

Question Paper

Quantitative Methods – I (MSF1B1): October 2007

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

1. $\frac{1}{x} + \frac{1}{y}$ is equal to [< Answer >](#)
- (a) $\frac{x+y}{xy}$
 (b) $\frac{x+y}{x+y}$
 (c) $\frac{x+y}{xy}$
 (d) $\frac{x+y}{x+y}$
 (e) $\frac{x+y}{xy}$
- (1 mark)
2. The value of n, if 4 times the number of permutations of n things taken 3 at a time is equal to 5 times the number of permutations of (n – 1) things taken 3 at a time, is [< Answer >](#)
- (a) 5
 (b) 10
 (c) 12
 (d) 15
 (e) 20.
- (1 mark)
3. Which of the following statements is/are **true** for measures of dispersion? [< Answer >](#)
- I. Range is a crudest measure.
 II. Coefficient of variation is a relative measure.
 III. Mean deviation does not follow algebraic rule.
- (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)
4. There are 5 boys and 3 girls. In how many ways can they stand in a row such that no two girls are together? [< Answer >](#)
- (a) 10,080
 (b) 5,040
 (c) 14,400
 (d) 15,200
 (e) 18,200.
- (1 mark)
5. In a mercantile firm, 4 posts fall vacant and 35 candidates apply for the posts. In how many ways can a selection be made if one particular candidate is always excluded? [< Answer >](#)
- (a) 46,376
 (b) 35,904
 (c) 17,952
 (d) 5,984
 (e) 4,600.
- (1 mark)
6. A committee of 5 members is to be formed from 8 official and 4 non-official members. In how many ways it can be formed such that it has 3 official and 2 non-official members? [< Answer >](#)
- (a) 224
 (b) 280
 (c) 336
 (d) 350
 (e) 420.
- (1 mark)

7. In a party, everybody in a room shakes hand with everybody else. If the total number of handshakes are 78, then the total number of persons in the room are [< Answer >](#)
- (a) 10
(b) 11
(c) 12
(d) 13
(e) 14.
- (1 mark)
8. If $x^2 + x + 1 = 0$, then $x^3 + x^2 + x + 1$ is [< Answer >](#)
- (a) 5
(b) 4
(c) 3
(d) 2
(e) 1.
- (1 mark)
9. What is the value of K in the following series? [< Answer >](#)
- $2 + 8 + 14 + 20 + 26 + \dots + K = 574$
- (a) 70
(b) 74
(c) 80
(d) 86
(e) 90.
- (2 marks)
10. The third term of an arithmetic progression is 7 and its seventh term is 2 more than thrice of its third term. Find the sum of its first 20 terms. [< Answer >](#)
- (a) 740
(b) 750
(c) 760
(d) 770
(e) 780.
- (1 mark)
11. A man saved Rs.16,500 in 10 years. At the end of every year he saves Rs.100 more than he did in the preceding year. How much did he save at the end of the first year? (0% interest) [< Answer >](#)
- (a) Rs. 100
(b) Rs.1,100
(c) Rs.1,200
(d) Rs.1,400
(e) Rs.1,500.
- (1 mark)
12. The sum of 3 numbers of an geometric progression is 35 and their product is 1000. The second term of the geometric progression is [< Answer >](#)
- (a) 5
(b) 10
(c) 15
(d) 20
(e) 25.
- (2 marks)
13. The arithmetic mean and geometric mean of two values are 4 and 6 respectively. What is the harmonic mean? [< Answer >](#)
- (a) $\frac{2}{3}$
(b) $\frac{3}{2}$
(c) 5
(d) 9
(e) 10.
- (1 mark)
14. If $F(x) = x + \frac{1}{x}$, then $F(-3)$ is [< Answer >](#)
- (a) 0

- (b) 1
- (c) 2
- (d) 3
- (e) 5.

(1 mark)

[< Answer >](#)

15. A function $f(x)$ is defined as follows

$$f(x) = 1 + 2x ; x \leq 1$$

$$= 3 - 2x ; x > 1$$

The value of $f(2.6)$ is

- (a) Zero
- (b) 1.0
- (c) 2.3
- (d) -2.2
- (e) -3.1.

(1 mark)

16. Mean of 100 observations is 40. But it was found that, at the time of computation two items are wrongly taken as 30 and 27 instead of 3 and 72. What is the correct mean? [< Answer >](#)

- (a) 39.22
- (b) 39.79
- (c) 39.94
- (d) 40.18
- (e) 40.48.

(1 mark)

17. A father is 28 years older than the son. In 5 years the father's age will be 7 years more than twice that of the son. Find the present age of the son. [< Answer >](#)

- (a) 1 year
- (b) 6 years
- (c) 8 years
- (d) 12 years
- (e) 16 years.

(1 mark)

18. If $f(x) = x^2 - 5x + 7$, the value of $f(x^2 + 2)$ is [< Answer >](#)

- (a) $x^2 - 2x + 2$
- (b) $x^4 - x + 3$
- (c) $x^4 - x^2 + 1$
- (d) $x^4 - 2x + 5$
- (e) $x^4 - 2x^2 + 1$.

(1 mark)

19. What is the median value of the following data? [< Answer >](#)

391, 384, 591, 407, 672, 522, 777, 753, 2488, 1490

- (a) 628.5
- (b) 591.0
- (c) 672.0
- (d) 631.5
- (e) 645.5.

(1 mark)

20. The mean height of 25 male workers in a factory is 66 inches and the mean height of 35 female workers in the same factory is 60 inches. The average height of workers in the factory is [< Answer >](#)

- (a) 59.25 inches
- (b) 59.45 inches
- (c) 59.55 inches
- (d) 59.85 inches
- (e) 62.50 inches.

(1 mark)

21. Why the “tally marks” are used in the presentation of data? [< Answer >](#)

- (a) To decide the number of classes within which the data are required to be presented
- (b) To decide the amount of class width
- (c) To simplify the process of getting the frequency of data
- (d) To avoid the overlapping of the adjacent classes
- (e) To help the reader to draw conclusion of higher accuracy.

(1 mark)

22. A marathon runner decides to spare his energy to the end of a race and also not to lag too far behind the other runners in the earlier parts of the race. For a while, he adjusts his speed so that half of the runners overtake him and half of the runners behind him. Which of the following averages is used to represent the above runner's speed? [< Answer >](#)

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

(1 mark)

23. If 5 is subtracted from every item in a data set then the coefficient of variation of the resulting data set is 10%. If 5 is added to every item of the same data set then the coefficient of variation of the resulting data set is 6%. The coefficient of variation of the original data set is [< Answer >](#)

- (a) 6.0%
- (b) 7.5%
- (c) 10.0%
- (d) 12.5%
- (e) 15.6%.

(2 marks)

24. The appropriate average for a set of ratios using the denominators of the ratio data as weights is [< Answer >](#)

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

(1 mark)

25. In a data set, the sum of reciprocals of the quantities in the data set is and the harmonic mean of the data set is . If the data set is expanded by including the quantities 5 and 10, then what would be the harmonic mean of the expanded data set? [< Answer >](#)

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

(1 mark)

26. The geometric mean of a set of five numbers is 3. The geometric mean of a set of four numbers is 5. What is the geometric mean of the numbers when both the sets considered together? [< Answer >](#)

- (a) 2.13
- (b) 2.72
- (c) 3.23
- (d) 3.76
- (e) 4.52.

(1 mark)

27. Which of the following is least influenced by the occurrence of extreme values in the samples? [< Answer >](#)

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

(1 mark)

28. Which of the following properties is **not** applicable for mode? [< Answer >](#)

- (a) It is not rigidly defined
- (b) It is readily comprehensible
- (c) It is easy to calculate
- (d) It is based on all the observations
- (e) It can take more than one value for a given data set.

(1 mark)

[< Answer >](#)

29. Which of the following measures can be determined graphically?

- (a) Arithmetic mean
- (b) Geometric mean
- (c) Harmonic mean
- (d) Median
- (e) Standard deviation.

(1 mark)

[< Answer >](#)

30. In a certain pleasure trip, you have crossed 900 km by train at an average speed of 60 kmph, 3,000 km by boat at an average speed of 25 kmph, 400 km by plane at 350 kmph and lastly 15 km by taxi at 25 kmph. What was the approximate average speed for the entire distance?

- (a) 30.00 kmph
- (b) 31.56 kmph
- (c) 33.00 kmph
- (d) 34.50 kmph
- (e) 36.00 kmph.

(2 marks)

[< Answer >](#)

31. The following details are available with regard to two groups A and B:

Group	Number of observations	Mean	Standard deviation
A	15	20	4
B	25	16	2

What is the combined standard deviation for both the groups?

- (a) 2.50
- (b) 3.50
- (c) 6.25
- (d) 7.00
- (e) 12.25.

(2 marks)

[< Answer >](#)

32. The value of $\frac{f}{N}$ is

- (a) 18
- (b) 22
- (c) 26
- (d) 30
- (e) 34.

(1 mark)

[< Answer >](#)

33. The value of x in the above simultaneous equations would be

- (a) 3
- (b) 6
- (c) 9
- (d) 12
- (e) 24.

(1 mark)

[< Answer >](#)

34. The letters of the word SUCCESS are arranged in a row at random. The probability that all S's come together is

- (a) $\frac{1}{7}$
- (b) $\frac{2}{7}$
- (c) $\frac{3}{7}$
- (d) $\frac{4}{7}$
- (e) $\frac{5}{7}$.

(1 mark)

[< Answer >](#)

35. The value of $\frac{f}{N}$ is

- (a) $x + c$
 (b) $x + c$
 (c) $x + c$
 (d) $x + c$
 (e) $x + c$

()

(2 marks)

If $x = 8$ and $y = 4$, the value of () would be

[< Answer >](#)

36.

- (a) 2
 (b) 4
 (c) 8
 (d) 16
 (e) 32.

(1 mark)

37. In preparing frequency distribution tables, the number of classes is equal to

[< Answer >](#)

- (a) The square of the number of data points
 (b) The square root of the number of data points
 (c) The number of data points
 (d) The cube of the number of data points
 (e) The cube root of the number of data points.

(1 mark)

38. Which of the following languages is/are comes under the classification of programming languages?

[< Answer >](#)

- I. Machine language.
 II. Assembly language.
 III. High-level language.

- (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)

39. Which of the following steps are required for solving a problem using a computer?

[< Answer >](#)

- I. Problem Definition.
 II. Program Planning.
 III. Writing the Program.
 IV. Debugging.
 V. Documentation.

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

(1 mark)

40. The basic type(s) of computers is/are

[< Answer >](#)

- I. Analog.
 II. Digital.
 III. Hybrid.

- (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. A sum of Rs.2,250 deposited today in a bank gets tripled in a period of 7 years. The annual rate of interest is

[< Answer >](#)

- (a) 12.53%
 (b) 14.47%
 (c) 16.99%

- (d) 18.32%
(e) 20.11%.

(1 mark)

[< Answer >](#)

42. A linear programming problem **cannot** be solved by the simplex method if

- (a) The number of basic variables are lesser than the number of constraints
(b) The number of constraints are lesser than the number of basic variables
(c) Some of the right hand side values of the inequalities are negative
(d) The number of variables is more than two
(e) Some of the constraints are not inequalities.

(1 mark)

[< Answer >](#)

43. In a linear programming problem the feasible region is bounded by the following system of inequalities:

Which of the following points is **not** a part of the feasible region?

- (a) (25, 0)
(b) (0, 20)
(c) (15, 10)
(d) (0, 0)
(e) (12,12).

(2 marks)

[< Answer >](#)

44. A company is involved in the production of two items (X and Y). The resources need to produce X and Y are twofold, namely machine time for automatic processing and craftsman time for hand finishing. The table below gives the number of minutes required for each item:

Item	Machine Time (Minutes)	Craftsman Time (Minutes)
X	13	20
Y	19	29

The company has 40 hours of machine time available in the next working week but only 35 hours of craftsman time. Machine time costs Rs.100 per hour worked and craftsman time costs Rs.20 per hour worked. Both machine and craftsman idle times incur no costs. The revenue received for each item produced (all production is sold) is Rs.200 for X and Rs.300 for Y. The company has a specific contract to produce 10 items of X per week for a particular customer.

Which of the following would represent the objective function of the above-mentioned linear programming problem? [Assume the production of X is x units and that of Y is y units]

- (a) $200x + 300y$
(b) $187x + 281y$
(c) $171.67x + 258.67y$
(d) $180x + 171y$
(e) $160x + 252y$.

(2 marks)

[< Answer >](#)

45. Which of the following is **false** with regard to the graphical method of solving linear programming problems?

- (a) Graphical method is applicable when there are two decision variables
(b) The decision variables are represented by the horizontal and vertical axes
(c) Straight lines are used to demarcate the feasible region
(d) The feasible region shows the solutions that satisfy all the constraints
(e) One of the corner points of the feasible region will always be at the origin.

(1 mark)

[< Answer >](#)

46. Alpha Engines Inc. produces two models of car engines, X and Y.

The following information is available:

Particulars	X	Y
Selling price per unit	Rs.400	Rs.500
Cost price per unit	Rs.325	Rs.410
Assembly hours per engine	3 hours	4 hours
Testing hours per engine	1.5 hour	2 hours
Total assembly hours available	700 hours	
Total testing hours available	150 hours	

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

What is the objective function of the above linear programming problem? (Let x be number of type 'X' to be produced and y be

number of type 'Y' to be produced.)

- (a) $400x + 500y$
- (b) $325x + 410y$
- (c) $75x + 90y$
- (d) $3x + 4y$
- (e) $1.5x + 5y$.

(1 mark)

[< Answer >](#)

47. A linear programming problem on profit maximization

- (a) Will have a single optimal solution under all conditions
- (b) Will have an optimal solution which lies outside the feasible region
- (c) Can be solved by the graphical method if there are two decision variables
- (d) Cannot be solved by the simplex method if there are two decision variables
- (e) Can be solved for the optimal solution by changing the constraints at every stage.

(1 mark)

[< Answer >](#)

48. The standard deviation of 24 items in a data set is $\frac{8}{3}$. If every item in the data set is multiplied by $\frac{3}{2}$ then, the variance of the group will be

- (a) 5
- (b) 9
- (c) 16
- (d) 25
- (e) 64.

(1 mark)

[< Answer >](#)

49. According to the Bienayme-Chebyshev rule, at least _____ percent of the observations in a sample are contained within two standard deviations of the mean, regardless of the shape of the distribution.

- (a) 88.89
- (b) 93.75
- (c) 68.26
- (d) 75.00
- (e) 50.00.

(1 mark)

[< Answer >](#)

50. Which of the following statements is/are **true** regarding the uses of interpolation in financial analysis?

- I. Determination of internal rate of return of a project.
 - II. In finding out the yield to maturity of a bond or debenture.
 - III. In situation, where the time value of money is considered and interpolation have to be made using the present and future value tables.
- (a) Only (I) above
 - (b) Only (III) above
 - (c) Both (I) and (II) above
 - (d) Both (I) and (III) above
 - (e) All (I), (II) and (III) above.

(1 mark)

[< Answer >](#)

51.

Year	2000	2001	2002	2003	2006
Advertising expenditure (Rs. in lakh)	54	48	37	26	11

Find the advertising expenditure incurred in 2005 using interpolation.

- (a) Rs.10 lakh
- (b) Rs.13 lakh
- (c) Rs.16 lakh
- (d) Rs.19 lakh
- (e) Rs.22 lakh.

(1 mark)

[< Answer >](#)

52. A die is loaded so that probability of getting face x is proportional to x . When the die is rolled, the probability of getting a number less than or equal to five would be

- (a)
- (b)

(c)

(d)

(e)

(1 mark)

[< Answer >](#)

53. A and B are two independent events such that $P(A) = 0.4$, $P(B) = k$ and

$P(A \text{ or } B) = 0.8$, then the value of k is given by

(a) $1/3$ (b) $2/3$ (c) $5/7$ (d) $3/7$ (e) $2/5$.

(1 mark)

[< Answer >](#)

54. The function $y = 48 + 16x - 4x^2$ is

(a) Maximum at $x = 1$ (b) Maximum at $x = 2$ (c) Minimum at $x = -1$ (d) Minimum at $x = 2$ (e) Maximum at $x = -2$.

(1 mark)

[< Answer >](#)

55. A person wants to invite one or more of his 7 friends for dinner. In how many ways can he do that?

(a) 34

(b) 63

(c) 127

(d) 720

(e) 5,040.

(1 mark)

[< Answer >](#)

56. Which of the following statements is/are **true** regarding positively skewed distribution?

I. A positively skewed distribution curve tails off towards the higher end.

II. For positively skewed distribution curve $A.M > \text{Median} > \text{Mode}$.

III. In positively skewed distribution most of the values are concentrated at the lower end and very few values are at the higher end.

(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 >](#)

57. Which of the following is **not** the correct step for arranging data in the form of class intervals?

(a) The lowest value should be included in the first class and the highest value should be included in the last class

(b) The adjacent classes should not have any interval in between

(c) The classes should overlap

(d) Every item of data should be included in one and only one class

(e) The class intervals should be of same length to the extent possible.

(1 mark)

[< Answer >](#)

58. Find the value of mode from the data given below:

Weight (kg)	No. of students
93 – 98	2
98 – 103	5
103 – 108	12
108 – 113	17
113 – 118	14
118 – 123	6
123 – 128	3

$128 - 133$	1
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- (a) 108.520 kg
 (b) 111.125 kg
 (c) 113.255 kg
 (d) 114.125 kg
 (e) 116.875 kg.

(1 mark)

[< Answer >](#)59. Which of the following is **false**?

- (a) The tallest rectangle in histogram represents the modal class of the distribution
 (b) For a multimodal distribution the mode is the best measure of central tendency
 (c) In a symmetrical distribution, the mean, median and mode are equal
 (d) The median and the mode may be found out graphically
 (e) The modes of two distributions cannot be combined.

$$n + 1 \quad n + 1 \quad n + 1$$

If $\frac{n}{a}, \frac{n}{b}, \frac{n}{c}$ (where n is a positive integer), then

$$\frac{n+1}{a} \quad \frac{n+1}{b} \quad \frac{(n+1)}{c} \quad \frac{n}{a+1}$$

(1 mark)

is equal to

[< Answer >](#)

60.

- (a) $a + b + c$
 (b) abc
 (c) $a - b - c$
 (d) $\frac{a+b+c}{abc}$
 (e) $\frac{a+b+c}{a+b+c}$

(2 marks)

61. If $x = \frac{2}{3}y$, $y = \frac{3}{4}z$, $z = \frac{4}{5}x$ then $(xyz + 1) =$

- (a) yz
 (b) $2yz$
 (c) $2xy$
 (d) $2xz$
 (e) xz .

(2 marks)

62. A class consists of 80 students, 25 of them are girls and 55 are boys. 10 of them are rich and remaining are poor. 20 of them are fair complexioned. What is the probability of selecting a fair complexioned rich girl?

[< Answer >](#)

- (a) 0.0035
 (b) 0.0044
 (c) 0.0067
 (d) 0.0079
 (e) 0.0098.

(1 mark)

63. From a well shuffled pack of 52 cards, four cards are drawn randomly. Find the chance that they will be the four honours i.e., ace, king, queen and jack of the same suit.

[< Answer >](#)

- (a) $\frac{1}{52}$
 (b) $\frac{1}{13}$
 (c) $\frac{1}{104}$
 (d) $\frac{1}{26}$
 (e) $\frac{1}{520}$

(1 mark)

64. If a machine is correctly set up, it will produce 90% acceptable items. If it is incorrectly set up, it will produce 40% acceptable items. Experience shows that 80% of the set ups are correctly done. If, after a certain set up, the item produced is found to be acceptable, find the probability that the machine is correctly set up.

[< Answer >](#)

- (a) 0.45
 (b) 0.87
 (c) 0.90
 (d) 0.51
 (e) 0.33.

(1 mark)

65. A manufacturer produces two types of products A and B, both of which are made in steps by Machine1 and Machine2 .The process time per hundred units for two products on two machines are (setup times are negligible) as shown below.

[< Answer >](#)

Product	Machine1	Machine2
A	4 hours	5 hours
B	5 hours	2 hours

For the coming period, Machine1 has 100 hours and Machine2 has available 80 hours. The contributor for product A is Rs.10 per 100 units and for product B is Rs.5 per 100 units. The manufacturer in market, which can absorb both products as much as he can produce for immediate period ahead. Determine how much of product A and product B they should produce to maximize their contribution by using simplex method. (Let x_1 be the number of units of product A and x_2 be the number of units of product B.)

- (a) $x_1 = 150$ and $x_2 = 180$
- (b) $x_1 = 200$ and $x_2 = 180/17$
- (c) $x_1 = 200/17$ and $x_2 = 180/17$
- (d) $x_1 = 100/17$ and $x_2 = 280/17$
- (e) $x_1 = 250/17$ and $x_2 = 110/17$.

(3 marks)

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

[< Answer >](#)

- (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 $(Z_j - C_j)$ value at the bottom of the solution column shows the value of the objective function for any solution.

(1 mark)

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

[< Answer >](#)

- (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)

68. Which of the following statements is/are **true** with regard to the measures of dispersion?

[< Answer >](#)

- I. A decile is a fractile which divides the total frequency into 10 equal parts.
 - II. A percentile is a fractile which divides the total frequency into 100 equal parts.
 - III. A quartile is a fractile which divides the total frequency into 4 equal parts.
- (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)

69. A and B are two non-mutually exclusive and independent events.

[< Answer >](#)

$$\begin{aligned} P(A \text{ or } B) &= 0.80 \\ P(A) &= 0.50 \\ P(A \text{ and } B) &= 0.30 \end{aligned}$$

What is the value of $P(B)$?

- (a) 0.50
- (b) 0.60
- (c) 0.70
- (d) 0.80
- (e) 0.24.

(1 mark)

70. Differentiation of _____ with respect to x is _____

[< Answer >](#)

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

(1 mark)

71. Which of the following statements is/are **true** regarding maxima and minima?

[< Answer >](#)

- I. If $f(x)$ has relative maxima at $x = a$.
 II. If $f(x)$ has relative minima at $x = a$.
 III. If $f'(a) = 0$ then we cannot say anything definitely about the occurrence of maxima or minima at point a .

- (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)

72. Bag A contains 2 white and 3 red balls and bag B contains 4 white and 5 red balls. One ball is drawn at random from one of the bags and is found to be red. Find the probability that it was drawn from bag B.

[< Answer >](#)

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

(2 marks)

73. A has 3 shares in a lottery containing 3 prizes and 9 blanks, B has 2 shares in a lottery containing 2 prizes and 6 blanks. The ratio of A's chance of winning lottery and B's chance of winning lottery is

[< Answer >](#)

- (a) 952 : 715
 (b) 711 : 819
 (c) 925 : 818
 (d) 592 : 517
 (e) 820 : 712.

(2 marks)

74. Three groups of workers contains 3 men and 1 woman; 2 men and 2 women; 1 man and 3 women. One worker is selected at random from each group. What is the probability that the group selected consists of 1 man and 2 women?

[< Answer >](#)

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

(1 mark)

75. In the frequency distribution of 100 families given below, the number of families corresponding to expenditure groups 20 – 40 and 60 – 80 are missing from the table. However, the median is known to be 50. The missing frequencies are

[< Answer >](#)

Expenditure (Rs.)	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100
No. of families	14	?	27	?	15

- (a) 18 and 26
 (b) 17 and 27
 (c) 22 and 22
 (d) 29 and 15
 (e) 33 and 11.

(2 marks)

[< Answer >](#)

76. A finance company offers to pay a lump sum of Rs.24,000 at the end of 5 years to investors

who deposit Rs.4,000 annually for 5 years. What is the implicit interest rate?

- (a) 8.11%
- (b) 9.13%
- (c) 10.25%
- (d) 11.87%
- (e) 12.56%.

(2 marks)

77. If

- (a) 1
- (b) 2
- (c) 3
- (d) 1/3
- (e) 1/2.

[< Answer >](#)

(2 marks)

78. The arithmetic mean of two numbers exceeds their geometric mean by 2 and the geometric mean exceeds their harmonic mean by 8/5. The highest of the two numbers is

[< Answer >](#)

- (a) 12
- (b) 16
- (c) 20
- (d) 24
- (e) 32.

(2 marks)

79. What is the quartile deviation of the following distribution?

[< Answer >](#)

Class	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80	80 – 90
Frequency	6	15	5	10	4	9	2	13

- (a) 23.12
- (b) 21.11
- (c) 24.46
- (d) 16.67
- (e) 17.45.

(2 marks)

80. The roots of are

[< Answer >](#)

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

(2 marks)

Suggested Answers

Quantitative Methods – I (MSF1B1): October 2007

1. Answer : (d)
Reason :

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$$= \frac{1}{2} = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$$

2. Answer : (d)
Reason : We are given that

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$$\Rightarrow 4 \times n(n-1)(n-2) = 5 \times (n-1)(n-2)(n-3)$$

Dividing through out by $(n - 1)(n - 2)$, we get

$$4n = 5(n - 3)$$

$$\text{i.e., } 4n = 5n - 15$$

$$-n = -15$$

$$n = 15.$$

3. Answer : (e)

Reason : All the statements are true according to the topic of measures of dispersion.

Hence, option (e) is correct answer.

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4. Answer : (c)

Reason : Since no two girls are to be together, each girl must be placed between two boys. Place the 5 boys as follows:

$$\times B_1 \times B_2 \times B_3 \times B_4 \times B_5 \times$$

In order that no two of the girls be together, they can only be placed in the places marked as $\times$. There are 6 such places and so the 3 girls can be placed in 6P_3 ways. Further, the 5 boys can be arranged among themselves in $5!$ Ways.

Since, for each way of placing girls there are $5!$ Ways of placing the boys, the total number of arrangements

$$= {}^6P_3 \times 5! =$$

5. Answer : (a)

Reason : Since a particular person is always to be excluded, the choice is restricted to selecting 4 candidates out of the remaining 34.

$\therefore$ The required number of selection =

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6. Answer : (c)

Reason : 3 official members can be selected from 8 official members in ${}^8P_3 = 56$ ways. On the other hand, 2 non-official members can be selected from 4 non-official members in ${}^4P_2 = 6$ ways. So, the $56 \times 6 = 336$ committees can be formed in the given condition.

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7. Answer : (d)

Reason : Let there be n number of people. Number of handshakes would be nP_2 .

In this case ${}^nP_2 = 78$

Or,

Or,

So, the value of $n = 13$.

The total number of persons = 13.

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8. Answer : (d)

Reason : According to the given equation we can say that

$$\begin{array}{ccccccc} & & 2 & & 1/3 & & \\ 2 & 3 & & & & & \\ & 2 & & 2 & & & \\ & 3 & & & & & \\ 2 & & 4 & & & & \\ & 2 & & & & & \\ & & 2 & & & & \end{array}$$

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9. Answer : (c)

Reason : Let K be the n^{th} term.

The given series is in A.P

First term, $a = 2$

Common difference, $d = 6$

$$\therefore K = a + (n - 1)d = 2 + 6(n - 1)$$

By the question:

$$S_n =$$

or

$$\text{or } 574 =$$

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$$\text{or } 1148 = 6n^2 - 2n$$

$$\text{or } 6n^2 - 2n - 1148 = 0$$

$$\text{or } 3n^2 - n - 574 = 0$$

$$\therefore n = \quad = \quad = 14 \text{ or}$$

Since the number of terms, n cannot be negative, $n = 14$

$$\therefore K = 2 + 6(14 - 1) = 80.$$

10. Answer : (a)

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Reason : Given that $T_3 = 7$ and $T_7 = 2 + 3 \times T_3 = 2 + 3 \times 7 = 23$

$$\text{Therefore } T_3 = a + 2d = 7 \text{ and } T_7 = a + 6d = 23$$

Solving the above two equations we have, $a = -1$ and $d = 4$,

$$\text{Therefore, } S_{20} = (20/2)[2 \times (-1) + 19 \times 4] = 740.$$

11. Answer : (c)

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Reason : Here a = saving in the first year

$$n = \text{number of years} = 10$$

$$d = 100$$

$$S_n = 16,500$$

$$\therefore S_n =$$

$$\Rightarrow 16,500 =$$

$$\Rightarrow 16500 = 5(2a + 900)$$

$$\Rightarrow 10a = 16500 - 4500$$

$$\text{or } a = 1,200.$$

12. Answer : (b)

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Reason : Let , a , ar be the three numbers in G.P.

$$\text{The product of these numbers} = a \cdot ar = 1000$$

$$\Rightarrow a^3 = 1000 \Rightarrow a = 10.$$

$$\text{The sum of the three numbers is } a + a + ar = 35$$

$$\Rightarrow 10 + 10 + 10r = 35$$

$$\Rightarrow 10(1 + r + r^2) = 35r \Rightarrow 2 + 2r + 2r^2 = 7r$$

$$\Rightarrow 2r^2 - 5r + 2 = 0 \Rightarrow (2r - 1)(r - 2) = 0$$

$$\therefore r =$$

Thus we have $a = 10$ and $r =$ or 2.

For $r =$, the numbers will be 10×2 , 10, i.e., 20, 10, 5 and

For $r = 2$, the numbers are , 10, 10×2 i.e., 5, 10, 20

$\therefore$ The second term is 10.

13. Answer : (d)

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Reason : If A , G and H are the Arithmetic, Geometric And Harmonic Means between two quantities then their relationship is: $G^2 = AH$

$$\text{Given: } A = 4 \quad G = 6$$

$$\therefore 6^2 = 4H$$

$$\text{Or, } H = 9.$$

14. Answer : (b)

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$$\text{Reason : } F(x) = x +$$

Replacing x by (-3) ; we get

$$F(-3) = -3 + = -3 + 4 = 1.$$

15. Answer : (d)

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Reason : The value of $x = 2.6$ belongs to the interval $x > 1$.

Hence, to obtain the value of $f(2.6)$, we replace x by 2.6 in $f(x) = 3 - 2x$.

$$\therefore f(2.6) = 3 - 2 \times 2.6 = -2.2.$$

16. Answer : (d)

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$$\text{Reason : } = \text{ or } \Sigma x =$$

Here $n = 40$, $N = 100$

$\therefore \Sigma x = 100 \times 40$	4000
Less: Incorrect items sum	57
	3943
Add: Correct items sum	75
Correct total	4018

$\therefore$ Correct mean =

17. Answer : (e)

Reason : Let the present age of son be 'x' then the age of father will be 'x+28'.
 Now, after 5 years their age will be $x + 5$ and $x + 28 + 5$ respectively.
 Then the age of the father will be 7 years more than twice that of the son;
 we can represent this in the equation form as:
 $x + 28 + 5 = 2(x + 5) + 7$
 $\Rightarrow x + 33 = 2x + 10 + 7$
 $\Rightarrow x - 2x = -33 + 10 + 7$
 $\Rightarrow x = 16.$
 $\therefore$ The present age of the son is 16 years.

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18. Answer : (c)

Reason : $f(x) = x^2 - 5x + 7$
 Replacing x by $(x^2 + 2)$, we get
 $f(x^2 + 2) = (x^2 + 2)^2 - 5(x^2 + 2) + 7$
 $= x^4 + 4x^2 + 4 - 5x^2 - 10 + 7$
 $= x^4 - x^2 + 1.$

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19. Answer : (d)

Reason :

Sl.No.	Data arranged in ascending order (x)
1	384
2	391
3	407
4	522
5	591
6	672
7	753
8	777
9	1490
10	2488

Median = Size of item =
 Size of 5.5th item =

20. Answer : (e)

Reason : N_1 = Number of male workers = 25
 $\bar{x}_1$ = mean height of male workers = 66 inches
 N_2 = Number of female workers = 35
 $\bar{x}_2$ = mean height of female workers = 60 inches
 The combined mean of 60 workers in the factory is,
 $N_1 = 25, \bar{x}_1 = 66, N_2 = 35, \bar{x}_2 = 60$
 $\bar{x} =$

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21. Answer : (c)

Reason : Tally marks are used to simplify the process of getting the respective class frequencies easily and with higher level of accuracy, reducing the possibility of human error.

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22. Answer : (d)

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Reason : Median is the middle most point of a set of observations. Here, the runner has maintained such a speed that he can maintain his position just at the middle of all the participants.

23. Answer : (b)

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Reason : Let the average and standard deviation of the original data let be $\bar{x}$ and s .

Average of all items ' $x - 5$ ' = $\bar{x} - 5$

Standard deviation of all items ' $x - 5$ ' = s

(This is because the value of standard deviation remains the same if each observation in a series is increased or decreased by the same quantity).

Given: $\sum (x - 5) = 10$

or $100s = 10 - 50$ or $100s = -40$ (A)

Average of all items ' $x + 5$ ' = $\bar{x} + 5$

Standard deviation of all items ' $x + 5$ ' = s

Given : $\sum (x + 5) = 6$

or $100s = 6 + 30$ or $100s = 36$ (B)

Subtracting equation (B) from equation (A) we get:

$(10 - 100s) - (6 - 100s) = 50 - (-30)$

or $4 = 80$ or $s = 80/4 = 20$ $\therefore s = 20$.

Putting the value of s in equation (A) we get :

$10(20) - 100s = 50$ or $200 - 100s = 50$ or $100s = 150$

Or $s = 1.50 \therefore s = 1.50$

Coefficient of variation of the original data set = $\frac{s}{\bar{x}} \times 100 = 7.5\%$.

24. Answer : (b)

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Reason : Weighted arithmetic mean is appropriate when the denominators of the ratio data are used as weights.

25. Answer : (e)

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Reason : Harmonic mean of a set of ' n ' quantities, $H = \frac{n}{\sum \frac{1}{x_i}}$

Given: $\sum \frac{1}{x_i} = \frac{1}{H}$

From above, $n = H$.

$n = 3$

Harmonic mean after the expansion = $\frac{3}{\sum \frac{1}{x_i}} = \frac{3}{1} = 3$.

26. Answer : (d)

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Reason : Geometric mean of the set of five numbers = 3

$\therefore$ Product of the five numbers = $3^5 = 243$

Geometric mean of the set of four numbers = 5

$\therefore$ Product of the four numbers = $5^4 = 625$

Product of the combined set of numbers = $243 \times 625 = 151875$

$\therefore$ Geometric mean of the combined set of numbers = $(151875)^{1/9} = 3.76$ (approx).

27. Answer : (b)

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Reason : Median is least influenced by the occurrence of extreme values in the samples.

28. Answer : (d)

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Reason : Mode is not based on all the observations of the data.

29. Answer : (d)

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Reason : The median can be determined graphically by drawing an ogive.

30. Answer : (b)

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Reason : Here, you have traveled different distances at different speeds and hence the average speed may found out by calculating the weighted harmonic mean of the given data in the following way:

Speed (Km per hour) (v)	Distance (Kilometers) (s)	Time taken, $t = s/v$
60	900	15.00
25	3,000	120.00
350	400	1.143
25	15	0.60
Total	4,315	136.743

Average speed can be calculated as: $\frac{24}{0.75} = 31.56 \text{ kmph.}$

31. Answer : (b)

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Reason : $N_A = 15 \quad \mu_A = 20 \quad \sigma_A = 4$

$N_B = 25 \quad \mu_B = 16 \quad \sigma_B = 2$

$\mu = \frac{N_A \mu_A + N_B \mu_B}{N_A + N_B} = \frac{15 \times 20 + 25 \times 16}{15 + 25} = 17.5.$

$d_A = \mu_A - \mu = 20 - 17.5 = 2.5$

$d_B = \mu_B - \mu = 16 - 17.5 = -1.5$

$\sigma^2 = \frac{N_A \sigma_A^2 + N_B \sigma_B^2}{N_A + N_B} = \frac{15 \times 16 + 25 \times 4}{15 + 25} = 3.50.$

32. Answer : (e)

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Reason : $\frac{1}{2} \times 5 \times 2^2 + 3 \times 2 + 8 = 34.$

33. Answer : (b)

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Reason :

34. Answer : (a)

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Reason : Total number of ways the letters of the word 'SUCCESS' can be rearranged $n(S) = 8!$

If all S's have to come together, we assume them to be as a single letter, then the total number of possible ways the letters can be rearranged $n(E) = 5!$

The probability of the favorable event = $\frac{n(E)}{n(S)} = \frac{5!}{8!} = \frac{1}{56}$

35. Answer : (d)

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Reason : $y = \int \frac{1}{x^2} dx = \int x^{-2} dx = \frac{x^{-2+1}}{-2+1} + c = -\frac{1}{x} + c$ [Where c is the integrating constant]

36. Answer : (b)

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Reason :

$\left(\frac{1}{x} \right)$

$\left(\frac{1}{x} \right)$

$\frac{4}{3} \times 4$

37. Answer : (b)

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Reason : In preparing the frequency table, the number of classes may be equal to square root of the number of data points.

Suppose there are 30 data points then number of classes is equal to (approximately).

38. Answer : (e)

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Reason : programming languages can be classified as follows:

- I. Machine language.
- II. Assembly language.
- III. High-level language.

All are true. Hence option (e) is correct.

39. Answer : (e)

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Reason : The following steps are required for solving a problem using a computer system:

- I. Problem definition
- II. Program Planning
- III. Writing the program
- IV. Debugging
- V. Documentation

All are true. Hence, option (e) is correct.

40. Answer : (e)

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Reason : computers are of three basic types:

- I. Analog
- II. Digital
- III. Hybrid

All are true. Hence , option (e) is correct.

41. Answer : (c)

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Reason : Let r be the rate of interest.

Applying the formula

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

$$\text{i.e., } 6750 = 2250 (1 + r)^7$$

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

$$1 + r =$$

$$= 1.1699$$

$$r = 0.1699 = 16.99\%$$

Thus, the rate of interest per annum = 16.99%.

42. Answer : (c)

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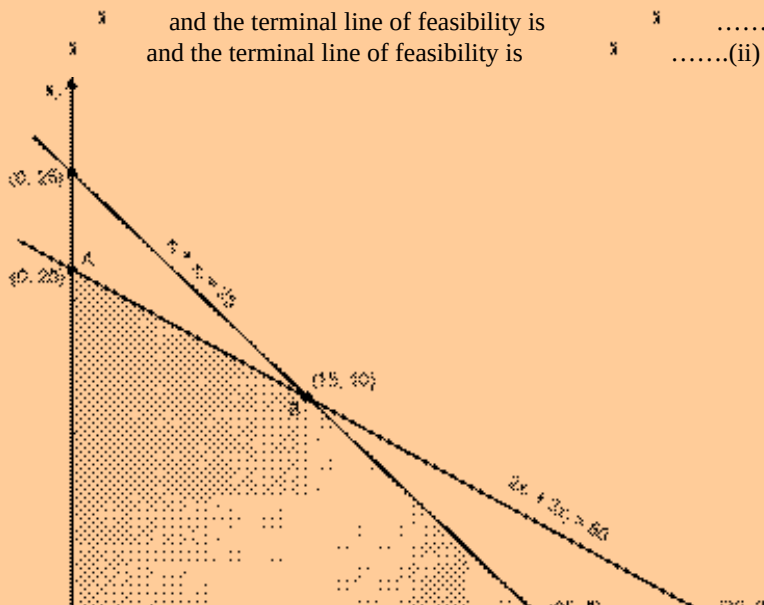
Reason : A linear programming problem cannot be solved by the simplex method if we give negative values for the resources available.

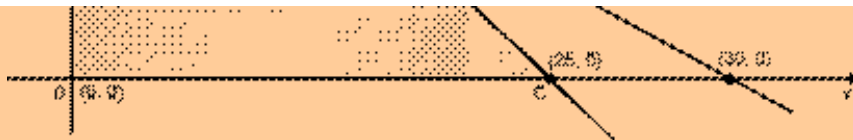
43. Answer : (e)

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Reason : The constraints are

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





The vertices are

- C (25, 0)
- B (15, 10)
- A (0, 20)
- O (0, 0)

44. Answer : (c)

Reason : Let x be the number of items of X and y be the number of items of Y

then the LPP is:

Maximize : $200x + 300y - 100(\text{machine time worked}) - 20(\text{craftsman time worked})$

Machine time would be $(13x + 19y)$ min or hours

Craftsman time worked = $(20x + 29y)$ min or hours

So, the objective function becomes

Maximize : $200x + 300y - 100$ – 20

i.e. Maximize $171.667x + 258.667y$

45. Answer : (e)

Reason : The given option (e), One of the corner points of the feasible region will always be at the origin is false. The correct is, the corner points of the feasible region may **not** include the origin.

46. Answer : (c)

Reason : let x be number of type 'X' to be produced and y be number of type 'Y' to be produced.)

Particulars	X	Y
Selling Price	Rs. 400	Rs. 500
Cost per unit	Rs.325	Rs. 410
Profit	Rs. 75	Rs. 90

Profit function or Objective function is : $75x + 90y$.

47. Answer: (c)

Reason : A linear programming problem on profit maximization, can be solved by the graphical method if it contains two decision variables.

48. Answer : (c)

Reason : If every item of the data set is multiplied by a constant quantity then the standard deviation will also be similarly affected.

i.e., = 4

Therefore the new standard deviation is 4. Hence the variance becomes 4^2 i.e., 16.

49. Answer : (d)

Reason : According to the Bienayme-Chebyshev rule, at least 75 percent of the observations in a sample are contained within two standard deviations of the mean, regardless of the shape of the distribution.

50. Answer : (e)

Reason : In financial analysis, interpolation is widely used in :

- I. Determination of internal rate of return of project.
- II. Finding out the yield to maturity of a bond or debenture.
- III. While using the present and future value tables.

All are true. Hence, option (e) is correct.

51. Answer : (c)

Reason :

Year	2000	2001	2002	2003	2006
Advertising expenditure Rs.(in lakh)	54	48	37	26	11

The advertising expenditure incurred in 2005 can be interpolated as follows:

Base value -is Rs.26 lakh

Lower limit is Rs.26lakh

Upper limit is Rs.11 lakh

$$t_s - t_p = (2006 - 2003) = 3$$

$$t_i - t_p = (2005 - 2003) = 2$$

advertising expenditure in 2005 =
= 26 - 10 = Rs. 16 lakh.

52. Answer : (e)

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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

$$\text{i.e. } k + 2k + 3k + 4k + 5k + 6k = 21k = 1 \text{ or } k =$$

The probability of less than or equal to five is

$$1k + 2k + 3k + 4k + 5k = 15k = \quad = \quad .$$

53. Answer : (b)

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Reason : Here, $P(A) = 0.4$ and $P(B) = k$ while,

$$P(A \text{ or } B) = P(A) + P(B) - P(A).P(B) \text{ (as the events are independent)} = 0.8$$

Therefore, $0.4 + k - 0.4 \times k = 0.8$ or, $0.6 \times k = 0.4$ or, $k = 2/3$.

54. Answer: (b)

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Reason: To prove the given function minimum or maximum

Necessary condition is

$$\text{Given, } y = 48 + 16x - 4x^2$$

$$8x = 16 \quad x = 2.$$

Sufficient condition :

Therefore the function is maximum at $x = 2$.

55. Answer : (c)

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Reason : To find the total number of ways in which it is possible to make a selection by taking some or all of n things : $2^n - 1$ ways.

Here, the person can select some or all of his friends to dinner. That can be done in $2^7 - 1 = 128 - 1 = 127$ ways.

56. Answer : (e)

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Reason : (i) A positively skewed distribution curve tails off towards the higher end .

(ii) For such a curve $A.M > \text{Median} > \text{Mode}$.

(iii) Many values are concentrated at the lower end. very few values are at the Higher end

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

57. Answer : (c)

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Reason : The classes should not overlap. Hence (c) is not correct.

Alternatives (a), (b) , (d) and (e) are correct.

58. Answer : (b)

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Reason :

Weight (kg)	No. of students
93 – 98	2
98 – 103	5
103 – 108	12
108 – 113	17
113 – 118	14
118 – 123	6
123 – 128	3
128 – 133	1

By inspection, mode lies in the class 108 – 113.

$$\text{Mode} = \quad x$$

$$\text{Here } L_m = 108, f = 17, f_1 = 12, f_2 = 14$$

$$f - f_1 = 17 - 12 = 5$$

$$f - f_2 = 17 - 14 = 3$$

$$w = 5$$

$$M_0 = 108 + \quad = 108 + \quad = 111.125$$

$\therefore$ The modal weight is 111.125 kg.

59. Answer : (b)

Reason : In case of multimodal distribution, there is more than one mode; so mode is not the best measure of central tendency for multimodal distributions.

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60. Answer : (a)

Reason : Given, $a^x + b^x + c^x = a + b + c$

$$\therefore, \quad \dots \dots \dots \quad (I)$$

$$\quad \dots \dots \dots \quad (II)$$

$$\quad \dots \dots \dots \quad (III)$$

$$\text{Now,} \quad \dots \dots \dots = \quad \dots \dots \dots$$

$$\text{Similarly,} \quad \dots \dots \dots$$

$$\therefore \quad \dots \quad + \quad \dots \quad + \quad \dots$$

$$= (a + b + c)^{1/n} \cdot a + (a + b + c)^{1/n} \cdot b + (a + b + c)^{1/n} \cdot c$$

$$= (a + b + c)^{1/n} \cdot [a + b + c]$$

$$= \dots$$

$$\text{Raising both sides to power} \quad \dots, \text{ we get} \quad \dots \dots \dots$$

$$\dots \dots \dots = a + b + c.$$

61. Answer : (b)

$$\text{Reason : } xyz + 1 = \left(\frac{1}{x} \right)^x \left(\frac{1}{y} \right)^y \left(\frac{1}{z} \right)^z + 1$$

$$= \dots \quad \quad \quad [\text{changing to common base 'e'}]$$

$$= \dots$$

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62. Answer : (e)

Reason : Probability of selecting a fair complexioned person = $\frac{1}{10}$ =

Probability of selecting a rich person = $\frac{1}{10}$ =

The probability of selecting a girl = $\frac{1}{10}$ =

The probability of selecting a fair complexioned rich girl

$$= \frac{1}{10} \times \frac{1}{10} \times \frac{1}{10} = 0.0098.$$

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63. Answer : (a)

$$\text{Reason : Here total number of ways} = \dots$$

$$= \dots = 13 \times 17 \times 25 \times 49 = 270725 = n$$

There are 4 honours (ace, king, queen and Jack) in each suit and so there are 4 sets of 4 honours each.

To obtain the favorable number of ways, we have to select one suit of four honours from these four sets

$$\therefore m = \dots = 4$$

$$\therefore P = \text{Required probability,} = \frac{m}{n}.$$

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64. Answer : (c)

Reason : Let A be the event of producing an acceptable item. Let E_1 be the event of setting up the machine correctly and E_2 be the event of setting up the machinery incorrectly.

$$\text{Given, } P(A/E_1) = 0.9, P(A/E_2) = 0.4, P(E_1) = 0.8,$$

$$P(E_2) = 1 - P(E_1) = 1 - 0.8 = 0.2.$$

$$\dots \dots \dots$$

$$= \dots$$

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65. Answer : (c)

Reason : Let the product A be x_1 and product B be x_2 . The objective function and constraint given in

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question are as

$$\text{Maximize } Z = 10x_1 + 5x_2$$

$$\text{Subject to } 4x_1 + 5x_2 \leq 100$$

$$5x_1 + 2x_2 \leq 80 \quad \text{Where } x_1, x_2 \geq 0$$

We introduce slack variables S_1 & S_2 in order to convert inequalities into equation. The resultant objective function & constraints are given as

$$\text{Maximize } Z = 10x_1 + 5x_2 + 0.S_1 + 0.S_2$$

$$\text{Subject to } 4x_1 + 5x_2 + S_1 = 100$$

$$5x_1 + 2x_2 + S_2 = 80$$

$$\text{Where } x_1, x_2, S_1, S_2 \geq 0$$

Simplex Table I

BV	C_B	X_B	10	5	0	0	Min.Ratio (X_B / X_k)
			x_1	x_2	S_1	S_2	
S_1	0	100	4	5	1	0	25
S_2	0	80	5*	2	0	1	16→
$Z_j - C_j$			-10 ↑	-5	0	0	

Simplex Table II

BV	C_B	X_B	10	5	0	0	Min.Ratio (X_B / X_k)
			x_1	x_2	S_1	S_2	
S_1	0	36	0	17/5*	1	-4/5	180/17→
X_1	10	16	1	2/5	0	1/5	40
$Z_j - C_j$			0	-1↑	0	2	

Simplex Table III

BV	C_B	X_B	10	5	0	0	Min.Ratio (X_B / X_k)
			x_1	x_2	S_1	S_2	
X_2	5	180/17	0	1	5/17	-4/17	180/17→
X_1	10	200/17	1	0	-2/17	5/17	40
$Z_j - C_j$			0	0	5/17	30/17	

Since all the values of $Z_j - C_j$, we get the optimal solution with

$$\text{Product A} = x_1 = 200/17$$

$$\text{Product B} = x_2 = 180/17$$

$$\text{And } Z = 2900/17 \text{ or contribution} = 2900/17.$$

66. Answer : (e)

Reason : In simplex method of solving linear programming problem ,the $Z_j - C_j$ value at the bottom of the solution column shows the value of the objective function for any solution.

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67. 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.

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68. Answer : (e)

Reason : **Other measures of dispersion**

I. A decile is a fractile which divides the total frequency in to 10 equal parts.

II. A percentile is a fractile which divides the total frequency in to 100 equal parts.

III. A quartile is a fractile which divides the total frequency in to 4 equal parts.

All statements are true. Hence, option (e) is true.

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69. Answer : (b)

$$\text{Reason : } P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$\text{or } P(B) = P(A \text{ or } B) - P(A) + P(A \text{ and } B)$$

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$$= 0.80 - 0.50 + 0.30$$

$$= 0.60.$$

70. Answer : (c)

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Reason :

71. Answer : (e)

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- Reason : I. If $f(x)$ has relative maxima at $x = a$.
 II. If $f(x)$ has relative minima at $x = a$.
 III. If $f(x)$ we cannot say anything definitely about the occurrence of maxima or minima at point a .

All statements are true. Hence, option (e) is correct.

72. Answer : (d)

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Reason : Let E_1 be the event that the ball is drawn from bag A. E_2 the event that it is drawn from bag B and E that the ball is red.

We have to find $P(E_2/E)$

Since both the bags are equally likely to be selected, we have

$$P(E_1) = P(E_2) = \frac{1}{2}$$

Also, $P(E) = \frac{3}{10}$ and $P(E|E_1) = \frac{2}{5}$ and $P(E|E_2) = \frac{1}{5}$

Hence by Bays' theorem, we have

$$P(E_2/E) = \frac{P(E_2)P(E|E_2)}{P(E_1)P(E|E_1) + P(E_2)P(E|E_2)} = \frac{\frac{1}{2} \times \frac{1}{5}}{\frac{1}{2} \times \frac{2}{5} + \frac{1}{2} \times \frac{1}{5}} = \frac{1}{3}$$

73. Answer : (a)

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Reason : Since A has three shares in a lottery, his chance of success means that he gets at least one prize, that is he gets either one prize or 2 prizes or 3 prizes and his chance of failure mean that he gets no prize. It is certain that either he success or fails. If p denotes his chance of success and q the chance of his failure, then $p + q = 1$ or $p = 1 - q$

Now n = total no. of ways =

Since out of 12 tickets in the lottery, he can draw any three tickets by virtue of his having three shares in lottery and

m = favorable number of ways for all the tickets drawn by him are blanks =

Since he will fail to draw a prize if all the tickets drawn by him are blanks.

$\therefore q =$

$\therefore p = A$'s chance of success =

Similarly B's chance of success

$$= 1 - \frac{1}{12} = \frac{11}{12}$$

A's chance of success : B's chance of success

$$= p : \frac{11}{12} = \frac{1}{12} : \frac{11}{12} = 1 : 11 = 952 : 715.$$

74. Answer : (e)

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Reason : There are 3 probabilities in this case:

- Man is selected from the first group and women is selected from 2nd & 3rd groups
- Man is selected from the second group and women is selected from 1st & 3rd groups
- Man is selected from the third group and women is selected from 1st & 2nd groups

$\therefore$ The probability of selecting a group of 1 man and 2 women

$$= \frac{1}{3} \times \frac{2}{3} \times \frac{1}{3} = \frac{2}{27}$$

75. Answer : (c)

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Reason: Let the missing frequencies of expenditure group 20–40, 60 –80 be f_1 and f_2 respectively.

Expenditure(Rs.)	No. of families (f)	Cumulative frequency
0–20	14	14
20–40	f_1	$14 + f_1$
40–60	27	$41 + f_1$
60–80	f_2	$41 + f_1 + f_2$
80–100	15	$56 + f_1 + f_2$
Total		

	$N = 100 = 56 + f_1 + f_2$	
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From the above table $56 + f_1 + f_2 = 100$ $f_1 + f_2 = 100 - 56 = 44$

Since, the median is 50, the class 40–60 is the median class

$$\text{Median} = \frac{W + L_m}{2}$$

Here $N = 100$, $L_m = 40$, $F = 14 + f_1$, $f_m = 27$, $w = 20$

$$50 = \frac{40 + F}{2} \times 20$$

$$\text{i.e., } f_1 = 35.5 - 13.5 = 22$$

substituting f_1 value in $f_1 + f_2 = 44$

$$\text{we get } f_2 = 22$$

Hence, the missing frequencies are 22 and 22 respectively.

76. Answer : (b)

Reason : we know that $24000 = 4000 \times \text{FVIFA}(k, 5)$

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

$$\text{FVIFA}(k, 5) = \frac{24000}{4000} = 6$$

If we refer to the FVIFA tables,

$$\text{At } k = 9\%, \text{FVIFA}(9, 5) = 5.9847$$

$$\text{At } k = 10\%, \text{FVIFA}(10, 5) = 6.1051$$

So, k must be greater than 9% but lower than 10%.

For an ascent of $(6.1051 - 5.9847)$, the ascent in rate is 1.

For a required ascent of $(6 - 5.9847)$, the ascent rate is $\frac{6 - 5.9847}{6.1051 - 5.9847} \times 1$

$$\begin{aligned} \text{The implicit rate of interest} &= 9 + \left(\frac{6 - 5.9847}{6.1051 - 5.9847} \right) \times 1 \\ &= 9 + 0.1271 = 9.1271 \end{aligned}$$

77. Answer : (e)

Reason : Given that,

78. Answer : (b)

Reason : Let the numbers be a, b . Let the A.M be A , GM be G and HM be H

A.M. exceeds GM by 2. So, $A - G = 2$; Or, $(A - 2)^2 = G^2$ (i)

GM exceeds HM by $\frac{8}{5}$. So, $G - H = \frac{8}{5}$ Or, $A - 2 - H = \frac{8}{5}$

$$\text{Or, } A - H = \frac{18}{5}$$

$G^2 = AH = A(A - \frac{18}{5})$ Putting this value of G^2 in equation (i) we get

$$(A - 2)^2 = A(A - \frac{18}{5}) \quad \text{Or, } -4A + 4 = -\frac{18}{5}A$$

$$\text{Or, } 2A = 20 \quad \text{Or, } A = 10. \text{ Or, } (a+b) = 20$$

$$\text{So, } G = 8 \text{ Or, } \frac{2}{\frac{1}{a} + \frac{1}{b}} = 8 \text{ i.e. } ab = 64$$

$$\text{So, } a + b = 20$$

$$\text{Or, } a^2 - 20a + 64 = 0.$$

$$\text{Or, } a^2 - 16a - 4a + 64 = 0$$

$$\text{Or, } a(a - 16) - 4(a - 16) = 0$$

$$\text{Or, } (a - 4)(a - 16) = 0$$

$$a = 4 \text{ or } 16$$

$$\text{if } a = 4 \text{ then } b = 16$$

$$\text{if } a = 16 \text{ then } b = 4$$

So the value of the numbers would be (4, 16) or (16, 4)

So the highest value is 16.

79. Answer : (b)

Reason : The given data

Class	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Freq	6	15	5	10	4	9	2	13
c.m.f	6	21	26	36	40	49	51	64

Here,

Substitute these values in $\frac{1}{x}$ we get $\frac{1}{x}$

80. Answer : (e)

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Reason :

Substitute all these values in the above equation

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