will fall

Within ± 2 standard deviations from the mean of the distribution and at least 93.75% of all observations fall within ± 3 standard deviations of the mean.

39. Answer : (e)

[< TOP](#)

Reason : The logarithm of a number is equal to the exponent to which a given base must be raised in order to get the number.

The logarithm of a number is not expressed with respect to base zero or one .

The logarithm of a number may be expressed with respect to base 10 or other positive real number not equal to 1.

40. Answer : (e)

[< TOP](#)

Reason : The rules of probability are:

- The probability of the entire sample space is one.
- The probability of the event A must be greater than or equal to zero and less than or equal to one.
- Two events A and B are mutually exclusive if the occurrence of one implies the non occurrence of the other.

So, option (e) is the correct answer.

41. Answer : (b)

[< TOP](#)

Reason : The values are already in arranged in ascending order.

$$Q_1 = \text{3rd item} = 3.25^{\text{th}} \text{ item}$$

$$Q_1 = 3^{\text{rd}} \text{ item} + \left(\frac{4^{\text{th}} \text{ item} - 3^{\text{rd}} \text{ item}}{4} \right)$$

$$= 80 + \frac{(82-80)}{4} = 80.5$$

$$Q_3 = \text{9th item} = 9.75^{\text{th}} \text{ item}$$

$$Q_3 = 9^{\text{th}} \text{ item} + \left(\frac{10^{\text{th}} \text{ item} - 9^{\text{th}} \text{ item}}{4} \right)$$

$$= 86 + \frac{(88-86)}{4} = 87.5$$

$$\text{Coefficient of quartile deviation} = \frac{Q_3 - Q_1}{Q_3 + Q_1} = \frac{87.5 - 80.5}{87.5 + 80.5} = 0.04.$$

42. Answer : (a)

[< TOP](#)

Reason :

Speed in Kms. per hour	Distance traveled(w)	w/x
80	900	11.25
300	2000	6.66
30	20	0.66
total	$\Sigma w = 2920$	$\Sigma (w/x) = 18.57$
Average speed , H.M (w) =	$= 157.24.$	

43. Answer : (e)

[< TOP](#)[≥](#)

Reason : (i) A computer is an electronic device which accepts input data ,performs operations or computations on the data in a pre-arranged sequence of program ,and provides the result as an output or action.

(ii) The basic difference between the computer and calculator is that the computer can perform long sequences of computations without human interventions.

(iii) Computer has the ability of storing and executing a given set of instructions for solving a particular problem.

All are true. So, option (e) is the correct answer.

44. Answer : (e)

[< TOP](#)[≥](#)

Reason : There are three major elements in every computer solution .

They are:

I. Data

II. Hardware

III. Software.

Hence option (e) is correct.

45. Answer : (c)

[< TOP](#)[≥](#)

Reason : For every LP formulation there exists another unique linear programming formulation called 'Dual'.

Same data can be used for both 'Dual' and 'Primal' formulation .Both can be solved in a similar manner as the Dual is also an LP formulation.

The Dual can be considered as the 'inverse' of the primal in every respect.

The directions of the inequalities are reversed.

If the primal objective function is a 'Maximization' function then the dual objective function is a '**Minimization**' function vice versa.

46. Answer : (c)

[< TOP](#)[≥](#)

- Reason :
- The derivative of a function $f(x)$ at $x = a$ may not be equal to $f(a)$.
 - The derivative of a function $f(x)$ at $x = a$ may not be equal to a .
 - The derivative of $f(x)$ at $x = a$ is the rate of change in the value of $f(x)$ at $x = a$.
 - The derivative of a function $f(x)$ at $x = a$ is not the limit of $f(x)$ as x approaches a .
 - The derivative of a function $f(x)$ at $x = a$ is not the ratio of $f(a)$ to a .

47. Answer : (b)

[< TOP](#)[≥](#)

Reason : If $f(x) = \ln g(x)$, then $f'(x) = \frac{g'(x)}{g(x)}$
 $\therefore \frac{f'(x)}{g'(x)} = \frac{1}{g(x)}$
 $\therefore f'(x) = \frac{g'(x)}{g(x)}$

48. Answer : (d)

[< TOP](#)[≥](#)

Reason : In case of a positively skewed distribution, mode < median < arithmetic mean. Hence (d) is the answer.

The relationships stated in (a), (b), (c) and (e) are not the features of positively skewed distributions.

49. Answer : (e)

[< TOP](#)[≥](#)

Reason : Standard deviation = 3 = 9

Coefficient of variation = 3 = 300%

50. Answer : (a)

[< TOP](#)[≥](#)

Reason : Clearly the numbers between 350 and 1000 which are exactly divisible by 5 are 355, 360, 365, ..., 995.

$\therefore T_n = 995 = a + (n-1)d = 355 + (n-1)5$

Solving the above we get $n = 129$.

$\therefore S = \frac{n}{2} [a + T_n] = \frac{129}{2} [355 + 995] = 87,075$.

51. Answer : (b)

[< TOP](#)[≥](#)

Reason : Let the numbers be $(m-d)$, m , $(m+d)$

So, $(m-d) + m + (m+d) = 3m = 27$

Or, $m = 9$

52. Answer : (b)

[< TOP](#)[≥](#)

Reason : Let A denote the first term and D denote the common difference of the A.P. then

$$a = \dots \Rightarrow \dots (1)$$

$$b = \dots \Rightarrow \dots (2)$$

$$c = \dots \Rightarrow \dots (3)$$

Multiplying (1) by $(q-r)$, (2) by $(r-p)$ and (3) by $(p-q)$ and adding we get,

=

= 0.

53. Answer : (b) [< TOP](#)
[≥](#)
Reason : There are six faces in a die and they are named as 1, 2, 3, 4, 5 and 6. So, the corresponding probability would be 1k, 2k, 3k, 4k, 5k and 6k respectively. Since one of the face must appear the sum of all these probabilities should be one
i.e. $k + 2k + 3k + 4k + 5k + 6k = 21k = 1$ or $k =$
The probability of less than or equal to three is $1k + 2k + 3k = 6k =$.
54. Answer : (d) [< TOP](#)
[≥](#)
Reason : Here, the sample space may be drawn as (HH, HT, TH and TT).
The number of cases that are favorable is given by 3 while the total number of possible outcomes is 4.
Hence, the required probability is = 0.75.
55. Answer : (a) [< TOP](#)
[≥](#)
Reason : Here the total number of ways (n) =
The favourable number of ways (m) =
Since one black ace out of 2 black aces can be chosen in ways.
One king out of 4 kings in ways and remaining 11 cards from the remaining 46 cards in ways.
 $\therefore$ The required probability = $P = = = 0.168$.
56. Answer : (c) [< TOP](#)
[≥](#)
Reason : We have to find out that the probability that both of them will be selected.
Since events are independent we have
 $P(A \text{ and } B) = P(A) \times P(B) = = 0.037 \approx 3.7 \%$.
57. Answer : (c) [< TOP](#)
[≥](#)
Reason : We are given $N = 100$; = 45
Since
 $= 100 \times 45 = 4500$
But this is not correct Σx
Correct $\Sigma x =$ Incorrect $\Sigma x -$ Wrong item + Correct item
 $= 4500 - 80 + 65 = 4485$
 $\therefore$.
58. Answer : (e) [< TOP](#)
[≥](#)
Reason : The total frequency is 230
The frequency of the class other than the missing one are $(4 + 16 + 100 + 6 + 4 = 130)$
Hence $f_1 + f_2 = (230 - 130) = 100$
Median =

We are given median = 33.5
Hence it must lie in the class (30 – 40), so 30 – 40 is the median class
Thus the various values known to us are
Median = 33.5, $L_m = 30$, $N = 230$,
 $F = (20 + f_1)$ $w = 10$, $f_m = 100$
So,
 $33.5 = 30 +$
 $\therefore f_2 = 100 - f_1 = 40$.
59. Answer : (c) [< TOP](#)
[≥](#)
Reason : $f(x) = x^2 - 4x + 9$
Replacing x by $(x^2 + 3)$, we get
 $f(x^2 + 3) = (x^2 + 3)^2 - 4(x^2 + 3) + 9$
 $= x^4 + 6x^2 + 9 - 4x^2 - 12 + 9$
 $= x^4 + 2x^2 + 6$.
60. Answer : (c) [< TOP](#)
[≥](#)
Reason : A series of numbers is said to be in a geometrical progression if the successive numbers in the series increase or decrease by a common ratio.

61. Answer : (c)

[< TOP](#)

[≥](#)

Reason : (a), (b), (d) and (e) are all assumptions underlying linear programming.

However, (c) is not an assumption because linear programming assumes that the amount of resources consumed by each unit of the decision variables is certain.

62. Answer : (c)

[< TOP](#)

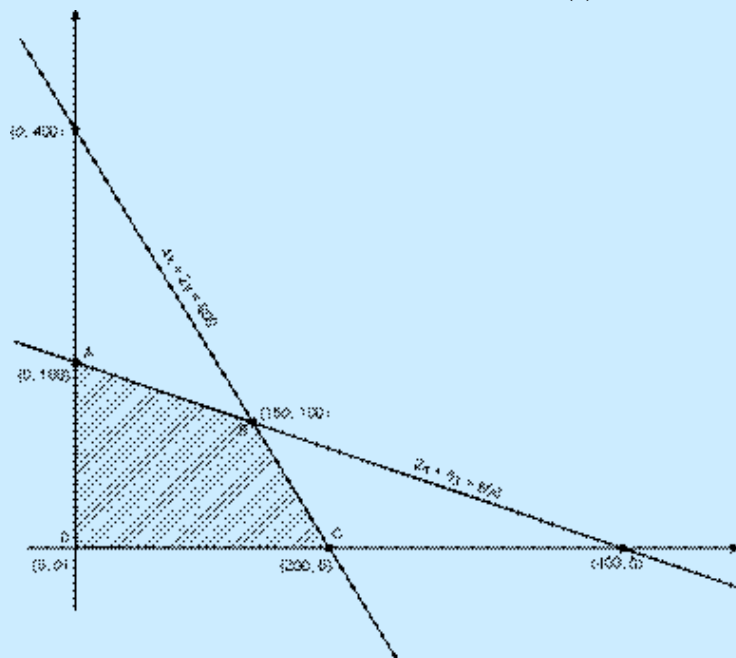
[≥](#)

Reason : Let there are x numbers of bass and y numbers of trout.

Objective is to maximize $x + y$.

Subject to:

and the terminal line is(i)
and the terminal line is(ii)



We obtain the feasible region as OABC for the given problem

Evaluating the value of objective function at the corners of feasible region, we get

Corner	Point	$Z = x + y$
O	(0, 0)	0
A	(0, 160)	160
B	(150, 100)	250
C	(200, 0)	200

We see that the maximum value is obtained at B(150, 100). This is the optimum point

The maximum number of fish, that the lake can support is 250.

So, the optimal point is 250 and the lake can contain at the most 250 fishes.

63. Answer : (b)

[< TOP](#)

[≥](#)

Reason : The following are the basic requirements of Linear Programming Problem technique for optimization problems:

when employed

- I. Decision variables and their relationship.
- II. Well-defined objective function.
- III. **Presence** of constraints or restrictions.
- IV. Alternative courses of action.
- V. Non-negative restriction.

Therefore (b) is the correct answer.

64. Answer : (d)

[< TOP](#)

[≥](#)

Reason : In the graphical method of solving linear programming problems if there is a unique optimal solution, then the optimal solution is located at one of the corner points of the feasible region.

65.

Answer : (a)

Reason :

After introducing slack variables, constraint equations become

The starting simplex table

	C_j		10	6	4	0	0	0	
Basic variables	C_B	X_B	X_1	X_2	X_3	S_1	S_2	S_3	Min Ratio (X_B/X_2)
S_1	0	10	1	1	1	1	0	0	$10/1=10$
$\leftarrow S_2$	0	60	10	4	5	0	1	0	$60/10=6 \leftarrow$
S_3	0	30	2	2	6	0	0	1	$30/2=15$
$x_1 = x_2 = x_3 = 0$	$Z = C_B X_B = 0$		$-10 \uparrow$	-6	-4	0	0	0	$\leftarrow \Delta_j$

From the above table we can observe that the incoming vector is x_2 and the outgoing vector is s_1 . Therefore

(a) is the correct answer.

66.

Answer : (a)

Reason : Given, linear programming problem is

The dual of the above linear programming problem is

Hence option (a) is correct.

67.

Answer : (c)

Reason : In linear programming, there is a unique dual (primal) problem associated with every primal (dual) problem. When a primal is solved, its associated dual is also solved simultaneously. Hence, the solution for a LP problem can be determined either by solving the original problem or the dual problem. In general, a maximization problem is easier to solve when compared to the minimization problem because in the former we have addition of slack variable where as in the later we have an additional of both surplus and artificial variables. But we **cannot** conclude that it is always easier to solve the dual rather than a primal because the dual could be either maximization or minimization problem.

68.

Answer : (b)

Reason : A unimodal distribution has only one mode. A bimodal distribution has two modes and a multimodal distribution contains more than two modes.

69.

Answer : (b)

Reason : Arithmetic mean, Geometric mean, median and mode are measures of central tendency. Mean deviation is a measure of dispersion.

Therefore (b) is the correct answer.

70.

Answer : (d)

Reason : To determine the appropriate width of each class interval in a grouped frequency distribution, we divide the range of the data by the number of desired class intervals.

71. Answer : (d)

Reason : Given that

72. Answer : (a)

Reason : Given that,

73.

Answer : (a)

Reason : If events A and B are mutually exclusive then $P(A \text{ and } B) = 0$ because A and B can not occur at the same time.

Mutual exclusiveness of two events A and B does not imply that both of them have zero probabilities of occurrence.

Mutual exclusiveness does not mean that the probability of any one of them occurring is either 0 or 1.

74.

Answer : (c)

Reason : Let the events are: A: A male is selected and B: A smoker is selected. Now, we have, $P(A \text{ or } B) = 0.60$, $P(A \text{ and } B) = 0.30$ and $P(A/B) = 0.57$. The probability of selecting a non-smoker is given by:

75. Answer : (c)

Reason : Variety of methods that can be used for interpolation such as graphical method, linear approximation, etc.,
The correct answer is (c).

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76. Answer : (b)

Reason : Here, the probability of choosing the right one is given by $1/5$ and the probability of at least one is correct is given by the sum of the probability one correct, probability of two correct and the probability of three correct. As it is problem of Binomial distribution, it may given as:

$${}^3C_1 \times p \times (1-p)^2 + {}^3C_2 \times p^2 \times (1-p) + {}^3C_3 \times p^3$$

=

OR,

Probability of answering a problem correctly =

Probability of answering a problem wrongly =

Probability of answering all three problems wrongly =

Probability of answering at least one correctly =

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77. Answer : (b)

Reason : The sample space of the experiment of throwing a pair of fair dice contains $6 \times 6 = 36$ equally likely event points.

Let A denote the event that the sum of the digits in the two dice is 7. again, let B be the event that the digit in the first die is greater than that of the second. Then,

$$A = \{ (1, 6), (2, 5), (3, 4), (4, 3), (5, 2), (6, 1) \}$$

i.e., event A contains 6 equally likely event points

$$\text{and } B = \{ (2, 1), (3, 1), (4, 1), (5, 1), (6, 1), (3, 2), (4, 2), (5, 2), (6, 2), (4, 3), (5, 3), (6, 3), (5, 4), (6, 4), (6, 5) \}$$

i.e., event B contains 15 equally likely event points.

Now we have to find the value of

i.e., the event contains 3 equally likely event points.

Therefore, we have,

78. Answer : (e)

Reason :

Particulars	X	Y
Assembly hours per engine	2 hours	5 hours
Testing hours per engine	1 hour	0.5 hours
Total assembly hours available	600 hours	
Total testing hours available	120 hours	

Constraints relating to this problem are

Assembling time: $2X + 5Y \leq 600$.

Testing time: =

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79. Answer : (e)

Reason : Histogram indicates the fluctuations in frequencies from class to class.

It does not clearly reveal the rate of change in frequency from one class to the next.

Rectangles have been erected with their bases equal to the lengths of the class intervals and their heights equal to the frequencies on a suitable scale.

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80. Answer : (e)

Reason : Total number of bulbs = 20

Number of defectives = 5

Number of non-defectives = $20 - 5 = 15$

P (all three bulbs are defective) =

P(exactly one of the three bulbs is defective) =

P (at least one of the three bulbs is defective) = $1 - P$ (none of the bulbs is defective)

=

P(at least two of the three bulbs are not defective) = P (2 are not defective) + P (3 are not defective)

=

(e) P(at least one of the three bulbs is not defective)

= $1 - P$ (All the three bulbs are defective)

=

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