

Question Paper

Quantitative Methods – I (131): October 2006

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

1. If ${}^nC_{r-1} = 36$, ${}^nC_r = 84$ and ${}^nC_{r+1} = 126$. The value of r is [< Answer >](#)
- (a) 3
(b) 4
(c) 7
(d) 9
(e) 10.
- (2 marks)
2. A guard of 12 persons is to be formed from a group of n soldiers in all possible ways. If the number of times two particular [< Answer >](#)
soldiers are working together is $2m$ and the number of times three particular soldiers are working together is m , the value of n is
- (a) 18
(b) 20
(c) 22
(d) 24
(e) 26.
- (1 mark)
3. If $\log_{12} 18 = a$ and $\log_{24} 54 = b$, then the value of $ab + 5(a - b)$ would be [< Answer >](#)
- (a) $1/2$
(b) $1/3$
(c) $2/3$
(d) $3/2$
(e) 1.
- (2 marks)
4. If $\log_3 2$, $\log_3(2^x - 5)$ and $\log_3(2^x - 7/2)$ are in the arithmetic progression, the value of x would be [< Answer >](#)
- (a) 1
(b) 3
(c) 5
(d) 7
(e) 10.
- (2 marks)

[< Answer >](#)

5. If $y = a^{\frac{1}{(1-\log_a x)}}$ and $z = a^{\frac{1}{(1-\log_a y)}}$, the value of x would be

- (a) $x = a^{\frac{1}{(1+\log_a z)}}$
(b) $x = a^{\frac{1}{(1-\log_a z)}}$
(c) $x = a^{(1-\log_a z)}$
(d) $x = a^{\frac{1}{\log_a z}}$
(e) $x = a^{\log_a z}$.

• (2 marks)

[< Answer >](#)

6. If $\left(\frac{x}{a}\right)^n + \left(\frac{y}{b}\right)^n + \left(\frac{z}{c}\right)^n = 1$ then $\frac{\partial z}{\partial x} =$

- (a) $-\left(\frac{c}{a}\right)^n \left(\frac{x}{z}\right)^{n-1}$
(b) $-\left(\frac{a}{c}\right)^n \left(\frac{z}{x}\right)^{n-1}$
(c) $-\left(\frac{a}{b}\right)^n \left(\frac{x}{y}\right)^{n-1}$
(d) $-\left(\frac{b}{a}\right)^n \left(\frac{y}{x}\right)^{n-1}$
(e) $-\left(\frac{b}{c}\right)^n \left(\frac{y}{z}\right)^{n-1}$.

• (1 mark)

[< Answer >](#)

7. If $\log_8 \log_2 \log_3 (x^2 - 4x + 85) = \frac{1}{3}$, then $x =$

- (a) 1
(b) 2
(c) 3
(d) 4
(e) 5.

• (1 mark)

8. If $\log_2 a + \log_4 b + \log_4 c = 2$,
 $\log_3 b + \log_9 c + \log_9 a = 2$,
 $\log_4 c + \log_{16} a + \log_{16} b = 2$; then the value of a, b and c are

[< Answer >](#)

- (a) $a = \frac{2}{3}$, $b = \frac{27}{8}$ and $c = \frac{32}{3}$
 (b) $a = \frac{27}{8}$, $b = \frac{2}{3}$ and $c = \frac{32}{3}$
 (c) $a = \frac{32}{3}$, $b = \frac{27}{8}$ and $c = \frac{2}{3}$
 (d) $a = \frac{2}{3}$, $b = \frac{32}{3}$ and $c = \frac{27}{8}$
 (e) $a = \frac{3}{2}$, $b = \frac{8}{27}$ and $c = \frac{3}{32}$.

• (2 marks)

9. If $\log_x 5$, $\log_y 5$ and $\log_z 5$ are in A.P. then $2\log_{xz} z$ is equal to

[< Answer >](#)

- (a) $\log_y x$
 (b) $\log_x y$
 (c) $\log_y z$
 (d) $\log_z x$
 (e) $\log_z y$.

• (2 marks)

10. LCM and HCF of two numbers **A** and **B** are 6 and 90 respectively. The value of **A × B** would be

[< Answer >](#)

- (a) 90
 (b) 180
 (c) 360
 (d) 540
 (e) Cannot be determined because of insufficient data.

• (1 mark)

11. $y = x^2 + 2x - 6$
 $z = x - 2$

[< Answer >](#)

The value of the remainder if **y** is divided by **z** would be

- (a) x
 (b) $x - 1$
 (c) $x + 1$
 (d) $-x$
 (e) $1 - x$.

• (1 mark)

12. In how many different ways can 8 performance reports for the same examination be arranged in a line so that the best and the worst reports are never together? [< Answer >](#)

(a) 10,080
(b) 40,320
(c) 5,040
(d) 30,240
(e) 20,200.

• (1 mark)

13. In a football championship, 153 matches were played. Every two teams played one match with each other. The number of teams participating in the championship is [< Answer >](#)

(a) 15
(b) 16
(c) 17
(d) 18
(e) 19.

• (1 mark)

14. If $u = \frac{x+y}{x-y}$ then $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} =$ [< Answer >](#)

(a) $\frac{2}{x+y}$
(b) $\frac{1}{x+y}$
(c) $\frac{2}{x-y}$
(d) $\frac{1}{x-y}$
(e) $\frac{x-y}{x+y}$.

• (1 mark)

[< Answer >](#)

15. If $y^2 = (x-b)(x-c)$ then $\frac{d^2y}{dx^2}$ at $x = b+c$ is

- (a) $\frac{1}{(bc)^{3/2}}$
- (b) $\frac{1}{4(bc)^{3/2}}$
- (c) $\frac{bc-b^2}{4(bc)^{3/2}}$
- (d) $\frac{-(b-c)^2}{4(bc)^{3/2}}$
- (e) $\frac{(b-c)^2}{(bc)^{3/2}}$.

• (2 marks)

[< Answer >](#)

16. If $u = \log(x^4 + y^4 + z^4 - x^2y^2 - y^2z^2 - z^2x^2)$, then $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z}$ is equal to

- (a) 2
- (b) 4
- (c) u
- (d) 2u
- (e) 4u.

• (1 mark)

[< Answer >](#)

17. If $f'(x) = g(x)$, $g'(x) = -f(x)$, $h(x) = [f(x)]^2 + [g(x)]^2$, and $h(5) = 11$, then $h'(10)$ is equal to

- (a) 0
- (b) 1
- (c) -1
- (d) 10
- (e) -10.

• (1 mark)

[< Answer >](#)

18. If $e^{f(x)} = \frac{1+x}{1-x}$, $f(x) = kf\left(\frac{2x}{1+x^2}\right)$, then the value of k is equal to

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

• (1 mark)

19. Which of the following statements is **false** with regard to the derivative of a function?

[< Answer >](#)

- (a) It indicates the rate of change of the function at a fixed point
- (b) The slope of the tangent to a function at a point is equal to the derivative of the function at the point
- (c) The derivative may be said to be a function of the independent variable
- (d) The value of the derivative is always independent of the point where the derivative is evaluated
- (e) The derivative of a function of a point may be equal to a constant.

• (1 mark)

20. $\lim_{x \rightarrow -1} \frac{2x^2 - x - 3}{x^2 - 2x - 3}$

[< Answer >](#)

- (a) 0
- (b) 1
- (c) 1/2
- (d) 3/4
- (e) 5/4.

• (1 mark)

21. The limit of the function $f(x) = \frac{x^2 - 4x + 3}{x^2 - 1}$ at $x = 1$ is

[< Answer >](#)

- (a) 0
- (b) 1
- (c) -1
- (d) 2
- (e) -2.

• (1 mark)

22. Differentiation of $\log\left(\frac{1}{x}\right)$ with respect to x is

[< Answer >](#)

- (a) x
- (b) $1/x$
- (c) $-x$
- (d) $-1/x$
- (e) $-1/x^2$.

• (1 mark)

23. A function $f(x)$ is said to be monotonically increasing if

[< Answer >](#)

- (a) The first derivative of $f(x)$ is a constant for all values of x
- (b) The first derivative of $f(x)$ is negative for all values of x
- (c) The first derivative of $f(x)$ is positive for all values of x
- (d) The first derivative of $f(x)$ is zero for all values of x
- (e) The first derivative of $f(x)$ is equal to 1 for all values of x .

• (1 mark)

[< Answer >](#)

24. If $f(x) = \frac{(x-1)}{x}$ for all real numbers except $x = 0$ and $g(u) = u^2 + 1$ for all real numbers, the value of $g[f(1)]$ is

- (a) 0
- (b) 1
- (c) -1
- (d) 2
- (e) -2.

• (1 mark)

[< Answer >](#)

25. Let $f(x) = \begin{cases} 1, & \text{if } x \text{ is a rational number} \\ 0, & \text{if } x \text{ is an irrational number} \end{cases}$

Which of the following would have a value of one?

- (a) $f\left(\frac{1}{3}\right)$
- (b) $f(\sqrt{7})$
- (c) $f(1.43)$
- (d) $f(\sqrt{5})$
- (e) Both (a) and (c) above.

• (1 mark)

[< Answer >](#)

26. $f(x) = 15x^2 - 60x$
 $f(x)$ is minimum at $x =$

- (a) 2
- (b) 5
- (c) 15
- (d) 20
- (e) 60.

• (1 mark)

[< Answer >](#)

27. If the first derivative of a function $f(x)$ is zero at $x = a$ then

- (a) $f(x)$ will be maximum at $x = a$
- (b) $f(x)$ will be minimum at $x = a$
- (c) $f(x)$ will be zero at $x = a$
- (d) $f(x)$ will be maximum at $x = a$ if the second derivative is negative at $x = a$
- (e) $f(x)$ will be minimum at $x = a$ if the second derivative is negative at $x = a$.

• (1 mark)

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

[< Answer >](#)

- (a) To every number in the domain, a function always associates a negative value
- (b) To all the numbers in the domain, a function does not associate any value in the range
- (c) To every number in the domain, a function always associates the same number in the range
- (d) To every number in the domain, a function always associates a unique number in the range
- (e) To every number in the domain a function always associates a positive value.

• (1 mark)

29. The probability of getting a number less than four when a die is rolled is

[< Answer >](#)

- (a) $1/6$
- (b) $1/5$
- (c) $1/4$
- (d) $1/3$
- (e) $1/2$.

• (1 mark)

30. A die is loaded so that probability of getting face x is proportional to x . The probability of an odd number occurring when the die is rolled would be

[< Answer >](#)

- (a) $1/21$
- (b) $2/7$
- (c) $3/7$
- (d) $4/7$
- (e) $5/7$.

• (1 mark)

31. There are five coins in a bag. One of the coins has head on both sides. A coin is drawn at random and tossed 10 times and fell always with head upward. The probability that it is the coin with two heads is:

[< Answer >](#)

- (a) $56/57$
- (b) $36/37$
- (c) $26/27$
- (d) $38/39$
- (e) $48/49$.

• (2 marks)

32. Which of the following is/are **true**?

[< Answer >](#)

- I. The probability of an outcome in a sample space must be a number between 0 and 1.
- II. The sum of the probabilities of all possible outcomes in a sample space must be 1.
- III. An event is a subset of the sample space.

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

• (1 mark)

33. Alan Greenspan wants to predict the likelihood of the US economy entering a recession. He knows the probability of a recession is 25%, if OPEC keeps oil prices high. Because OPEC members have a history of cheating on production agreements, he knows the probability of high OPEC oil prices is only 40%. What is the probability that the US will have a recession because of high OPEC oil prices? [< Answer >](#)

- (a) 65.0%
- (b) 62.5%
- (c) 56.2%
- (d) 15.0%
- (e) 10.0%.

• (1 mark)

34. Given that the events **A**, **B** and **C** are mutually exclusive and collectively exhaustive, which of the following statements is **true**? [< Answer >](#)

- (a) $P(A) = 0.24$, $P(B) = 0.40$ and $P(A \text{ or } C) = 0.20$
- (b) $P(A) = 0.24$, $P(B) = 0.40$ and $P(A \text{ or } C) = 0.60$
- (c) $P(A) = 0.24$, $P(B) = 0.45$ and $P(A \text{ or } C) = 0.30$
- (d) $P(A) = 0.42$, $P(B) = 0.48$ and $P(A \text{ or } C) = 0.80$
- (e) $P(A) = 0.24$, $P(B) = 0.40$ and $P(A \text{ or } C) = 0.50$.

• (1 mark)

35. A, B and C are mutually exclusive and collectively exhaustive events, resulting from an experiment. B is twice as likely as A, and C is 2.5 times as likely as B. [< Answer >](#)

Which of the following is **correct**?

- (a) $P(A) = 3\%$, $P(B) = 6\%$ and $P(C) = 15\%$
- (b) $P(A) = 5\%$, $P(B) = 10\%$ and $P(C) = 25\%$
- (c) $P(A) = 8\%$, $P(B) = 16\%$ and $P(C) = 40\%$
- (d) $P(A) = 10\%$, $P(B) = 20\%$ and $P(C) = 50\%$
- (e) $P(A) = 12.5\%$, $P(B) = 25\%$ and $P(C) = 62.5\%$.

• (1 mark)

36. In a certain town, male and female each form 60 and 40 percent of the population respectively. It is known that 25 percent of the males and 15 percent of the females are unemployed. A research student studying the employment situation selects an unemployed person at random. What is the probability that the person so selected is male? [< Answer >](#)

- (a) 0.121
- (b) 0.714
- (c) 0.800
- (d) 0.485
- (e) 0.735.

• (1 mark)

37. A small contractor undertakes various types of jobs in the construction business. From his past experience he [< Answer >](#)

believes that the probability that he will get a plumbing contract is $\frac{2}{5}$ and the probability that he will not get a wiring contract is $\frac{1}{4}$. He also believes that the probability that he will get at least one of the two types of contract is $\frac{17}{20}$. The two types of contracts are independent of each other.

What is the probability that he will get both types of contract?

- (a) 60%
- (b) 75%
- (c) 30%
- (d) 70%
- (e) 85%.

• (1 mark)

38. Two persons, A and B committed a crime together. The police has arrested both of them for the purpose of [interrogation](#). A tells truth 4 out of 5 times, while B tells truth 3 out of 4 times. The police will be interrogating them separately.

What is the probability that they will give contradictory statements during the course of interrogation?

- (a) 0.80
- (b) 0.75
- (c) 0.60
- (d) 0.35
- (e) 0.20.

• (1 mark)

39. A number is chosen from the first 120 natural numbers. The probability that the number chosen is being a [multiple of 5 or 15](#) is

- (a) $\frac{1}{5}$
- (b) $\frac{1}{8}$
- (c) $\frac{1}{16}$
- (d) $\frac{1}{9}$
- (e) $\frac{1}{10}$.

• (1 mark)

44. Two computers **A** and **B** are to be sold. A salesman who is assigned the job of selling these has the chances of 60 percent and 40 percent respectively to get success. The two computers may be sold independently given that he is able to sell at least one computer. The salesman has been able to sell atleast one computer. What is the probability that computer **A** has been sold? (Round off your answer up to the second decimal) [< Answer >](#)

- (a) 0.40
- (b) 0.64
- (c) 0.79
- (d) 0.90
- (e) 0.24.

• (2 marks)

45. 1,500 workers are working in an industrial establishment. Their age is classified as follows: [< Answer >](#)

Age (years)	No. of workers	Age (years)	No. of workers
18 - 22	115	38 - 42	160
22 - 26	130	42 - 46	156
26 - 30	260	46 - 50	73
30 - 34	280	50 - 54	88
34 - 38	163	54 - 58	75

Calculate the median age.

- (a) 30.56
- (b) 31.28
- (c) 32.15
- (d) 32.89
- (e) 33.49.

• (1 mark)

46. The ratio of harmonic mean of two numbers to the geometric mean of the same numbers is 12:13. The actual numbers are in the ratio of [< Answer >](#)

- (a) 3 : 4
- (b) 4 : 5
- (c) 5 : 8
- (d) 9 : 4
- (e) 3 : 7.

• (2 marks)

47. The A.M. of two numbers exceeds their G.M. by 15 and H.M. by 27. The lowest of the two numbers is [< Answer >](#)

- (a) 20
- (b) 25
- (c) 30
- (d) 40
- (e) 50.

• (2 marks)

48. The geometric mean of 10 observations on a certain variable was calculated as 16.2. It was later discovered that one of the observations was wrongly recorded as 12.9 that was actually 21.9. What is the correct geometric mean? [< Answer >](#)

- (a) 16.58
- (b) 16.83
- (c) 17.08
- (d) 17.33
- (e) 17.58.

• (1 mark)

49. Which of the following is influenced the least 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)

50. The appropriate mean for a set of ratios using the denominators of the ratios as weights is [< Answer >](#)

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

• (1 mark)

51. If the sum of the deviations of the items from a measure of central tendency is zero, then that measure is known as [< Answer >](#)

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

• (1 mark)

52. The coefficient of variation of a data set is 20% and the variance of the data set is 16. What is the mean of the data set? [< Answer >](#)

- (a) 4
- (b) 20
- (c) 25
- (d) 80
- (e) 125.

• (1 mark)

53. The variance of a data set is 9. If every item in the data set is multiplied by 2 then, what is the variance of the resulting data set? [< Answer >](#)

(a) 9
(b) 12
(c) 36
(d) 72
(e) 324.

• (1 mark)

54. The sum of the observations in a data set containing 10 observations is 120 and the standard deviation of the data set is 3. If 3 is added to every observation in the data set then, what will be the coefficient of variation of the resulting data set? [< Answer >](#)

(a) 0
(b) 7.5%
(c) 20%
(d) 25%
(e) 50%.

• (1 mark)

55. Murali purchases three different types of pencils at the following prices as given below: [< Answer >](#)

Type	Price per pencil (Rs.)	Total Amount spent (Rs.)
A	1.00	50
B	1.50	30
C	2.00	20

What was the average price per pencil?

(a) Re.1.00
(b) Rs.1.25
(c) Rs.1.50
(d) Rs.1.75
(e) Rs.2.00.

• (1 mark)

56. A security analyst studied hundred companies and obtained the following Return on Investment (ROI) data for the year 2005. [< Answer >](#)

Returns %	0 – 10	10 – 20	20 – 30	30 - 40
No. companies	25	36	34	5

Calculate the standard deviation of the above data.

(a) 7.21%
(b) 7.86%
(c) 8.68%
(d) 8.81%
(e) 9.12%.

• (2 marks)

57. The percentage of data observations lying within 3 standard deviations are

[< Answer >](#)

- (a) 76%
- (b) 89%
- (c) 92%
- (d) 96%
- (e) 99%.

• (1 mark)

58. The following are the prices of the shares of a company from Monday to Saturday:

[< Answer >](#)

Day	Price (Rs.)
Monday	195.00
Tuesday	200.00
Wednesday	198.00
Thursday	190.00
Friday	210.00
Saturday	270.00

Calculate the coefficient of range of the above data.

- (a) 0.173
- (b) 0.218
- (c) 0.289
- (d) 0.316
- (e) 0.375.

• (1 mark)

59. Which of the following is/are **true** with respect to ogives?

[< Answer >](#)

- I. It is used to determine as well as to portray the number or proportion of cases above or below a given value.
 - II. It is used to compare two or more frequency distributions.
 - III. Ogives are drawn for determining certain values graphically such as median, quartiles, deciles, etc.
- (a) Only (I) above
 - (b) Only (II) above
 - (c) Only (III) above
 - (d) Both (II) and (III) above
 - (e) All (I), (II) and (III) above.

• (1 mark)

60. Which of the following is **true** in a negatively skewed distribution?

[< Answer >](#)

- (a) Mean, median and mode are alike
- (b) Mode is greater than mean and median lies in between mean and mode
- (c) Mean is greater than mode and median lies in between mean and mode
- (d) Median is greater than mean and mode lies between mean and median
- (e) The interval between mean and the median is approximately one-third of the interval between the mean and the mode.

• (1 mark)

61. The most appropriate diagram to represent the data relating to monthly expenditure on different items is:

[< Answer >](#)

- (a) Line graph
- (b) Frequency polygon
- (c) Ogives
- (d) Histogram
- (e) Pie-diagram.

• (1 mark)

62. Which of the following indicates that a given distribution of data is skewed?

[< Answer >](#)

- (a) The mean, median and mode are equal
- (b) A vertical line drawn from the peak of the distribution curve to the horizontal axis divides the area of the curve into two parts which are mirror images of each other
- (c) The values are concentrated towards the center of the distribution
- (d) Most of the values are concentrated at the higher end of the distribution
- (e) The mean value lies at the centre of the distribution.

• (1 mark)

63. What do you mean by “Raw data”?

[< Answer >](#)

- (a) Data that are collected by the novice people
- (b) Data that are collected from the unreliable sources
- (c) Data that are yet to be analyzed by a statistician
- (d) Data that are completely analyzed by a statistician
- (e) Data that are completely analyzed but suitable measures are yet to be taken.

• (1 mark)

64. 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:

[< Answer >](#)

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. [Assume the production of X is x units and that of Y is y units]

Which of the following would be a true representative of the constraint with regard to machine time in the above-mentioned linear programming problem?

- (a) $19x + 13y \leq 2400$
- (b) $29x + 20y \leq 2400$
- (c) $13x + 19y \leq 2400$
- (d) $20x + 29y \leq 2400$
- (e) $20x + 19y \leq 2400$.

• (1 mark)

65. The primal is a maximization model in **m** equality constraints and **n** non-negative variables, then the

[< Answer >](#)

- I. Dual is also maximization model.
- II. Dual is a minimization model.
- III. Dual has n constraints and m non-negative variables.
- IV. Dual has $n - 1$ constraints and $m - 1$ non-negative variables.

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

• (1 mark)

66. A manufacturer makes a range of three types of car, *A*, *B* and *C* in two factories; an engine plant *E* and a body factory *F*. The net profit on a car of type *A* is Rs.55,000, on type *B* it is Rs.60,000 and on type *C* it is Rs.72,500. There are 10120 labour units (a labour unit is approximately one "man-hour") available in *E* and 11000 labour units in factory *F* each month and the number of labour units, needed to build the various products is given in the following table:

[< Answer >](#)

Car Type	Engine	Body
A	8	8
B	8	9
C	9	11

This is a problem of maximizing the profit subject to these constraints as a linear programming problem.

The maximum profit the manufacturer can earn is

- (a) Rs.5.9 crore
- (b) Rs.6.3 crore
- (c) Rs.6.7 crore
- (d) Rs.7.4 crore
- (e) Rs.7.9 crore.

• (3 marks)

67. Which of the following is **false** with regard to a linear programming problem?

[< Answer >](#)

- (a) Each structural constraint adds one row in the simplex tableau
- (b) Each inequality adds exactly one variable to the problem
- (c) The simplex method is an iterative method
- (d) Each feasible solution found by the simplex method correspond to an extreme point of the feasible region
- (e) The value of slack variables at optimal solution shows the value of resources used.

• (1 mark)

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

[< Answer >](#)

- (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)

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

[< Answer >](#)

$$2x + y \leq 12$$

$$x + 3y \leq 21$$

$$x, y \geq 0$$

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

- (a) (6, 0)
- (b) (0, 7)
- (c) (3, 6)
- (d) (4, 5)
- (e) (0, 0).

• (1 mark)

70. In a linear programming problem, the limitations on the use of resources are represented by the

[< Answer >](#)

- (a) Objective function
- (b) Structural constraints
- (c) Nonnegativity constraints
- (d) Decision variables
- (e) Solutions.

• (1 mark)

71. Which of the following is **true** with regard to the simplex method of solving a linear programming problem (LPP) on profit maximization?

[< Answer >](#)

- (a) At the optimal solution the slack variables are always equal to zero
- (b) The constraints which contain ' $\leq$ ' are converted into equations by adding slack variables
- (c) There can be only one feasible solution to a LPP
- (d) The slack variables make positive contributions to profit
- (e) The slack variables can only assume the values 0 or 1.

• (1 mark)

72. Which of the following is **true** with regard to the graphical method of solving a linear programming problem?

[< Answer >](#)

- (a) The points which lie outside the feasible region satisfy all the constraints
- (b) There will always be a unique optimal solution
- (c) The optimal solution occurs at one of the corner points of the feasible region
- (d) The graphical method can be applied to solve problems involving more than two decision variables
- (e) The objective function may have non-linear relationship.

• (1 mark)

73. In a transportation problem, a supplier can serve any destination and a destination can be served by any supplier. If one supplier can serve only one destination and one destination can be served by only one supplier, this type of problem is called

[< Answer >](#)

- (a) Transportation problem
- (b) Transportation problem with constraints
- (c) General allocation problem
- (d) Assignment problem
- (e) Linear programming problem.

(1 mark)

74. Which of the following statement(s) is/are **true** with respect to the inventory? [< Answer >](#)

- I. Inventory helps in smooth and efficient running of business.
 - II. Inventory provides service to the customers immediately or at a short notice.
 - III. Inventory helps in maintaining the economy by absorbing some of the fluctuations when the demand for an item fluctuates or seasonal.
 - IV. Maintaining of inventory may earn price discount because of bulk-purchasing.
- (a) Only (I) above
 - (b) Only (III) above
 - (c) Both (I) and (II) above
 - (d) Both (II) and (IV) above
 - (e) All (I), (II), (III) and (IV) above.

(1 mark)

75. In solving the linear programming problem, if the type of constraint is greater than or equal to type, then the extra variable called surplus variable is subtracted, and an artificial variable is added, then the coefficient of extra variables in the objective function of type Max.z is/are [< Answer >](#)

- (a) 0
- (b) 1
- (c) -1
- (d) 0, M
- (e) 0, -M.

(1 mark)

76. Which of the following is **not true** in obtaining the dual of the given primal LP problem? [< Answer >](#)

- (a) If the Primal is a 'maximization' problem the Dual is a 'minimization' problem and vice versa
- (b) The directions of the inequalities in Dual will be same as in the Primal
- (c) The constants of Primal constraints will become the coefficient in the Dual objective function
- (d) The coefficient of the Primal objective function will become constants in the right-hand-side of the Dual constraints
- (e) The column coefficient in the Primal constraint will become the row coefficient in the Dual constraints.

(1 mark)

77. Which of following statements is/are **false** regarding interpolation? [< Answer >](#)

- I. It is a statistical technique.
 - II. It is a method of statistical estimation.
 - III. The figures obtained by interpolation are fairly correct as long as underlying assumptions hold good.
 - IV. It allows us to make insertions.
 - V. It allows us to forecast a value for some future date.
- (a) Only (II) above
 - (b) Only (IV) above
 - (c) Only (V) above
 - (d) Both (I) and (III) above
 - (e) Both (II) and (V) above.

(1 mark)

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

[< Answer >](#)

- (a) Revised simplex method
- (b) Dual simplex method
- (c) Census method
- (d) Simplex method
- (e) Graphical method.

(1 mark)

79. A project requires an initial outlay of Rs.41 lakh and has the following cost flow projections:

[< Answer >](#)

Year	0	1	2	3	4
Cash flows (Rs.lakh)	41	17	18	14	19

Using interest factor tables and interpolation techniques find out the IRR of the project.

- (a) 17.32%
- (b) 23.73%
- (c) 14.90%
- (d) 10.66%
- (e) 16.33%.

(1 mark)

80. In the following linear programming problem the value of the objective function is

[< Answer >](#)

$$\text{Max. } Z = 3x_1 + 2x_2$$

Subject to:

$$2x_1 + x_2 \leq 10$$

$$x_1 + 3x_2 \leq 6$$

$$x_1, x_2 \geq 0.$$

- (a) 5/4
- (b) 31/13
- (c) 14/29
- (d) 24/5
- (e) 76/5.

(3 marks)

Suggested Answers

Quantitative Methods – I (131): October 2006

1. Answer : (a)

[<TOP>](#)

Reason :

$${}^nC_{r-1} = 36, {}^nC_r = 84 \text{ and } {}^nC_{r+1} = 126$$

$$\text{So, } \frac{{}^nC_r}{{}^nC_{r-1}} = \frac{84}{36} = \frac{7}{3} \quad \text{Or, } 3 \times {}^nC_r = 7 \times {}^nC_{r-1}$$

$$\text{Or, } 3 \times \frac{n!}{r!(n-r)!} = 7 \times \frac{n!}{(r-1)!(n-r+1)!} \quad \text{Or, } 3 \times (n-r+1) = 7 \times r$$

$$\text{Or, } 10r - 3n = 3 \quad \dots\dots\dots(i)$$

$$\text{Again } \frac{{}^nC_{r+1}}{{}^nC_r} = \frac{126}{84}$$

$$\text{Or, } 84 \times \frac{n!}{(r+1)!(n-r-1)!} = 126 \times \frac{n!}{r!(n-r)!} \quad \text{Or, } 84(n-r) = 126(r+1)$$

$$\text{Or, } 84n - 84r = 126r + 126 \quad \text{Or, } 84n - 210r = 126$$

$$\text{Or, } 14n - 35r = 21$$

$$\text{Or, } 2n - 5r = 3 \quad \dots\dots\dots(ii)$$

By $2 \times (i) + 3 \times (ii)$ we get

$$20r - 15r = 9 + 6$$

$$5r = 15 \quad \text{Or, } r = 3$$

2. Answer : (c)

[<TOP>](#)

Reason : When two particular persons are together, the remaining 10 soldiers are to be selected from $(n-2)$

in ${}^{(n-2)}C_{10}$ ways. So, $2m = {}^{(n-2)}C_{10}$

When three particular persons are together, the remaining 9 soldiers are to be selected from $(n-3)$

in ${}^{(n-3)}C_9$ ways. So, $2m = {}^{(n-3)}C_9$

$$\text{So, } {}^{(n-2)}C_{10} = 2 \times {}^{(n-3)}C_9$$

$$\text{Or, } \frac{(n-2)!}{10!(n-12)!} = 2 \times \frac{(n-3)!}{9!(n-12)!}$$

$$\text{Or, } n-2 = 2 \times 10 = 20$$

$$\text{Or, } n = 22$$

3. Answer : (e)

[<TOP>](#)

Reason :

$$\begin{aligned}
 &\log_{12} 18 = a, \text{ and } \log_{24} 54 = b, \\
 &ab + 5(a - b) = \log_{12} 18 \times \log_{24} 54 + 5(\log_{12} 18 - \log_{24} 54) \\
 &= \frac{\log 18}{\log 12} \times \frac{\log 54}{\log 24} + 5 \left(\frac{\log 18}{\log 12} - \frac{\log 54}{\log 24} \right) \\
 &= \frac{\log 18 \times \log 54 + 5 \log 18 \times \log 24 - 5 \log 12 \times \log 54}{\log 12 \times \log 24} \\
 &= \frac{(2 \log 3 + \log 2) \times (3 \log 3 + \log 2) + 5(2 \log 3 + \log 2) \times (3 \log 2 + \log 3) - 5(2 \log 2 + \log 3) \times (3 \log 3 + \log 2)}{(2 \log 2 + \log 3) \times (3 \log 2 + \log 3)} \\
 &\text{Let } \log 3 = x \text{ and } \log 2 = y \text{ then } ab + 5(a - b) = \\
 &= \frac{(2x + y)(3x + y) + 5(2x + y)(x + 3y) - 5(x + 2y)(3x + y)}{(x + 2y)(x + 3y)} \\
 &= \frac{6x^2 + 5xy + y^2 + 10x^2 + 35xy + 15y^2 - 15x^2 - 35xy - 10y^2}{x^2 + 5xy + 6y^2} \\
 &= \frac{x^2 + 5xy + 6y^2}{x^2 + 5xy + 6y^2} = 1
 \end{aligned}$$

4. Answer : (b)

[<TOP>](#)

Reason :

$$\begin{aligned}
 &\text{If } \log_3 2, \log_3(2^x - 5) \text{ and } \log_3(2^x - 7/2) \text{ are in arithmetic progression} \\
 &\text{Then } 2\log_3(2^x - 5) = \log_3 2 + \log_3(2^x - 7/2) \\
 &\text{Or, } 2\log_3(2^x - 5) = \log_3 2(2^x - 7/2) = \log_3(2^{x+1} - 7) \\
 &\text{Or, } (2^x - 5)^2 = (2^{x+1} - 7) \\
 &\text{Or, } 2^{2x} - 10 \cdot 2^x + 25 = 2^{x+1} - 7 \\
 &\text{Let } 2^x = k \\
 &\text{Or, } k^2 - 10k + 25 = 2k - 7 \\
 &\text{Or, } k^2 - 12k + 32 = 0 \\
 &\text{Or, } k^2 - 8k - 4k + 32 = 0 \\
 &\text{Or, } k(k-8) - 4(k-8) = 0 \\
 &\text{Or, } (k-4)(k-8) = 0 \\
 &\text{Or, } 2^x = 4 \text{ or } 8 = 2^2 \text{ or } 2^3 \\
 &\text{So, } x = 2 \text{ or } 3
 \end{aligned}$$

5. Answer : (b)

[< TOP >](#)

Reason :

$$y = a^{\frac{1}{(1-\log_a x)}} \Rightarrow \log_a y = \frac{1}{(1-\log_a x)} \dots (i)$$

$$\text{and } z = a^{\frac{1}{(1-\log_a y)}} \Rightarrow \log_a z = \frac{1}{(1-\log_a y)} = \frac{1}{1-\frac{1}{(1-\log_a x)}} = \frac{(1-\log_a x)}{-\log_a x}$$

$$\log_a z - 1 = -\frac{1}{\log_a x}$$

$$\text{Or, } \log_a x = \frac{1}{1-\log_a z}$$

$$\text{Or, } x = a^{\frac{1}{(1-\log_a z)}}$$

6. Answer : (a)

[< TOP >](#)

Reason : The given function is

$$\left(\frac{x}{a}\right)^n + \left(\frac{y}{b}\right)^n + \left(\frac{z}{c}\right)^n = 1$$

partially differentiating w.r.t x,

$$n\left(\frac{x}{a}\right)^{n-1} \left(\frac{1}{a}\right) + n\left(\frac{z}{c}\right)^{n-1} \cdot \frac{1}{c} \cdot \frac{\partial z}{\partial x} = 0$$

$$\text{or, } \frac{\partial z}{\partial x} = \left(\frac{-x^{n-1}}{a^n} \times \frac{c^n}{z^{n-1}} \right)$$

$$\text{or, } \frac{\partial z}{\partial x} = -\frac{c^n}{a^n} \left(\frac{x}{z} \right)^{n-1}$$

7. Answer : (b)

[< TOP >](#)

Reason : According to the given equation we can say that

$$\log_2 \log_3 (x^2 - 4x + 85) = (8)^{1/3} = 2$$

$$\text{or, } \log_3 (x^2 - 4x + 85) = 2^2 = 4$$

$$\text{or, } x^2 - 4x + 85 = 3^4 = 81$$

$$\text{or, } x^2 - 4x + 4 = 0$$

$$\Rightarrow (x-2)^2 = 0$$

$$\therefore x = 2$$

8. Answer : (a)

[<TOP>](#)

Reason : Given that,

$$\log_2 a + \log_4 b + \log_4 c = 2,$$

$$\Rightarrow \log_2 4 \cdot \log_4 a + \log_4 b + \log_4 c = 2$$

$$\text{or}, 2 \log_4 a + \log_4 b + \log_4 c = 2$$

$$\text{or}, \log_4 a^2 bc = 2$$

$$\text{or}, a^2 bc = 4^2 = 16 \dots\dots\dots(i)$$

Similarly,

$$\text{we can get } b^2 ca = 81 \dots\dots\dots(ii)$$

$$\text{and } c^2 ab = 256 \dots\dots\dots(iii)$$

Solving (i), (ii) and (iii), we get,

$$a = \frac{2}{3}, b = \frac{27}{8}, c = \frac{32}{3}.$$

9. Answer : (b)

[<TOP>](#)

Reason : Given that $\log_x 5$, $\log_y 5$ and $\log_z 5$ are in A.P.

$$\therefore 2 \log_y 5 = \log_x 5 + \log_z 5$$

$$\text{or}, \frac{2}{\log_5 y} = \frac{1}{\log_5 x} + \frac{1}{\log_5 z}$$

$$\text{or}, \frac{2}{\log_5 y} = \frac{\log_5 z + \log_5 x}{\log_5 x \cdot \log_5 z} = \frac{\log_5 xz}{\log_5 x \cdot \log_5 z}$$

$$\text{or}, 2 \frac{\log_5 z}{\log_5 xz} = \frac{\log_5 y}{\log_5 x}$$

$$\text{or}, 2 \log_{xz} z = \log_x y$$

10. Answer : (d)

[<TOP>](#)

Reason : We know the multiplication of two numbers **A** and **B** would be same as the multiplication of their LCM and HCF. So, the multiplication would be $6 \times 90 = 540$.

11. Answer : (a)

[<TOP>](#)

Reason :

$$y = x^2 + 2x - 6$$

$$z = x - 2$$

$$x - 2 \mid x^2 + 2x - 6 \mid x + 3$$

$$x^2 - 2x$$

$$+ 4x - 6$$

$$+ 3x - 6$$

$$+ x$$

12. Answer : (d)

[<TOP>](#)

Reason : The best and the worst paper be taken together. These taken an one and the remaining 6 can be arranged amongst them-selves in 7! Ways. In each of these arrangements the best and the worst papers can be arranged in 2! Ways.

∴ The total number of arrangements in which the best and worst papers can come together are $7! \times 2!$

∴ The number of arrangements in which the two particular papers are not together are $8! - 2 \times 7! = 40,320 - 10,080 = 30,240$.

13. Answer : (d)

[<TOP>](#)

Reason : Let there be n number of teams. Number of matches would be nC_2 . In this case ${}^nC_2 = 153$.

$$\frac{n(n-1)}{2} = 153$$

$$\text{Or, } n^2 - n = 306$$

$$\text{Or, } n^2 - 18n + 17n - 306 = 0$$

$$\text{Or, } n(n-18) + 17(n-18) = 0$$

$$\text{Or, } (n-18)(n+17) = 0$$

$$\text{Or, } n = 18.$$

14. Answer : (c)

[<TOP>](#)

Reason : The given function is

$$u = \frac{x+y}{x-y}$$
$$u_x = \frac{(x-y)(1) - (x+y)(1)}{(x-y)^2} = \frac{-2y}{(x-y)^2}$$
$$u_y = \frac{(x-y) - (x+y)(-1)}{(x-y)^2} = \frac{2x}{(x-y)^2}$$
$$\therefore u_x + u_y = \frac{-2y}{(x-y)^2} + \frac{2x}{(x-y)^2} = \frac{2}{(x-y)}$$

15. Answer : (d)

[<TOP>](#)

Reason : Given that,

$$y^2 = (x-b)(x-c)$$

$$\text{or, } y^2 = x^2 - (b+c)x + bc$$

Differentiating with respect to x,

$$2y \frac{dy}{dx} = 2x - (b+c), \quad \text{or, } \frac{dy}{dx} = \frac{2x - (b+c)}{2y}$$

Again differentiating w.r.t. x,

$$2y \cdot \frac{d^2y}{dx^2} + 2 \frac{dy}{dx} \cdot \frac{dy}{dx} = 2, \quad \text{or, } y \cdot \frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^2 = 1$$

$$\text{or, } \frac{d^2y}{dx^2} = \frac{1 - \left(\frac{dy}{dx}\right)^2}{y} = \frac{1 - \left(\frac{2x - (b+c)}{2y}\right)^2}{y}$$

At $x = (b+c)$,

$$\frac{d^2y}{dx^2} = \frac{1 - \left(\frac{b+c}{2\sqrt{bc}}\right)^2}{\sqrt{bc}} = \frac{4bc - b^2 - c^2 - 2bc}{4(bc)^{3/2}}$$
$$= \frac{-(b^2 + c^2 - 2bc)}{4(bc)^{3/2}} = \frac{-(b-c)^2}{4(bc)^{3/2}}$$

16. Answer : (b)

[<TOP>](#)

Reason : Given that,

$$u = \log(x^4 + y^4 + z^4 - x^2 y^2 - y^2 z^2 - z^2 x^2),$$

$$\text{or, } u = \log f(x, y, z)$$

$$\text{Now, } u_x = \frac{4x^3 - 2xy^2 - 2z^2x}{f(x, y, z)}, u_y = \frac{4y^3 - 2x^2y - 2yz^2}{f(x, y, z)},$$

$$u_z = \frac{4z^3 - 2y^2z - 2zx^2}{f(x, y, z)}$$

$$\therefore xu_x + yu_y + zu_z = \frac{4[x^4 + y^4 + z^4 - x^2 y^2 - y^2 z^2 - z^2 x^2]}{f(x, y, z)}$$

$$= \frac{4f(x, y, z)}{f(x, y, z)} = 4$$

17. Answer : (a)

[<TOP>](#)

Reason : Given that,

$$f'(x) = g(x), \quad g'(x) = -f(x),$$

$$h(x) = f^2(x) + g^2(x)$$

$$\begin{aligned} h'(x) &= 2f(x) \cdot f'(x) + 2g(x) \cdot g'(x) \\ &= 2f(x) \cdot g(x) + 2g(x) \cdot (-1)f(x) \\ &= 0 \end{aligned}$$

$$h'(10) = 0$$

18. Answer : (e)

[<TOP>](#)

Reason : Given that,

$$e^{f(x)} = \frac{1+x}{1-x},$$

$$\Rightarrow f(x) = \log_e \left(\frac{1+x}{1-x} \right)$$

Now finding the value of

$$f\left(\frac{2x}{1+x^2}\right) = \log_e \left(\frac{1 + \frac{2x}{1+x^2}}{1 - \frac{2x}{1+x^2}} \right)$$

$$= \log_e \left(\frac{1+x^2+2x}{1+x^2-2x} \right) = \log_e \left(\frac{1+x}{1-x} \right)^2$$

$$= 2 \log_e \left(\frac{1+x}{1-x} \right) = 2f(x) \quad \therefore f(x) = \frac{1}{2} f\left(\frac{2x}{1+x^2}\right)$$

$$\text{From the question K} = \frac{1}{2}$$

19. Answer : (d)

[< TOP >](#)

Reason : If the derivative is a function of the independent variable then the value of the derivative is dependent on the point where it is evaluated. All the other alternatives are true.

20. Answer : (e)

[< TOP >](#)

$$\begin{aligned}\text{Reason : } \lim_{x \rightarrow -1} \frac{2x^2 - x - 3}{x^2 - 2x - 3} &= \lim_{x \rightarrow -1} \frac{2x^2 - 3x + 2x - 3}{x^2 - 3x + x - 3} \\&= \lim_{x \rightarrow -1} \frac{x(2x - 3) + 1(2x - 3)}{x(x - 3) + 1(x - 3)} \\&= \lim_{x \rightarrow -1} \frac{(2x - 3)(x + 1)}{(x - 3)(x + 1)} \\&= \lim_{x \rightarrow -1} \frac{(2x - 3)}{(x - 3)} \\&= \frac{2(-1) - 3}{-1 - 3} = \frac{-5}{-4} = \frac{5}{4}.\end{aligned}$$

21. Answer : (c)

[< TOP >](#)

$$\text{Reason : } f(x) = \frac{x^2 - 4x + 3}{x^2 - 1} = \lim_{x \rightarrow 1} \frac{x^2 - 4x + 3}{x^2 - 1} = \lim_{x \rightarrow 1} \frac{(x - 1)(x - 3)}{(x - 1)(x + 1)} = \lim_{x \rightarrow 1} \frac{(x - 3)}{(x + 1)} = \frac{-2}{2} = -1$$

22. Answer : (d)

[< TOP >](#)

Reason :

$$\frac{d \log \left(\frac{1}{x} \right)}{dx} = \frac{d \log \left(\frac{1}{x} \right)}{d \left(\frac{1}{x} \right)} \times \frac{d \left(\frac{1}{x} \right)}{dx} = \frac{1}{\frac{1}{x}} \times (-1)x^{-2} = -\frac{x}{x^2} = -\frac{1}{x}$$

23. Answer : (c)

[< TOP >](#)

- Reason :
- If the first derivative of **f(x)** is a constant for all values of **x** then it indicates that the function changes at a constant rate.
 - A function **f(x)** is said to be monotonically decreasing if the first derivative of **f(x)** is negative for all values of **x**.
 - A function **f(x)** is said to be monotonically increasing if the first derivative of **f(x)** is positive for all values of **x**.
 - If the first derivative of **f(x)** is zero for all values of **x** then it indicates that the function has a constant value.
 - This is not the condition for a monotonically increasing function.

24. Answer : (b)

[< TOP >](#)

Reason :

$$\begin{aligned}f(x) &= \frac{(x-1)}{x} \text{ and } g(u) = u^2 + 1 \\g[f(1)] &= g\left[\frac{1-1}{1}\right] = g(0) = 0 + 1 = 1\end{aligned}$$

25. Answer : (e)

[<TOP>](#)

Reason : Since $\frac{1}{3}$ and 1.43 are rational number and $\sqrt{7}$ and $\sqrt{5}$ are irrational number, the value of

$f(1.43)$ and $f\left(\frac{1}{3}\right)$ would be one.

26. Answer : (a)

[<TOP>](#)

Reason : $f(x) = 15x^2 - 60x$

$$f'(x) = 15(2x) - 60 = 30x - 60$$

For maxima or minima $f'(x) = 0$

$$f'(x) = 0 \Rightarrow 30x - 60 = 0 \text{ or } x = \frac{60}{30} = 2$$

$f''(x) = 30$ This is always positive

$\therefore f(x)$ is minimum at $x = 2$.

27. Answer : (d)

[<TOP>](#)

Reason : If the first derivative of a function $f(x)$ is zero at $x = a$ then $f(x)$ will be maximum at $x = a$ if the second derivative is negative at $x = a$. If the first derivative of a function $f(x)$ is zero at $x = a$ then $f(x)$ will be minimum at $x = a$ if the second derivative is positive at $x = a$.

In the given condition it cannot be inferred that $f(x)$ is zero at $x = a$.

28. Answer : (d)

[<TOP>](#)

Reason : To every number in the domain, a function always associates a unique number in the range.

29. Answer : (e)

[<TOP>](#)

Reason : The sample space for this experiment is $S = \{1, 2, 3, 4, 5, 6\}$

The set of favorable event $E = \{1, 2, 3\}$

$$\frac{n(E)}{n(S)} = \frac{3}{6} = \frac{1}{2}$$

Therefore required probability $P(E) = \frac{n(E)}{n(S)} = \frac{3}{6} = \frac{1}{2}$

30. Answer : (c)

[<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 $k = \frac{1}{21}$

The probability of odd number is $1k + 3k + 5k = 9k = \frac{9}{21} = \frac{3}{7}$.

31. Answer : (a)

[<TOP>](#)

Reason : Probability of selecting a coin having both head = $\frac{1}{5}$

and it has at 10 heads = $\frac{1}{5} \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 = \frac{1}{5}$

Probability of selection of a coin having head & tail = $\frac{4}{5}$

And it will fall ten heads = $\frac{4}{5} \times \left(\frac{1}{2}\right)^{10} = \frac{1}{1280}$

$$\therefore P(E) = \frac{\frac{1}{5}}{\frac{1}{5} + \frac{1}{1280}} = \frac{1}{5} \times \frac{280}{57} = \frac{56}{57}$$

32. Answer : (e)

[<TOP>](#)

Reason : All the three statements are true. The probability of an outcome in a sample space must be a number between 0 and 1. The sum of the probabilities of all possible outcomes of a probability model must be 1. An event is a subset of the sample space.

33. Answer : (e)

[<TOP>](#)

Reason : The probability of recession if oil prices are high, $P(R/H)$

= 0.25 and Probability of high oil prices, $P(H) = 0.40$.

The probability that the US will have a recession because of high oil prices

$P(R \text{ and } H) = P(R/H) \times P(H) = 0.25 \times 0.40 = 0.10$ i.e. 10 %.

34. Answer : (b)

[<TOP>](#)

Reason : As the events are mutually exclusive and collectively exhaustive, we have, $P(A \text{ or } B \text{ or } C) = 1$ or, $P(A) + P(B) + P(C) = 1$ as $P(A \text{ and } B) = P(B \text{ and } C) = P(A \text{ and } C) = P(A \text{ and } B \text{ and } C) = 0$. In the case of option (b), $P(A) = 0.24$, $P(B) = 0.40$ and

$P(C) = 0.36$ $P(A \text{ or } C) = 0.60$ Hence, the conditions are satisfied.

35. Answer : (e)

[<TOP>](#)

Reason : $P(A) = x$ $\therefore P(B) = 2x$ $P(C) = 2.5 P(B) = 2.5(2x) = 5x$

Since A, B and C are mutually exclusive and collectively exhaustive,

$P(A) + P(B) + P(C) = 1$

$\therefore x + 2x + 5x = 1$

or $8x = 1$

$\frac{1}{8} = 0.125$

or $x = \frac{1}{8}$ i.e. 12.5%

$\therefore P(A) = 12.5\%$ $P(B) = 2 \times 12.5 = 25\%$ $P(C) = 5 \times 12.5 = 62.5\%$.

36. Answer : (b)

[<TOP>](#)

Reason : The problem gives us the following probabilities as shown in the table below:

	Unemployed	Employed	Total
males	0.15	0.45	0.60
Females	0.06	0.34	0.40
Total	0.21	0.79	1.00

$$\begin{aligned}
 \therefore P(\text{Male/Unemployed}) &= P(M/U) \\
 &= \frac{P(M \cap U)}{P(U)} \\
 &= \frac{0.15}{0.21} = 0.714
 \end{aligned}$$

Thus the probability that the unemployed person selected being a male is 0.714

37. Answer : (c)

[<TOP>](#)

Reason : Let the following notations be used:

A : Getting a plumbing contract

B : Getting a wiring contract

$$\text{Given: } P(A) = \frac{2}{5}$$

$$P(B) = 1 - \frac{1}{4} = \frac{3}{4}$$

$$P(A \text{ or } B) = \frac{17}{20}$$

Since the two types of contract are independent, we may consider them to be not mutually exclusive.

$$\begin{aligned}
 \therefore P(A \text{ or } B) &= P(A) + P(B) - P(A \text{ and } B) \\
 \text{or } P(A \text{ and } B) &= P(A) + P(B) - P(A \text{ or } B)
 \end{aligned}$$

$$= \frac{2}{5} + \frac{3}{4} - \frac{17}{20} = \frac{3}{10} \text{ i.e. } 30\%.$$

38. Answer : (d)

[<TOP>](#)

Reason : Probability that A and B give contradictory statements

$$= P(A \text{ tells truth and } B \text{ tells lie}) + P(A \text{ tells lie and } B \text{ tells truth})$$

$$= \frac{4}{5} \times \left(1 - \frac{3}{4}\right) + \left(1 - \frac{4}{5}\right) \times \frac{3}{4}$$

$$= \frac{1}{5} + \frac{3}{20}$$

$$= \frac{7}{20} = 0.35 \text{ i.e. } 35\%.$$

39. Answer : (a)

[<TOP>](#)

Reason : A number may be chosen from the set of first 120 natural numbers by 120 ways. Now, the number of numbers that are multiple of 5 or 15 is 24. Hence, the required probability is $24/120 = 1/5$.

40. Answer : (d)

[<TOP>](#)

Reason : $P(A) = P(A \text{ and } D) + P(A \text{ and } E) = 0.12 + 0.28 = 0.40$

Similarly,

$$P(B) = 0.075 + 0.225 = 0.30$$

$$P(C) = 0.12 + 0.18 = 0.30$$

$$P(D) = P(A \text{ and } D) + P(B \text{ and } D) + P(C \text{ and } D) = 0.12 + 0.075 + 0.12 = 0.315$$

Similarly,

$$P(E) = 0.28 + 0.225 + 0.18 = 0.685$$

$$P(D|C) = \frac{P(C \text{ and } D)}{P(C)} = \frac{0.12}{0.30} = 0.40$$

$$P(E|B) = \frac{P(B \text{ and } E)}{P(B)} = \frac{0.225}{0.30} = 0.75$$

$$P(D|A) = \frac{P(A \text{ and } D)}{P(A)} = \frac{0.12}{0.40} = 0.30$$

$$P(D|B) = \frac{P(B \text{ and } D)}{P(B)} = \frac{0.075}{0.30} = 0.25$$

$$P(E|A) = \frac{P(A \text{ and } E)}{P(A)} = \frac{0.28}{0.40} = 0.70$$

$$P(E|C) = \frac{P(C \text{ and } E)}{P(C)} = \frac{0.18}{0.30} = 0.60.$$

From above we can see that:

$$P(D|A) \neq P(D) \quad P(D|B) \neq P(D) \quad P(D|C) \neq P(D)$$

$\therefore$ D is dependent on the events A, B and C respectively.

$$P(E|A) \neq P(E) \quad P(E|B) \neq P(E) \quad P(E|C) \neq P(E)$$

$\therefore$ E is dependent on the events A, B and C respectively.

41. Answer : (c)

[<TOP>](#)

Reason : According to Bayes' theorem:

$$\begin{aligned}
 P(\text{Female/Illiterate}) &= \frac{P(\text{Female and Illiterate})}{P(\text{Illiterate})} \\
 P(\text{Female and Illiterate}) &= P(\text{Female}) \cdot P(\text{Illiterate / Female}) \\
 &= \left(1 - \frac{3}{5}\right) \times \frac{4}{5} = \frac{2}{5} \times \frac{4}{5} = \frac{8}{25} \\
 P(\text{Illiterate}) &= P(\text{Female and Illiterate}) + P(\text{Male and Illiterate}) \\
 &= \frac{8}{25} + [P(\text{Male}) \cdot P(\text{Illiterate / Male})] \\
 &= \frac{8}{25} + \left[\frac{3}{5} \times \frac{1}{2}\right] = \frac{8}{25} + \frac{3}{10} = \frac{31}{50} \\
 \frac{\frac{8}{25}}{\frac{31}{50}} &= \frac{16}{31}
 \end{aligned}$$

$\therefore P(\text{Female / Illiterate}) = \frac{16}{31} = 0.516$ i.e. 51.6% approximately.

(In the above calculations, 'males' imply adult males and 'females' imply adult females).

42. Answer : (e)

[<TOP>](#)

Reason : The event can occur in six ways(aces of four colors, 10 of diamond and 2 of spades)out of 52 equally likely cases. Thus $P = 6/52 = 3/26$.

43. Answer : (c)

[<TOP>](#)

Reason : B_1 = black ball from first bag, B_2 = black ball from second bag

$$P\{B_1 B_2\} = P\{B_1\}P\{B_2\} = (2/6)(5/8) = 5/24.$$

44. Answer : (c)

[<TOP>](#)

Reason : Let the events A and B denote that the computers A and B respectively be sold. As per the problem, $P(A) = 0.60$ and $P(B) = 0.40$ and hence, $P(\bar{A}) = 0.40$ and $P(\bar{B}) = 0.60$.

The probability of selling at least one computer is given by $P(A \text{ or } B)$. Hence, the required probability may be obtained as: $P\{A/(A \text{ or } B)\}$. Therefore, from the multiplication theorem of probability, we get,

$$\begin{aligned}
 P\{A/(A \text{ or } B)\} &= \frac{P[A \text{ and } (A \text{ or } B)]}{P(A \text{ or } B)} = \frac{P(A)}{1 - P(\bar{A} \text{ and } \bar{B})} = \frac{0.6}{1 - 0.6 \times 0.4} \\
 &= \frac{0.6}{1 - 0.24} = \frac{0.6}{0.76} = 0.79 \text{ (approx.)}
 \end{aligned}$$

45. Answer : (e)

[<TOP>](#)

Reason :

Age group	f	c.f
18 - 22	115	115
22 - 26	130	245
26 - 30	260	505
30 - 34	280	785
34 - 38	163	948
38 - 42	160	1108
42 - 46	156	1264
46 - 50	73	1337
50 - 54	88	1425
54 - 58	75	1500

Median = size of $\frac{N}{2}$ th observation = $\frac{1500}{2}$ = 750th observation.
Hence the median lies in the class 30–34.

$$\begin{aligned}\text{Median} &= \left[\frac{(N+1)/2 - (F+1)}{f_m} \right] W + L_m \\ &= \left[\frac{750.50 - 506}{280} \right] 4 + 30 \\ &= 33.49\end{aligned}$$

46. Answer : (d)

[<TOP>](#)

Reason :

Let the numbers be a and b.

$$HM = \frac{2ab}{(a+b)} \quad ; \quad GM = \sqrt{ab}$$

$$\frac{HM}{GM} = \frac{\frac{2ab}{(a+b)}}{\sqrt{ab}} = \frac{2\sqrt{ab}}{(a+b)} = \frac{12}{13}$$

$$\text{Or, } 6a + 6b = 13\sqrt{ab} \quad \text{Or, } 6\sqrt{\frac{a}{b}} + 6\sqrt{\frac{b}{a}} = 13$$

$$\text{Let } \sqrt{\frac{a}{b}} = z \text{ So, the equation would be } 6z + \frac{6}{z} = 13$$

$$\text{Or, } 6z^2 + 6 = 13z$$

$$\text{Or, } 6z^2 - 13z + 6 = 0 \quad \text{Or, } 6z^2 - 9z - 4z + 6 = 0$$

$$\text{Or, } 3z(2z - 3) - 2(2z - 3) = 0 \quad \text{Or, } (3z - 2)(2z - 3) = 0$$

$$\text{So, } z = \frac{2}{3} \text{ or } \frac{3}{2} \quad \text{So, } z^2 = \frac{a}{b} = \frac{4}{9} \text{ or } \frac{9}{4}$$

47. Answer : (c)

[<TOP>](#)

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

As A.M. exceeds GM by 15. So, $A - G = 15$; Or, $(A - 15)^2 = G^2$ (i)

As AM exceeds HM by 27. So, $A - H = 27$ Or, $H = A - 27$

$G^2 = AH = A(A - 27)$ Putting this value of G^2 in equation (i) we get

$$(A - 15)^2 = A(A - 27)$$

$$\text{Or, } -30A + 225 = -27A$$

$$\text{Or, } 3A = 225$$

$$\text{Or, } A = 75. \text{ Or, } (a+b) = 150$$

$$\text{So, } G = 60 \text{ Or, } \sqrt{ab} = 60 \text{ i.e } ab = 3600$$

$$\frac{3600}{a}$$

$$\text{So, } a + \frac{3600}{a} = 150$$

$$\text{Or, } a^2 - 150a + 3600 = 0.$$

$$\text{Or, } a^2 - 120a - 30a + 3600 = 0.$$

$$\text{Or, } a(a - 120) - 30(a - 120) = 0$$

$$\text{Or, } (a - 30)(a - 120) = 0$$

So the value

of the numbers would be (30, 120) or (120, 30)

So the lowest value is 30.

48. Answer : (c)

[<TOP>](#)

Reason : Here, the geometric mean of 10 observations is 16.2 and hence, the product of all the observations will be $= 16.2^{10}$. Now, one of the observation was wrongly noted as 12.9 though it is actually 21.9.

$$\frac{16.2^{10} \times 21.9}{12.9} = 2.1135^{12}$$

Hence, the actual product is given by: and correspondingly, the actual

geometric mean is obtained as: $\sqrt[10]{2.1135^{12}} = 17.08$.

49. Answer : (b)

[<TOP>](#)

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

50. Answer : (c)

[<TOP>](#)

Reason : The appropriate mean for a set of ratios using the denominators of the ratios as weights is weighted arithmetic mean.

51. Answer : (c)

[<TOP>](#)

Reason : The sum of the deviations (along with their signs) of the data items from the arithmetic mean is zero.

52. Answer : (b)

[<TOP>](#)

$$\text{Reason : Coefficient of variation} = \frac{\text{Standard deviation}}{\text{Mean}} \times 100$$

$$= \frac{\sqrt{\text{Variance}}}{\text{Mean}} \times 100$$

$$\text{or } 20 = \frac{\sqrt{16}}{\text{Mean}} \times 100$$

$$\text{or } \text{Mean} = \frac{4}{20} \times 100 = 20.$$

53. Answer : (c)

[<TOP>](#)

$$\text{Reason : Variance} = \frac{1}{n-1} \sum_{i=1}^n (x_i - \bar{x})^2$$

If every item is multiplied by 2 then mean of the resulting data set will be $2\bar{x}$ and the variance of the resulting data set

$$= \frac{1}{n-1} \sum (2x - 2\bar{x})^2 = \frac{1}{n-1} \sum 2^2 (x - \bar{x})^2 = 4 \times \frac{1}{n-1} \sum (x - \bar{x})^2$$

$$= 4 \times \text{Variance of the original data set}$$

$$= 4 \times 9 = 36.$$

54. Answer : (c)

[<TOP>](#)

$$\text{Reason : Given : } \sum x = 120 \quad s = 3 \quad n = 10$$

$$\therefore \bar{x} = \frac{\sum x}{n} = \frac{120}{10} = 12$$

After 3 added to every observation, mean of the resulting data set = $\bar{x} + 3 = 12 + 3 = 15$

Standard deviation of the resulting data set will be unchanged, i.e. = 3.

$$\therefore \text{Coefficient of variation of the resulting data set} = \frac{3}{15} \times 100 = 20\%$$

55. Answer : (b)

[<TOP>](#)

Reason : It is an application of the harmonic mean. The average price of the pencils are given by:

$$\frac{\text{Total amount spent}}{\text{Total number of pencils bought}} = \frac{\text{Rs.50} + \text{Rs.30} + \text{Rs.20}}{\frac{50}{1.00} + \frac{30}{1.50} + \frac{20}{2.00}}$$

$$= \frac{\text{Rs.100}}{50 + 20 + 10} = \frac{\text{Rs.100}}{80} = \text{Rs.1.25}.$$

56. Answer : (c)

[<TOP>](#)

Reason :

Return on investment %	Mid-point (X)	No. of Companies (f)	fX	X -μ	f(X -μ) ²
0 - 10	5	25	125	-11.9	3540.25
10 - 20	15	36	540	-1.9	129.96
20 - 30	25	34	850	8.1	2230.74
30 - 40	35	5	175	18.1	1638.05
Total		100	1690		7539

$$\text{Mean } \mu = \frac{\sum fx}{\sum f} = \frac{1690}{100} = 16.9\%$$

$$\text{Standard deviation} = \sqrt{\frac{\sum f(X - \mu)^2}{\sum f}} = \sqrt{\frac{7539}{100}} = 8.68\%$$

57. Answer : (b)

[<TOP>](#)

Reason : The variability of the data about its mean when the distribution of the data set is not known is

$$\text{given by } \left(1 - \frac{1}{k^2}\right) \times 100$$

$$\left(1 - \frac{1}{3^2}\right) \times 100$$

$$\text{Here } K = 3 = 88.88 \approx 89\%$$

58. Answer : (a)

[<TOP>](#)

Reason : Range = L – S

Where L = 270 and S = 190

Range = 270 – 190 = 80

$$\text{Coefficient of range} = \frac{L - S}{L + S} = \frac{270 - 190}{270 + 190} = 0.173.$$

59. Answer : (e)

[<TOP>](#)

Reason : From the standpoint of graphic presentation, the ogive is especially used for the following purposes:

- I. It is used to determine as well as to portray the number or proportion of cases above or below a given value.
- II. It is used to compare two or more frequency distributions.
- III. Ogives are drawn for determining certain values graphically such as median, quartiles, deciles, etc.

Therefore (e) is the correct answer.

60. Answer : (b)

[<TOP>](#)

Reason : In a negatively skewed distribution mode is greater than the mean and median lies between mean and mode.

61. Answer : (e)

[<TOP>](#)

Reason : The most appropriate diagram to represent the data relating to monthly expenditure on different items is pie-diagram

62. Answer : (d) [<TOP>](#)

Reason : For a skewed distribution of data most of the values are concentrated either at the lower end or at the higher end of the scale. All the other alternatives are valid for symmetrical distributions.

63. Answer : (c) [<TOP>](#)

Reason : Raw data is the nature of information that is yet to be processed or analyzed by an expert.

64. Answer : (c) [<TOP>](#)

Reason : Let x be the number of items of X and y be the number of items of Y. So, the Machine time would

$\frac{(13x + 19y)}{60}$

be $(13x + 19y)$ min or $\frac{(13x + 19y)}{60}$ hours. The company has 40 hours or 2400 minutes of machine time available in the next working week. So, the corresponding constraint would be $13x + 19y \leq 2400$.

65. Answer : (e) [<TOP>](#)

Reason : The primal is a maximization model in m equality constraints and n non-negative variables, then the

II. Dual is a minimization model.

III. Dual has n constraints and m non-negative variables.

Therefore (e) is the correct answer.

66. Answer : (d)

[<TOP>](#)

Reason : Let the number of type of A, B and C cars are A, B and C respectively.

Objective function: $55000A + 60000B + 72500C$

Subject to:

$$8A + 8B + 9C \leq 10120$$

$$8A + 9B + 11C \leq 11000$$

Using slack variables the constraints would look like

$$8A + 8B + 9C + S_1 = 10120 \quad \text{.....(i)}$$

$$8A + 9B + 11C + S_2 = 11000 \quad \text{.....(ii)}$$

So, the first tableau of the simplex method of this problem would look like

Tableau 1

Variable	Solution	A	B	C	S ₁	S ₂	Ratio
S ₁	10120	8	8	9	1	0	$\frac{10120}{9} = 1124.4$
S ₂	11000	8	9	11	0	1	$\frac{11000}{11} = 1000$
		-55000	-60000	-72500	0	0	

Variable to enter: C

Variable to leave: S₂

Tableau 2

Variable	Solution	A	B	C	S ₁	S ₂	Ratio
S ₁	1120	$\frac{16}{11}$	$\frac{7}{11}$	0	1	$\frac{9}{11}$	$\frac{1120 \times 11}{16} = 770$
C	1000	$\frac{8}{11}$	$\frac{9}{11}$	1	0	$\frac{1}{11}$	$\frac{1000 \times 11}{8} = 1375$
		$\frac{25000}{11}$	$\frac{7500}{11}$	0	0	$\frac{72500}{11}$	

Variable to enter: A

Variable to leave: S₁

Tableau 3

Variable	Solution	A	B	C	S ₁	S ₂	Ratio
A	770	1	$\frac{7}{16}$	0	$\frac{11}{16}$	$\frac{9}{16}$	
C	440	0	$\frac{1}{2}$	1	$-\frac{1}{2}$	$-\frac{7}{22}$	
		0	$\frac{6875}{22}$	0	$\frac{28125}{22}$	$\frac{173125}{22}$	

Since, all $(Z_i - C_i)$ value are non-negative, the optimal solution is reached

A = 770, B = 0, C = 440. So the company would earn a profit of

$$770 \times 55000 + 440 \times 72500 = \text{Rs. } 7,42,50,000$$

Or Rs. 7.4 crore approximately.

67. Answer : (e) [<TOP>](#)

Reason : All the given statements are true except (e) with regard to linear programming problems.

68. Answer : (c) [<TOP>](#)

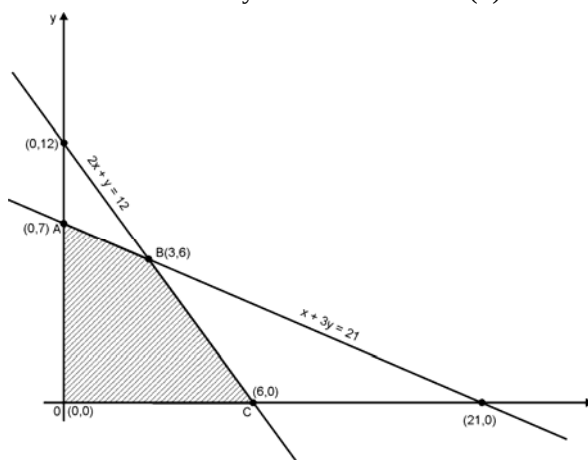
Reason : A linear programming problem cannot be solved by the simplex method if we give negative values for the resources available.

69. Answer : (d) [<TOP>](#)

Reason : The constraints are

$2x + y \leq 12$ and the terminal line of feasibility is $2x + y = 12$ (i)

$x + 3y \leq 21$ and the terminal line of feasibility is $x + 3y = 21$ (ii)



So, the vertices are
(6, 0), (0, 7), and (3, 6).

70. Answer : (b) [<TOP>](#)

- Reason :
- a. The objective function specifies the objective to be achieved by solving the LPP.
 - b. The limitations on the use of resources are represented by the structural constraints.
 - c. Nonnegativity constraints are used to prevent the decision variables from assuming negative values.
 - d. Decision variables are the variables, which contribute to the value of the objective function, and their values are determined by solving the LPP.
 - e. Solutions represent the specific combinations of values of the decision variables.

71. Answer : (b) [<TOP>](#)

- Reason :
- (a) At the optimal solution the slack variables need not be equal to zero.
 - (b) The constraints which contain the $\leq$ sign are converted into equations by adding slack variables.
 - (c) There can be more than one feasible solution to a LPP.
 - (d) The slack variables make zero contribution towards profit.
 - (e) The slack variables can only assume any non-negative value.

72. Answer : (c) [<TOP>](#)
Reason : With regard to the graphical method of solving a linear programming problem, the optimal solution occurs at one of the corner prints of the feasible reagon. (a) is false because points which lie outside the feasible region do not satisfy all the constraints. (b) is false because if the objective function is parallel to an edge of the feasible region then, there may be multiple optimal solutions. (d) is false because the graphical method cannot be used to solve problems involving more than two decision variables.
73. Answer : (d) [<TOP>](#)
Reason : If each job requires exactly one resource and each resource can be used on only job, the resulting problem, is an assignment problem. Therefore (d) is the correct answer.
74. Answer : (e) [<TOP>](#)
Reason : Inventory maintaince is necessary because of the following reasons:
I. Inventory helps in smooth and efficient running of business
II. Inventory provides service to the customers immediately or at a short notice.
III. Inventory helps in maintaining the economy by absorbing some of the fluctuations when the demand for an item fluctuates or seasonal
IV. Maintaining of inventory may earn price discount because of bulk-purchasing.
Therefore (e) is the correct answer.
75. Answer : (e) [<TOP>](#)
Reason : In solving the linear programming problem, if the type of constraint is greater than or equal to type, then the extra variable called surplus variable is subtracted, and an artificial variable is added, then the coefficient of extra variables in the objective function of type Max. z are 0, $-M$.
76. Answer : (b) [<TOP>](#)
Reason : The option **(b)** is **not true** because the directions of the inequalities will be reversed i.e., if the primal constraints have the inequalities of $\leq$, then the dual constraints will have the inequalities of $\geq$.
The options (a), (c), (d) and (e) are **true**.
77. Answer : (c) [<TOP>](#)
Reason : Options (I), (II), (III), (IV) are true with regard to the interpolation. Option (v) is false because Extrapolation is used for forecasting purposes. Hence (c) is the answer.
78. Answer : (e) [<TOP>](#)
Reason : The correct answer is (e) . Therefore variety of methods that can be used for interpolation such as graphical method, linear approximation, etc.,

79. Answer : (b)

[<TOP>](#)

Reason : Let the IRR of the project be 'r'

$$\therefore 41 = \frac{17}{(1+r)^1} + \frac{18}{(1+r)^2} + \frac{14}{(1+r)^3} + \frac{19}{(1+r)^4}$$

for r = 25%,

$$\text{RHS} = \frac{17}{1.25} + \frac{18}{(1.25)^2} + \frac{14}{(1.25)^3} + \frac{19}{(1.25)^4} = 40.0704$$

for r = 23%,

$$\text{RHS} = \frac{17}{1.23} + \frac{18}{(1.23)^2} + \frac{14}{(1.23)^3} + \frac{19}{(1.23)^4} = 41.5432$$

$$\therefore r = 23 + \frac{41.5432 - 41}{41.5432 - 40.0704} \times 2 = 23.73\%$$

80. Answer: (e)

[<TOP>](#)

Reason:

Convert the inequality constraints to equations by introducing slack variables S_1 and S_2

Therefore the given problem now becomes.

$$\text{Max } Z = 3x_1 + 2x_2 + 0.S_1 + 0.S_2$$

Subject to

$$2x_1 + x_2 + S_1 = 10$$

$$x_1 + 3x_2 + S_2 = 6$$

$$x_1, x_2, S_1, S_2 \geq 0.$$

Simplex Table

Basic Variables	$C_j \rightarrow$		3	2	0	0	Min. Ratio
	C_B	X_B	X_1	X_2	S_1	S_2	
S_1	0	10	2	1	1	0	$10/2 = 5 \leftarrow$
S_2	0	6	1	3	0	1	$6/1 = 6$
	$Z_j - C_j = 0$		-3	-2	0	0	
X_1	3	5	1	$\frac{1}{2}$	$\frac{1}{2}$	0	$5/1/2 = 10$
S_2	0	1	0	$\frac{5}{2}$	$-\frac{1}{2}$	1	$1/5/2 = 0.4 \leftarrow$
	$Z_j - C_j = 15$		0	$-\frac{1}{2}$	$\frac{3}{2}$	0	
X_1	3	$\frac{24}{5}$	1	0	$\frac{3}{5}$	$-\frac{1}{5}$	
X_2	2	$\frac{2}{5}$	0	1	$-\frac{1}{5}$	$\frac{2}{5}$	
	$Z_j - C_j = \frac{76}{5}$		0	0	1.4	0.2	

The value of the objective function is $76/5$.

[< TOP OF THE DOCUMENT >](#)

