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MINIMUM LEARNING MATERIALS (FOR SLOW LEARNERS)

12th Standard

Business Maths

20 x 2 = 40

1) Find the rank of the matrix A = $\begin{pmatrix} 1 & -3 & 4 & 7 \\ 9 & 1 & 2 & 0 \end{pmatrix}$

2) The discrete random variable X has the probability function

X	1	2	3	4
P(X=x)	k	2k	3k	4k

Show that k = 0.1.

3) If MR = 20 − 5x + 3x^2, find total revenue function.

4) The following information is the probability distribution of successes.

No. of Successes	0	1	2
Probability	$\frac{6}{11}$	$\frac{9}{22}$	$\frac{1}{22}$

Determine the expected number of success.

5) Find the expected value for the random variable of an unbiased die

6) Let X be a random variable and Y = 2X + 1. What is the variance of Y if variance of X is 5 ?

7) A fair coin is tossed 6 times. Find the probability that exactly 2 heads occurs.

8) Find the differential equation of the following
y = cx + c − c^3

9) Fit a trend line by the method of freehand method for the given data

Year	2000	2001	2002	2003	2004	2005	2006	2007
Sales	30	46	25	59	40	60	38	65

10) Find the order and degree of the following differential equations

$$\frac{d^2y}{dx^2} + 3\left(\frac{dy}{dx}\right)^2 + 4y = 0$$

11) Find the trend of production by the method of a five-yearly period of moving average for the following data:

Year	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Production('000)	126	123	117	128	125	124	130	114	122	129	118	123

12) Find (i) Δe^{ax}

(ii) $\Delta^2 e^x$

(iii) $\Delta \log x$

13)

Evaluate $\Delta^2 \left(\dfrac{1}{x} \right)$ by taking '1' as the interval of differencing.

14) Find the order and degree of the following differential equations.

$$\frac{d^2y}{dx^2} = \sqrt{y - \frac{dy}{dx}}$$

15) Find the order and degree of the following differential equations.

$$\frac{d^2y}{dx^2} + y + \left(\frac{dy}{dx} - \frac{d^3y}{dx^3} \right)^{3/2} = 0$$

16) Find the consumer's surplus for the demand function $p = 25 - x - x^2$ when $P_o = 19$

17) Find the producer's surplus for the supply function $p = x^2 + x + 3$ when $x_o = 4$

18) Find the missing term from the following data.

x	20	30	40
y	51	-	34

19) Find the missing term from the following data

x	1	2	3	4
f(x)	100	-	126	157

20) When h = 1, find $\Delta (x^3)$.

21) Find the rank of each of the following matrices.

$$\begin{pmatrix} 1 & -1 \\ 3 & -6 \end{pmatrix}$$

22)

Find the rank of the matrix $\begin{pmatrix} 1 & 1 & -1 \\ 2 & -3 & 4 \\ 3 & -2 & 3 \end{pmatrix}$

23)

Find the rank of the matrix $\begin{pmatrix} 1 & 2 & 3 & -1 \\ 2 & 4 & 6 & -2 \\ 3 & -6 & 9 & -3 \end{pmatrix}$

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24) Solve x + 2y = 3 and x +y = 2 using Cramer's rule.

25) Solve: x + 2y = 3 and 2x + 4y = 6 using rank method.

26) Solve: 2x + 3y = 4 and 4x + 6y = 8 using Cramer's rule.

27) Integrate the following with respect to x.

$$\left(9x^2 - \frac{4}{x^2}\right)^2$$

28) Evaluate $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} sinx$ dx

29) Evaluate $\int \left(e^x + \frac{1}{e^x}\right)^2 dx$

30) Evaluate $\int \frac{x}{x^2+1} dx$

31) Integrate the following with respect to x.

$$\frac{2x+5}{x^2+5x-7}$$

32) Integrate the following with respect to x

$$\frac{6x+7}{\sqrt{3x^2+7x-1}}$$

33) Integrate the following with respect to x.

$$\frac{1}{x\log x}$$

34)

If f(x) = $\begin{cases} x^2, & -2 \leq x < 1 \\ x, & 1 \leq x < 2 \\ x-4, & 2 \leq x \leq 4 \end{cases}$, then find the following

(i) $\int_{-2}^{1} f(x)dx$

(ii) $\int_{1}^{2} f(x)dx$

(iii) $\int_{2}^{3} f(x)dx$

35) Evaluate $\int \frac{dx}{(2x+3)^2}$

36) Evaluate $\int \frac{ax^2+bx+c}{\sqrt{x}} dx$

37) Evaluate $\int \frac{3x^2+2x+1}{x} dx$

38) Evaluate $\int \frac{2}{3x+5}dx$

39) Evaluate the following

$\Gamma\left(\frac{9}{2}\right)$

40) Evaluate the following

$\int_0^\infty e^{-4x}x^4 dx$

41) Evaluate $\int \frac{dx}{\sqrt{4x^2-9}}$

42) Evaluate $\int sin^2 x dx$

43) Evaluate $\int \frac{cos2x}{sin^2 x cos^2 x}dx$

44) Evaluate $\int \sqrt{1+sin2x}\ \ dx$

45) Evaluate $\int \sqrt{4x^2+9}\ dx$

46) Integrate the following with respect to x.
$\sqrt{1-sin2x}$

47) $\int \frac{x^3-x^2+x-1}{x-1}dx$

48) $\int \frac{(\log x)^3}{x}dx$

49) $\int \frac{(1+\log x)^2}{x}dx$

50)
$\int e^x\left(\frac{1}{x}-\frac{1}{x^2}\right)dx$

51)
$\int e^r\left(\log x+\frac{1}{x}\right)dx$

52) Using Integration, find the area of the region bounded the line 2y + x = 8, the x axis and the lines x = 2, x = 4.

53) Find the area of the region bounded by the line x − 2y − 12 = 0 , the y-axis and the lines y = 2, y = 5.

54) Find the area of the region bounded by the parabola $y = 4 - x^2$, x −axis and the lines x = 0, x = 2.

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55) The marginal cost function is MC = $\dfrac{100}{x}$. Find the cost function C(x) if C(16) = 100.

56) The marginal cost function of manufacturing x units of a commodity is 3 - 2x - x^2. If fixed cost is 200, find the total cost and average cost function.

57) If the marginal revenue for a commodity is MR = 9 - $6x^2$+2x, find total revenue and demand function.

58) If the marginal revenue for a commodity is R'(x) = 15 - 9x - $3x^2$. Find the revenue function and average revenue function.

59) The marginal cost function is $MC = 20 - 0.04x + 0.003x^2$ where r is the number of units produced. The fixed cost of production is Rs. 7,000. Find the total cost and average cost.

60) If the marginal revenue function is $R'(x) = 15 - 9x - 3x^2$. Find the revenue and average revenue function.

61) Find the order and degree of the following differential equation
$y' + (y'')^2 = (x + y'')^2$

62) Solve: $(x^2 + x + 1)dx + (y^2 - y + 3)dy = 0$

63) Solve $(D^2-3D-4)y = 0$

64) Solve 9y'' − 12y' + 4y = 0

65) Solve $\dfrac{d^2y}{dx^2} - 4\dfrac{dy}{dx} + 5y = 0$

66) Solve the following differential equations: $\dfrac{d^2y}{dx^2} + 16y = 0$

67) Solve: ydx − xdy = 0

68) Solve: $\dfrac{dy}{dx} + e^x+ye^x = 0$

69) Form the differential equation of the family of curves y = A cos 5x + B sin 5x where A and B are parameters.

70) Find the differential equation of a family of curves given by y = a cos (mx + b), a and b being arbitrary constants.

71) Form the differential equation for the following:
a) y = mx
b) $y = mx + \dfrac{a}{m}$, (m is arbitrary constant)
c) $y = a\cos 3x + b\sin 3x$
d) $x^2 + y^2 = a^2$

72) Solve: $\dfrac{dy}{dx} = \dfrac{1+y^2}{1+x^2}$

73) Solve: $\dfrac{dy}{dx} = 2xy + 2ax$

74) Solve: $\sec^2 x \tan y\, dx + \sec^2 y \tan x\, dy = 0$

75) Solve: $\dfrac{dy}{dx} = \dfrac{x+1}{y-2}$

76) Find Δe^x

77) Find $\Delta^2 e^{xx}$

78) Evaluate $\Delta\left(\dfrac{1}{x}\right)$ y taking 1 as the interval of differencing.

79) Prove that $f(3) = f(2) + \Delta I(1) + \Delta^2 f(1)$ by taking 1 will givea- as the interval of differencing.

80) Construct a forward difference table for $y = f(x) = x^2 + 2x + 2$ for $x = 1, 2, 3, 4$

81) Two coins are tossed simultaneously. Getting a head is termed as success. Find the probability distribution of the number of successes.

82) Explain what are the types of random variable?

83) Distinguish between discrete and continuous random variable.

84) Explain the distribution function of a random variable.

85) What is the expected value of a game that works as follows: I flip a coin and, if tails pay you Rs. 2; if heads pay you Rs. 1. In either case I also pay you Rs. 50.

86) In an investment, a man can make a profit of Rs. 5,000 with a probability of 0.62 or a loss of Rs. 8,000 with a probability of 0.38. Find the expected gain.

87) What are the properties of Mathematical expectation?

88) Define Mathematical expectation in terms of discrete random variable.

89) Two eggs are drawn at random without replacement from a bag containing two bad eggs and eight good eggs. Find the probability of getting two bad eggs?

90) A player tosses two fair coins. He wins Rs. 5 if 2 heads appear and Rs. 2 if 1 head appear and Rs. 1 if no head occurs. Find the expected amount of gain.

91) What is population?

92) What is sample?

93) What is sampling distribution of a statistic?

94) State any two merits of simple random sampling.

95) State any two demerits of systematic random sampling.

96) State any two merits for systematic random sampling.

97) What is interval estimation?

98) Define alternative hypothesis.

99) Define level of significance

100) What is type I error

101) Find the standard of the sample mean, when Sample mean is 100, sample size is 64 and population standard deviation is 24.

102) State the uses of Index Number.

103) Mention the classification of Index Number.

104) State the test of adequacy of index number.

105) State the uses of Cost of Living Index Number.

106) Define Statistical Quality Control.

107) Name the control charts for variables.

108) What are the uses of statistical quality control?

109) Define Time series.

110) What is the need for studying time series?

111) State the uses of time series.

112) Define seasonal index.

113) State the two normal equations used in fitting a straight line.

114) Fit a straight line to the following $\Sigma I = 10, \Sigma Y = 19, \Sigma X^2 = 30, \Sigma XY = 53$ and n = 5

115) Using the method ofleast squares, fit a straight line trend for $\Sigma x = 10, \Sigma y = 16.9, \Sigma x^2 = 30, \Sigma xy = 47.4$ and n = 7.

116) Fit the line of best fit if $\Sigma X = 75, \Sigma Y = 115, \Sigma X^{-2} = 1375, \Sigma XY = 1875$ and n = 6.

117) The following data shows the value of sample mean ($\bar{X}$) and the range R for 10 samples of size 5 each. Calculate the control limits for : mean chart and range chart.

Sample No.	1	2	3	4	5	6	7	8	9	10
Mean $\bar{X}$	11.2	11.8	10.8	11.6	11.0	9.6	10.4	9.6	10.6	10.0
Range	7	4	8	5	7	4	8	4	7	9

(Given for n = 5, A_2 = .577, D_3 = 0, D_4 = 2.115)

118) What is transportation problem?

119) Write mathematical form of transportation problem.

120) What is the Assignment problem?

121) Give mathematical form of assignment problem.

122) What is the difference between Assignment Problem and Transportation Problem?

40 x 3 = 120

123)

Find the rank of the matrix $\begin{pmatrix} 1 & 2 & -1 & 3 \\ 2 & 4 & 1 & -2 \\ 3 & 6 & 3 & -7 \end{pmatrix}$

124)

If A=$\begin{pmatrix} 1 & 1 & -1 \\ 2 & -3 & 4 \\ 3 & -2 & 3 \end{pmatrix}$ and B=$\begin{pmatrix} 1 & -2 & 3 \\ -2 & 4 & -6 \\ 5 & 1 & -1 \end{pmatrix}$, then find the rank of AB and the rank of BA.

125) Consider the matrix of transition probabilities of a product available in the market in two brands A and B.

$\begin{array}{c} \\ A \\ B \end{array}\begin{array}{c} \begin{array}{cc} A & B \end{array} \\ \begin{pmatrix} 0.9 & 0.1 \\ 0.3 & 0.7 \end{pmatrix} \end{array}$

Determine the market share of each brand in equilibrium position.

126) Parithi is either sad (S) or happy (H) each day. If he is happy in one day, he is sad on the next day by four times out of five. If he is sad on one day, he is happy on the next day by two times out of three. Over a long run, what are the chances that Parithi is happy on any given day?

127) The subscription department of a magazine sends out a letter to a large mailing list inviting subscriptions for the magazine. Some of the people receiving this letter already subscribe to the magazine while others do not. From this mailing list, 45% of those who already subscribe will subscribe

again while 30% of those who do not now subscribe will subscribe. On the last letter, it was found that 40% of those receiving it ordered a subscription. What percent of those receiving the current letter can be expected to order a subscription?

128) Find the area bounded by y = x between the lines x = −1 and x = 2 with x - axis.

129) The marginal cost function MC = $2 + 5e^x$ Find C if C (0)=100

130) Two unbiased dice are thrown simultaneously and sum of the upturned faces considered as random variable. Construct a probability mass function.

131) If the marginal revenue function for a commodity is MR = $9 - 4x^2$. Find the demand function.

132) If MR = $14 - 6x + 9x^2$, find the demand function.

133) The demand function of a commodity is y = $36 - x^2$. Find the consumer's surplus for y_0 = 11

134) Calculate the producer's surplus at x = 5 for the supply function p = 7 + x.

135) Suppose the probability mass function of the discrete random variable is

X=x	0	1	2	3
p(x)	0.2	0.1	0.4	0.3

What is the value of E($3X + 2X^2$) ?

136) The following table is describing about the probability mass function of the random variable X

x	3	4	5
P(x)	0.1	0.1	0.2

Find the standard deviation of x.

137) The mean of Binomials distribution is 20 and standard deviation is 4. Find the parameters of the distribution.

138) If x is a binomially distributed random variable with E(x) = 2 and van (x) = 4/3 Find P(x = 5)

139) From the following data, select 68 random samples from the population of heterogeneous group with size of 500 through stratified random sampling, considering the following categories as strata.
Category1: Lower income class - 39%

Category2: Middle income class - 38%

Category3: Upper income class - 23%

140) Find the sample size for the given standard deviation 10 and the standard error with respect of sample mean is 3.

141) A die is thrown 9000 times and a throw of 3 or 4 is observed 3240 times. Find the standard error of the proportion for an unbiased die .

142) The standard deviation of a sample of size 50 is 6.3. Determine the standard error whose population standard deviation is 6?

143) Fit a trend line by the method of semi-averages for the given data.

Year	2000	2001	2002	2003	2004	2005	2006
Production	105	115	120	100	110	125	135

144) Calculate three-yearly moving averages of number of students studying in a higher secondary school in a particular village from the following data.

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Number of students	332	317	357	392	402	405	410	427	435	438

145) Calculate four-yearly moving averages of number of students studying in a higher secondary school in a particular city from the following data.

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009
Sales	124	120	135	140	145	158	162	170	175

146) Construct the cost of living Index number for 2015 on the basis of 2012 from the following data using family budget method.

Commodity	Price 2012	Price 2015	Weight
Rice	250	280	10
Wheat	70	280	5
Corn	150	170	6
Oil	25	35	4
Dhal	85	90	3

147) Calculate the cost of living index by aggregate expenditure method:

Commodity	Weights 2010	Price (Rs.) 2010	Price (Rs.) 2015
P	80	22	25
Q	30	30	45
R	25	42	50
S	40	25	35
T	50	36	52

148) Obtain the initial solution for the following problem

		Destination			
		A	B	C	Supply
Sources	1	2	7	4	5
	2	3	3	1	8
	3	5	4	7	7
	4	1	6	2	14
Demand		7	9	18	

149) Determine an initial basic feasible solution to the following transportation problem using North West corner rule.

	D_1	D_2	D_3	D_4	Availability
O_1	6	4	1	5	14
O_2	8	9	2	7	16
O_3	4	3	6	2	5
Requirement	6	10	15	4	35

Here O_i and D_j represent i^{th} origin and j^{th} destination.

150) Obtain an initial basic feasible solution to the following transportation problem using least cost method.

	D_1	D_2	D_3	D_4	Supply
O_1	1	2	3	4	6
O_2	4	3	2	5	8
O_3	5	2	2	1	10
Demand	4	6	8	6	

Here O_i and D_j denote i^{th} origin and j^{th} destination respectively.

151) Consider the following pay-off (profit) matrix Action States

Action	States			
	(s_1)	(s_2)	(s_3)	(s_4)
A_1	5	10	18	25
A_2	8	7	8	23
A_3	21	18	12	21
A_4	30	22	19	15

Determine best action using maximin principle.

152) A business man has three alternatives open to him each of which can be followed by any of the four possible events. The conditional pay offs for each action - event combination are given below:

Alternative	Pay – offs (Conditional events)			
	A	B	C	D
X	8	0	-10	6
Y	-4	12	18	-2
A_3	14	6	0	8

Determine which alternative should the businessman choose, if he adopts the maximin principle.

153) Find the initial basic feasible solution of the following transportation problem :

	I	II	III	Demand
A	1	2	6	7
B	0	4	2	12
C	3	1	5	11
Supply	10	10	10	

Using (i) North West Corner rule

(ii) Least Cost method

(iii) Vogel's approximation method

154) Construct a forward difference table for the following data

x	0	10	20	30
y	0	0.174	0.347	0.518

155) Construct a forward difference table for $y = f(x) = x^3+2x+1$ for x = 1,2,3,4,5

156) Given the following pay-off matrix(in rupees) for three strategies and two states of nature.

Strategy	States-of-nature	
	E_1	E_2
S_1	40	60
S_2	10	-20
S_3	-40	150

Select a strategy using each of the following rule

(i) Maximin

(ii) Minimax

157) Evaluate $\Delta(\log ax)$.

158) If $y = x^3 - x^2 + x - 1$ calculate the values of y for x = 0,1,2,3,4,5 and form the forward differences table.

159) If h = 1 then prove that $(E^{-1}\Delta)x^3 = 3x^2 - 3x + 1$.

160) If $f(x) = x^2 + 3x$ then show that $\Delta f(x) = 2x + 4$

161) Find the missing entry in the following table

x	0	1	2	3	4
y_x	1	3	9	-	81

162) Find the rank of each of the following matrices.

$$\begin{pmatrix} 1 & -2 & 3 & 4 \\ -2 & 4 & -1 & -3 \\ -1 & 2 & 7 & 6 \end{pmatrix}$$

163)

Find the rank of the matrix $A = \begin{pmatrix} -2 & 1 & 3 & 4 \\ 0 & 1 & 1 & 2 \\ 1 & 3 & 4 & 7 \end{pmatrix}$

164) Examine the consistency of the system of equations: x + y + z = 7, x + 2y + 3z = 18, y + 2z = 6.

165) The subscription department of a magazine sends out a letter to a large mailing list inviting subscriptions for the magazine. Some of the people receiving this letter already subscribe to the magazine while others do not. From this mailing list, 60% of those who already subscribe will subscribe again while 25% of those who do not now subscribe will subscribe. On the last letter it was found that 40% of those receiving it ordered a subscription. What percent of those receiving the current letter can be expected to order a subscription?

166) Show that the equations x + y = 5, 2x + y = 8 are consistent and solve them.

167) Show that the equations 3x − 2y = 6, 6x − 4y = 10 are inconsistent

168) A commodity was produced by using 3 units of labour and 2 units of capital, the total cost is Rs 62. If the commodity had been produced by using 4 units of labour and one unit of capital, the cost is Rs 56. What is the cost per unit of labour and capital? (Use determinant method).

169) A total of Rs. 8,600 was invested in two accounts. One account earned $4\frac{3}{4}$ % annual interest and the other earned $6\frac{1}{2}$% annual interest. If the total interest for one year was Rs. 431.25, how much was invested in each account? (Use determinant method).

170) Solve the following equation by using Cramer's rule
5x + 3y = 17; 3x + 7y = 31

171) Evaluate the following using properties of definite integrals:

$\int_{-1}^{1} log\left(\frac{2-x}{2+x}\right) dx$

172) Integrate the following with respect to x.

$$\frac{8x+13}{\sqrt{4x+7}}$$

173) Integrate the following with respect to x.

$$\frac{1}{\sqrt{x+1}+\sqrt{x-1}}$$

174) If f'(x) = x + b, f(1)= 5 and f(2) = 13, then find f(x)

175)

Evaluate $\int e^{2x}\left[\dfrac{2x-1}{4x^2}\right]dx$

176) Evaluate $\int \dfrac{5+5e^{2x}}{e^x+e^{-x}}dx$

177)

If f(x) = $\begin{cases} x^2, & -2 \le x < 1 \\ x, & 1 \le x < 2 \\ x-4, & 2 \le x \le 4 \end{cases}$, then find the following

  (i) $\int_{-2}^{1.5}f(x)dx$

  (ii) $\int_{1}^{3}f(x)dx$

178) Evaluate $\int_{1}^{2}\dfrac{1}{(x+1)(x+2)}dx$

179) Evaluate $\int x^3 \log x\, dx$

180) Evaluate $\int \dfrac{dx}{x\left(x^3+1\right)}$

181) Integrate the following with respect to x.

$$\frac{x^{e-1}+e^{x-1}}{x^e+e^x}$$

182) If $\int_{a}^{b}dx = 1$ and $\int_{a}^{b}xdx = 1$, then find a and b

183)

Evaluate $\int_{1}^{4}f(x)dx$, where $\begin{cases} 7x+3, & if 1 \le x \le 3 \\ 8x, & if 3 \le x \le 4 \end{cases}$

184) Evaluate $\int \dfrac{2x^2-14x+24}{x-3}dx$

185) Evaluate $\int \dfrac{1}{\sqrt{x+2}-\sqrt{x-2}}dx$

186) Evaluate $\int \cos^3 x\, dx$

187) Integrate the following with respect to x.

$$\frac{x^3}{x+2}$$

188) Evaluate the following integrals:

$\int \sqrt{9x^2 + 12x + 3}\ dx$

189) Find the area bounded by the line y = x, the x-axis and the ordinates x = 1, x = 2

190) Mr. Arul invests Rs. 10,000 in ABC Bank each year, which pays an interest of 10% per annum compounded continuously for 5 years. How much amount will there be after 5 years.($e^{0.5}$ = 1.6487)

191) The marginal cost function of manufacturing x shoes is $6 + 10x - 6x^2$. The cost producing a pair of shoes is Rs. 12. Find the total and average cost function.

192) A company has determined that the marginal cost function for a product of a particular commodity is given by MC = $125 + 10x - \frac{x^2}{9}$ where C rupees is the cost of producing x units of the commodity. If the fixed cost is Rs.250 what is the cost of producing 15 units.

193) If the marginal cost function of x units of output is $\frac{a}{\sqrt{ax+b}}$ and if the cost of output is zero. Find the total cost as a function of x.

194) Given the marginal revenue function $\frac{4}{(2x+3)^2} - 1$, show that the average revenue function is P = $\frac{4}{6x+9} - 1$

195) If the marginal revenue function is R'(x) = $1500 - 4x - 3x^2$. Find the revenue function and average revenue function.

196) For the marginal revenue function MR = $35 + 7x - 3x^2$, find the revenue function and demand function.

197) The demand and supply functions under perfect competition are p_d = $1600 - x^2$ and p_s = $2x^2 + 400$ respectively. Find the producer's surplus.

198) For the marginal revenue function MR = $6 - 3x^2 - x^3$, Find the revenue function and demand function.

199) Solve $yx^2 dx + e^{-x} dy = 0$

200) Find the differential equation of the family of curves y = e^x (acos x + bsin x) where a and b are arbitrary constants.

201) Solve $\frac{dy}{dx} = e^{x-y} + x^2 e^{-y}$

202) Solve $\sec^2 x \tan y \, dx + \sec^2 y \tan x \, dy = 0$

203) Solve $y\,dx - x\,dy - 3x^2 y^2 e^{x^3} dx = 0$

204) $(D^2 - 2D - 15)y = 0$ given that $\frac{dy}{dx} = 0$ and $\frac{d^2 y}{dx^2} = 2$ when $x = 0$

205) Solve: $\cos x(1 + \cos y)dx - \sin y(1 + \sin x)dy = 0$

206) Solve: $\frac{dy}{dx} = y \sin 2x$

207) Solve: $\log\left(\frac{dy}{dx}\right) = ax + by$

208) Solve : $(D^2 - 4D - 1)y = e^{-3x}$

209) Solve: $\left(D^2 - 4D + 13\right)y = c^{-1x}$

210) Given $y_3 = 2$, $y_4 = -6$, $y_5 = 8$, $y_6 = 9$ and $y_7 = 17$ Calculate $\Delta^4 y_3$

211) Following are the population of a district

Year (x)	1881	1891	1901	1911	1921	1931
Population (y) Thousands	363	391	421	-	467	501

Find the Population of the year 1911.

212) By constructing a difference table and using the second order differences as constant, find the sixth term of the series 8,12,19,29,42...

213) Prove that $f(4) = f(3) + \Delta f(2) + \Delta^2 f(1) + \Delta^3 f(1)$ taking '1' as the interval of differencing.

214) Given $U_0 = 1$, $U_1 = 11$, $U_2 = 21$, $U_3 = 28$ and $U_4 = 29$ find $\Delta^4 U_0$

215) If $p(x) = \begin{cases} \dfrac{x}{20}, & x = 0, 1, 2, 3, 4, 5 \\ 0, & \text{otherwise} \end{cases}$

Find
(i) P(X< 3) and
(ii) P(2 ≤ 4)

216) The time to failure in thousands of hours of an important piece of electronic equipment used in a manufactured DVD player has the density function.

f(x) = $\{3e^{-3x},\quad x > 0$ 0, $otherwise$

Find the expected life of the piece of equipment.

217) Explain the terms

(i) probability mass function,

(ii) probability density function and

(iii) probability distribution function.

218) The probability distribution function of a discrete random variable X is

f(x) = {2k, x = 13k, x = 34k, x = 50, *otherwise*

where k is some constant. Find (a) k and (b) P(X > 2).

219) In a business venture a man can make a profit of Rs. 2,000 with a probability of 0.4 or have a loss of Rs. 1,000 with a probability of 0.6. What is his expected, variance and standard deviation of profit?

220) The number of miles an automobile tire lasts before it reaches a critical point in tread wear can be represented by a p.d.f.

$$f(x) = \begin{cases} \dfrac{1}{30}e^{-\frac{x}{30}}, & \text{for } x > 0 \\ 0, & \text{for } x \leq 0 \end{cases}$$

Find the expected number of miles (in thousands) a tire would last until it reaches the critical tread wear point.

221) A person tosses a coin and is to receive Rs. 4 for a head and is to pay Rs. 2 for a tail. Find the expectation and variance of his gains.

222) A fair die is thrown. Find out the expected value of its outcomes

223) Assuming one in 80 births is a case of twins, calculate the probability of 2 or more sets of twins on a day when 30 births occur.

224) Determine the binomial distribution for which the mean is 4 and variance 3. Also find P(X=15).

225) It is given that 5% of the electric bulbs manufactured by a company are defective. Using poisson distribution find the probability that a sample of 120 bulbs will contain no defective bulb.

226) A and B play a game in which their chance of winning are in the ratio 3 : 2 Find A's chance of winning atleast three games out of five games played.

227) If the chance of running a bus service according to schedule is 0.8, calculate the probability on a day schedule with 10 services :

(i) exactly one is late

(ii) atleast one is late

228) Suppose A and B are two equally strong table tennis players. Which of the following two events is more probable:

(a) A beats B exactly in 3 games out of 4 or

(b) A beats B exactly in 5 games out of 8 ?

229) A pair of dice is thrown 4 times. If getting a doublet is considered a success, find the probability of 2 successes.

230) Explain the procedures of testing of hypothesis

231) State any three merits of stratified random sampling.

232) A wholesaler in apples claims that only 4% of the apples supplied by him are defective. A random sample of 600 apples contained 36 defective apples. Calculate the standard error concerning of good apples.

233) A sample of 1000 students whose mean weight is 119 lbs(pounds) from a school in Tamil Nadu State was taken and their average weight was found to be 120 lbs with a standard deviation of 30 lbs. Calculate standard error of mean.

234) A sample of 100 items, draw from a universe with mean value 4 and S.D 3, has a mean value 63.5. Is the difference in the mean significant?

235) Calculate by a suitable method, the index number of price from the following data:

Commodity	2002		2012	
	Price	Quantity	Price	Quantity
A	10	20	16	10
B	12	34	18	42
C	15	30	20	26

236) From the following data, calculate the trend values using fourly moving averages.

Year	1990	1991	1992	199	1994	1995	1996	1997	1998
Sales	506	620	1036	673	588	696	1116	738	663

237) Compute the consumer price index for 2015 on the basis of 2014 from the following data.

Commodities	Quantities	Prices in 2015	Prices in 2016
A	6	5.75	6.00
B	6	5.00	8.00
C	1	6.00	9.00
D	6	8.00	10.00
E	4	2.00	1.50
F	1	20.00	15.00

238) The following data gives the readings for 8 samples of size 6 each in the production of a certain product. Find the control limits using mean chart.

Sample	1	2	3	4	5	6
Mean	300	342	351	319	326	333
Range	25	37	20	28	30	22

Given for n = 6, A_2 = 0.483,

239) State the different methods of measuring trend.

240) From the data given below calculate seasonal indices

Quarter	Year				
	1984	1985	1986	1987	1988
I	40	42	41	45	44
II	35	37	35	36	38
III	38	39	38	36	38
IV	40	39	40	41	42

241) Calculate the trend values by tour year moving average method

Year	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Production (in tonnes)	614	615	652	678	681	655	717	719	708	779	757

242) Construct the cost of living index for 2000 taking 1999 as the base year from the following data using Aggregate Expenditure method.

Commodity	Quantity (kg)	Price	
	2000	2000	2003
A	6	5.75	6
B	1	5	8
C	6	6	9
D	4	8	10
E	2	2	1.80
F	1	20	15

243) Consider the following pay-off matrix

Alternative	Pay – offs (Conditional events)			
	A_1	A_2	A_3	A_4
E_1	7	12	20	27
E_2	10	9	10	25
E_3	23	20	14	23
E_4	32	24	21	17

Using minmax principle, determine the best alternative.

244) Find an initial basic feasible solution of the following problem using north west corner rule.

	D_1	D_2	D_3	D_4	Supply
O_1	5	3	6	2	19
O_2	4	7	9	1	37
O_3	3	4	7	5	34
Demand	16	18	31	25	

245) Determine basic feasible solution to the following transportation problem using North west Corner rule.

		Sinks					Supply
		A	B	C	D	E	
Origins	P	2	11	10	3	7	4
	Q	1	4	7	2	1	8
	R	3	9	4	8	12	9
Demand		3	3	4	5	6	

246) A farmer wants to decide which of the three crops he should plant on his 100-acre farm. The profit from each is dependent on the rainfall during the growing season. The farmer has categorized the amount of rainfall as high medium and low. His estimated profit for each is shown in the table.

Rainfall	Estimated Conditional Profit(Rs.)		
	crop A	crop B	crop C
High	8000	3500	5000
Medium	4500	4500	5000
Low	2000	5000	4000

If the farmer wishes to plant only crop, decide which should be his best crop using

(i) Maximin

(ii) Minimax

247) Find the assignment of operation to appropriate job with lowest possible time to complete the jobs.

Job	Operator				
	1	2	3	4	5
J_1	5	6	8	6	4
J_2	4	8	7	7	5
J_3	7	7	4	5	4
J_4	6	5	6	7	5
J_5	4	7	8	6	8

248) Solve the following assignment problem. Cell values represent cost of assigning job A, B, C and D to the operators I, II, III and IV.

	Operators			
	I	II	III	IV
Job A	5	3	2	8
B	7	9	2	6
C	6	4	5	7
D	5	7	7	8

40 x 5 = 200

249) Show that the equations $2x + y + z = 5$, $x + y + z = 4$, $x - y + 2z = 1$ are consistent and hence solve them.

250) Show that the equations $x + y + z = 6$, $x + 2y + 3z = 14$, $x + 4y + 7z = 30$ are consistent and solve them.

251) Show that the equations are inconsistent $x - 4y + 7z = 14$, $3x + 8y - 2z = 13$, $7x - 8y + 26z = 5$

252) Find k, if the equations $x + y + z = 7$, $x + 2y + 3z = 18$, $y + kz = 6$ are inconsistent

253) Investigate for what values of 'a' and 'b' the following system of equations $x + y + z = 6$, $x + 2y + 3z = 10$, $x + 2y + az = b$ have
(i) no solution
(ii) a unique solution
(iii) an infinite number of solutions.

254) The total number of units produced (P) is a linear function of amount of over times in labour (in hours) (l), amount of additional machine time (m) and fixed finishing time (a)
i.e, $P = a + bl + cm$
From the data given below, find the values of constants a, b and c

Day	Production (in Units P)	Labour (in Hrs l)	Additional Machine Time (in Hrs m)
Monday	6,950	40	10
Tuesday	6,725	35	9
Wednesday	7,100	40	12

Estimate the production when overtime in labour is 50 hrs and additional machine time is 15 hrs.

255) 80% of students who do maths work during one study period, will do the maths work at the next study period. 30% of students who do english work during one study period, will do the english work at the next study period. Initially there were 60 students do maths work and 40 students do english work.
Calculate,

(i) The transition probability matrix

(ii) The number of students who do maths work, english work for the next subsequent 2 study periods.

256) A new transit system has just gone into operation in Chennai. Of those who use the transit system this year, 30% will switch over to using metro train next year and 70% will continue to use the transit system. Of those who use metro train this year, 70% will continue to use metro train next year and 30% will switch over to the transit system. Suppose the population of Chennai city remains constant and that 60% of the commuters use the transit system and 40% of the commuters use metro train this year.

(i) What percent of commuters will be using the transit system after one year?

(ii) What percent of commuters will be using the transit system in the long run?

257) Evaluate $\int \dfrac{3x+2}{(x-2)^2(x-3)} dx$

258) Evaluate $\int \dfrac{3x^2+6x+1}{(x+3)\left(x^2+1\right)} dx$

259) A random variable X has the following probability function

Values of X	0	1	2	3	4	5	6	7
p(x)	0	a	2a	2a	3a	a^2	$2a^2$	$7a^2$+a

(i) Find a, Evaluate

(ii) P(X < 3),

(iii) P(X > 2) and

(iv) P(2 < X $\leq$ 5).

260) A continuous random variable X has the following probability function

Value of X = x	0	1	2	3	4	5	6	7
P(x)	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2$+k

(i) Find k

(ii) Ealuate p(x< 6), p(x $\geq$ 6) and p(0)

(iii) If P(X $\leq$ x).$\dfrac{1}{2}$, then find the minimum value of x.

261) The distribution of a continuous random variable X in range (–3, 3) is given by p.d.f.

$$f(x) = \begin{cases} \frac{1}{16}(3+x)^2, & -3 \le x \le -1 \\ \\ \frac{1}{16}\left(6 - 2x^2\right), & -1 \le x \le 1 \\ \\ \frac{1}{16}(3-x)^2, & 1 \le x \le 3 \end{cases}$$

Verify that the area under the curve is unity.

262) Determine the mean and variance of a discrete random variable, given its distribution as follows.

X = x	1	2	3	4	5	6
$F_x(x)$	$\frac{1}{6}$	$\frac{2}{6}$	$\frac{3}{6}$	$\frac{4}{6}$	$\frac{5}{6}$	1

263) Under perfect competition for a commodity the demand and supply laws are $P_d = \frac{8}{x+1} - 2$ and $P_s = \frac{x-3}{2}$ respectively. Find the consumer's and producer's surplus.

264) The demand equation for a products is x = $\sqrt{100 - p}$ and the supply equation is x = $\frac{p}{2}$ -10. Determine the consumer's surplus and producer's surplus, under market equilibrium.

265) Find the consumer's surplus and producer's surplus for the demand function p_d = 25 − 3x and supply function p_s = 5 + 2x.

266) The demand equation for a product is p_d = 20 − 5x and the supply equation is p_s = 4x + 8. Determine the consumer's surplus and producer's surplus under market equilibrium.

267) If 5% of the items produced turn out to be defective, then find out the probability that out of 20 items selected at random there are
(i) exactly three defectives
(ii) atleast two defectives
(iii) exactly 4 defectives
(iv) find the mean and variance

268) In a particular university 40% of the students are having news paper reading habit. Nine university students are selected to find their views on reading habit. Find the probability that
(i) none of those selected have news paper reading habit

(ii) all those selected have news paper reading habit

(iii) atleast two third have news paper reading habit.

269) A manufacturer of metal pistons finds that on the average, 12% of his pistons are rejected because they are either oversize or undersize. What is the probability that a batch of 10 pistons will contain

(a) no more than 2 rejects?

(b) at least 2 rejects?

270) Evaluate $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{sinx}{sinx+cosx} \, dx$

271) Evaluate $\int_{2}^{5} \frac{\sqrt{x}}{\sqrt{x}+\sqrt{7-x}} \, dx$

272) Evaluate the following using properties of definite integrals:

$\int_{\frac{\pi}{6}}^{\frac{\pi}{2}} \frac{sin^7 x}{sin^7 x + cos^7 x} dx$

273) Evaluate the following integrals:

$\int_{0}^{3} \frac{x dx}{\sqrt{x+1}+\sqrt{5x+1}}$

274) Given below are the data relating to the sales of a product in a district. Fit a straight line trend by the method of least squares and tabulate the trend values.

Year	1995	1996	1997	1998	1999	2000	2001	2002
Sales	6.7	5.3	4.3	6.1	5.6	7.9	5.8	6.1

275) Calculate the seasonal index for the monthly sales of a product using the method of simple averages.

Months Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
2001	15	41	25	31	29	47	41	19	35	38	40	30
2002	20	21	27	19	17	25	29	31	35	39	30	44
2003	18	16	20	28	24	25	30	34	30	38	37	39

276) Calculate the seasonal index for the quarterly production of a product using the method of simple averages.

Year	I Quarter	II Quarter	III Quarter	IV Quarter
2005	255	351	425	400
2006	269	310	396	410
2007	291	332	358	395
2008	198	289	310	357
2009	200	290	331	359

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2010	250	300	350	400

277) the Laspeyre's, Paasche's and Fisher's price index number for the following data. Interpret on the data.

Commodities	Price		Quandity	
	2000	2010	2000	2010
Rice	38	35	6	7
Wheat	12	18	7	10
Rent	10	15	10	15
Fuel	25	30	12	16
Miscellaneous	30	33	8	10

278) Calculate Fisher's price index number and show that it satisfies both Time Reversal Test and Factor Reversal Test for data given below.

Commodities	Price		Quandity	
	2003	2009	2003	2009
Rice	10	13	4	6
Wheat	125	18	7	8
Rent	25	29	5	9
Fuel	11	14	8	10
Miscellaneous	14	17	6	7

279) Calculate the cost of living index number for the year 2015 with respect to base year 2010 of the following data.

Commodities	Number of Units (2010)	Price (2010)	Price (2015)
Rice	5	1500	1750
Sugar	3.5	1100	1200
Pulses	3	800	950
Cloth	2	1200	1550
Ghee	0.75	550	700
Rent	12	2500	3000
Fuel	8	750	600
Misc	10	3200	3500

280) Find the initial basic feasible solution for the following transportation problem by VAM

		Distribution Centers				Availability
		D_1	D_2	D_3	D_4	---
origin	S_1	11	13	17	14	250
	S_2	16	18	14	10	300
	S_3	21	24	13	10	400
Requirement		200	225	275	250	

281) Obtain an initial basic feasible solution to the following transportation problem using Vogel's approximation method.

Ware houses   Stores

	I	II	III	IV	Availability (a_i)
A	5	1	3	3	34
B	3	3	5	4	15
C	6	4	4	3	12
D	4	1	4	5	19
Requirement (b_j)	21	25	17	17	

282) Obtain an initial basic feasible solution to the following transportation problem by north west corner method.

	D	E	F	C	Available
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Required	200	225	275	250	

283) From the following table find the number of students who obtained marks less than 45.

Marks	30-40	40-50	50-60	60-70	70-80
No. of Students	31	42	51	35	31

284) The population of a certain town is as follows

Year : x	1941	1951	1961	1971	1981	1991
Population in lakhs:y	20	24	29	36	46	51

Using appropriate interpolation formula, estimate the population during the period 1946.

285)

Evaluate $\Delta\left[\dfrac{5x+12}{x^2+5x+6}\right]$ by taking '1' as the interval of differencing.

286) From the following table of half- yearly premium for policies maturing at different ages. Estimate the premium for policies maturing at the age of 63.

Age	45	50	55	60	65
Premium	114.84	96.16	83.32	74.48	68.48

287) Evaluate $\Delta\left[\dfrac{1}{(x+1)(x+2)}\right]$ by taking '1' as the interval of differencing

288) Find the missing entries from the following

x	0	1	2	3	4	5
y = f(x)	0	-	8	15	-	35

289) Solve the following system of equations by rank method

x + y + z = 9, 2x + 5y + 7z = 52, 2x − y − z = 0

290) Show that the equations 5x + 3y + 7z = 4, 3x + 26y + 2z = 9, 7x + 2y + 10z = 5 are consistent and solve them by rank method.

291) The price of three commodities X, Y and Z are x, y and z respectively Mr. Anand purchases 6 units of Z and sells 2 units of X and 3 units of Y. Mr. Amar purchases a unit of Y and sells 3 units of X and 2units of Z. Mr. Amit purchases a unit of X and sells 3 units of Y and a unit of Z. In the process they earn Rs. 5,000/-, Rs. 2,000/- and Rs. 5,500/- respectively. Find the prices per unit of three commodities by rank method.

292) Two types of soaps A and B are in the market. Their present market shares are 15% for A and 85% for B. Of those who bought A the previous year, 65% continue to buy it again while 35% switch over to B. Of those who bought B the previous year, 55% buy it again and 45% switch over to A. Find their market shares after one year and when is the equilibrium reached?

293) Two products A and B currently share the market with shares 50% and 50% each respectively. Each week some brand switching takes place. Of those who bought A the previous week, 60% buy it again whereas 40% switch over to B. Of those who bought B the previous week, 80% buy it again where as 20% switch over to A. Find their shares after one week and after two weeks. If the price war continues, when is the equilibrium reached?

294) An amount of Rs. 5,000/- is to be deposited in three different bonds bearing 6%, 7% and 8% per year respectively. Total annual income is Rs. 358/-. If the income from first two investments is Rs. 70/- more than the income from the third, then find the amount of investment in each bond by rank method.

295) Find k if the equations 2x + 3y − z = 5, 3x − y + 4z = 2, x + 7y − 6z = k are consistent.

296) Solve the equations x + 2y + z = 7, 2x − y + 2z = 4, x + y − 2z = −1 by using Cramer's rule

297) The price of 3 Business Mathematics books, 2 Accountancy books and one Commerce book is Rs. 840. The price of 2 Business Mathematics books, one Accountancy book and one Commerce book is Rs. 570. The price of one Business Mathematics book, one Accountancy book and 2 Commerce books is Rs. 630. Find the cost of each book by using Cramer's rule.

298) Solve the following equation by using Cramer's rule
$2x + y - z = 3$, $x + y + z = 1$, $x - 2y - 3z = 4$

299) Find x, y, z for the following system of equations.
$\frac{2}{x} + \frac{3}{y} + \frac{4}{z} = 14$, $\frac{3}{x} - \frac{2}{y} + \frac{1}{z} = 3$,
$\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 5$

300) Evaluate the following using properties of definite integrals:

$\int_0^1 log\left(\frac{1}{x} - 1\right)dx$

301)
Evaluate $\int \left[\frac{1}{\log x} - \frac{1}{(\log x)^2}\right]dx$

302) Evaluate the integral as the limit of a sum: $\int_0^1 x\,dx$

303) Integrate the following with respect to x.
$\frac{1}{x(x^2+1)}$

304) Integrate the following with respect to x.

$e^x\left[\frac{x-1}{(x+1)^3}\right]$

305) Evaluate the integral as the limit of a sum: $\int_1^2 x^2\,dx$

306) Evaluate the following integrals as the limit of the sum:
$\int_0^1 (x + 4)dx$

307) Integrate the following with respect to x.
$\frac{4x^2+2x+6}{(x+1)^2(x-3)}$

308) Integrate the following with respect to x.
$\frac{3x^2-2x+5}{(x-1)\left(x^2+5\right)}$

309) The marginal cost and marginal revenue with respect to commodity of a firm are given by C'(x) = 8 + 6x and R'(x)= 24. Find the total Profit given that the total cost at zero output is zero.

310) Sketch the graph $y = |x + 3|$ and evaluate $\int_{-6}^{0}|x + 3|$ dx.

311) Elasticity of a function $\frac{Ey}{Ex}$ is given by $\frac{Ey}{Ex} = \frac{-7x}{(1-2x)(2+3x)}$. Find the function when x = 2, y = $\frac{3}{8}$

312) The elasticity of demand with respect to price p for a commodity is $\eta_d = \frac{p+2p^2}{100-p-p^2}$.. Find demand function where price is Rs. 5 and the demand is 70.

313) The marginal cost of production of a firm is given by C'(x) = 5 + 0.13x, the marginal revenue is given by R'(x) = 18 and the fixed cost is Rs. 120. Find the profit function.

314) The demand and supply function of a commodity are p_d = 18− 2x − x^2 and p_s = 2x − 3 . Find the consumer's surplus and producer's surplus at equilibrium price.

315) A firm has the marginal revenue function given by MR = $\frac{a}{(x+b)^2}$ - c where x is the output and a, b, c are constants. Show that the demand function is given by $x = \frac{a}{b(p+c)} - b$.

316) The marginal cost C'(x) and marginal revenue R'(x) are given by C'(x) = 50 + $\frac{x}{50}$ and R'(x) = 60. The fixed cost is Rs. 200. Determine the maximum profit

317) The demand and supply function under price competition are p_d = 16 - x^2 and P_s = 2x^2 +4. Find the consumer's surplus and producer's surplus at the market equilibrium price.

318) Solve: (3D^2 + D - 14)y = 4 - 13$e^{\frac{-7}{3}x}$

319) Suppose that the quantity demanded $Q_d = 29 - 2p - 5\frac{dp}{dt} + \frac{d^2p}{dt^2}$ and quantity supplied Q_s = 5 + 4p where p is the price. Find the equilibrium price for market clearance.

320) Suppose that $Q_d = 30 - 5P + 2\frac{dp}{dt} + \frac{d^2P}{dt^2}$ and Q_s = 6 + 3P. Find the equilibrium price for market clearance.

321) Solve (D^2-3D+2)y = e^{4x} given y = 0 when x = 0 and x = 1.

322) Solve $x^2 y dx - (x^3 + y^3) dy = 0$

323) The slope of the tangent to a curve at any point (x, y) on it is given by $(y^3 - 2yx^2)dx + (2xy^2 - x^3)dy = 0$ and the curve passes through (1, 2). Find the equation of the curve.

324) Solve $\frac{dy}{dx} - 3y \cot x = \sin 2x$ given that y = 2 when x = $\frac{\pi}{2}$

325) Find the differential equation of the family of straight lines y = mx + c when
   (i) m is the arbitrary constant
   (ii) c is the arbitrary constant
   (iii) m and c both are arbitrary constants.

326) Solve the following differential equations $(D^2 + D - 6)y = e^{3x} + e^{-3x}$

327) Suppose that the quantity demanded Q_4 = 13 - 6P + $2\frac{dp}{dt}$ + $\frac{d^2 p}{dt^2}$ and quantity supplied Q_s = $- 3 + 2p$, where p is the price. Find the equilibrium price for market clearance.

328) Solve: $(D^2 - 2D + 1)y = e^{2x} + e^x$

329) Estimate the production for 1964 and 1966 from the following data

Year	1961	1962	1963	1964	1965	1966	1967
Production	200	220	260	-	350	-	430

330) In an examination the number of candidates who secured marks between certain interval were as follows

Marks	0-19	20-39	40-59	60-79	80-99
No.of.candidates	41	62	65	50	17

Estimate the number of candidates whose marks are lessthan 70.

331) Using Lagrange's interpolation formula find a polynomial which passes through the points (0, −12), (1, 0), (3, 6) and (4,12).

332) Using Lagrange's formula find the value of y when x = 42 from the following table

x	40	50	60	70
y	31	73	124	159

333) The probability density function of a random variable X is $f(x) = ke^{-|x|}$, -∞ Find the value of k and also find mean and variance for the random variable.

334) A continuous random variable X has p.d.f
   $f(x) = 5x^4$, $0 \le x \le 1$
   Find a_1 and a_2 such that

i) $P[X \leq a_1] = P[X > a_1]$

ii) $P[X > a_2] = 0.05$

335) If 18% of the bolts produced by a machine are defective, determine the probability that out of the 4 bolts chosen at random

(i) exactly one will be defective

(ii) none will be defective

(iii) atmost 2 will be defective

336) Out of 750 families with 4 children each, how many families would be expected to have

(i) atleast one boy

(ii) atmost 2 girls

(iii) and children of both sexes? Assume equal probabilities for boys and girls.

337) Forty percent of business travellers carry a laptop. In a sample of 15 business travelers,

(i) what is the probability that 3 will have a laptop?

(ii) what is the probability that 12 of the travelers will not have a laptop?

(iii) what is the probability that atleast three of the travelers have a laptop?

338) The distribution of the number of road accidents per day in a city is poisson with mean 4. Find the number of days out of 100 days when there will be

(i) no accident

(ii) atleast 2 accidents and

(iii) at most 3 accidents.

339) In a distribution 30% of the items are under 50 and 10% are over 86. Find the mean and standard deviation of the distribution.

340) X is normally distributed with mean 12 and sd 4. Find $P(X \leq 20)$ and $P(0 \leq X \leq 12)$

341) X is a normally normally distributed variable with mean $\mu = 30$ and standard deviation $\sigma = 4$. Find

(a) $P(x < 40)$

(b) $P(x > 21)$

(c) $P(30 < x < 35)$

342) If the probability that an individual suffers a bad reaction from injection of a given serum is 0.001, determines the probability that out of 2,000 individuals

(a) exactly 3, and

(b) more than 2 individuals will suffer a bad reaction.

343) In a sample of 1000 candidates mean of certain test is 45 and standard deviation 15. Assuming the normality of the distribution, find the following
(i) How many candidates score between 40 and 60?
(ii) How many candidates score above 507
(iii) How many candidates score below 30?

344) 20% of the bolts produced in a factory are found to be defective. Find the probability that in a sample of 10 bolts chosen at random exactly 2 will be defective using
(i) Binomial distribution
(ii) Poisson distribution (e^{-2} = 0.1353)

345) A sample of 100 students are drawn from a school. The mean weight and variance of the sample are 67.45 kg and 9 kg. respectively. Find
(a) 95% and
(b) 99% confidence intervals for estimating the mean weight of the students.

346) An auto company decided to introduce a new six cylinder car whose mean petrol consumption is claimed to be lower than that of the existing auto engine. It was found that the mean petrol consumption for the 50 cars was 10 km per litre with a standard deviation of 3.5 km per litre. Test at 5% level of significance, whether the claim of the new car petrol consumption is 9.5 km per litre on the average is acceptable.

347) A manufacturer of ball pens claims that a certain pen he manufactures has a mean writing life of 400 pages with a standard deviation of 20 pages. A purchasing agent selects a sample of 100 pens and puts them for test. The mean writing life for the sample was 390 pages. Should the purchasing agent reject the manufactures claim at 1% level?

348) (i) A sample of 900 members has a mean 3.4 cm and SD 2.61 cm. Is the sample taken from a large population with mean 3.25 cm. and SD 2.62 cm? (95% confidence limit)
(ii) If the population is normal and its mean is unknown, find the 95% and 98% confidence limits of true mean.

349) The wages of the factory workers are assumed to be normally distributed with mean and variance 25. A random sample of 50 workers gives the total wages equal to Rs. 2,550. Test the hypothesis μ = 52, against the alternative hypothesis μ = 49 at 1% level of significance.

350) Calculate the seasonal indices from the following data using the average from the following data using the average method:

	I Quarter	II Quarter	III Quarter	IV Quarter

2008	72	68	62	76
2009	78	74	78	72
2010	74	70	72	76
2011	76	74	74	72
2012	72	72	76	68

351) Compute

(i) Laspeyre's

(ii) Paasche's

(iii) Fisher's Index numbers for the 2010 from the following data.

Commodity	Price		Quantity	
	2000	2010	2000	2010
A	12	14	18	16
B	15	16	20	15
C	14	15	24	20
D	12	12	29	23

352) Ten samples each of size five are drawn at regular intervals from a

manufacturing process. The sample means ($\overline{X}$) and their ranges (R) are given below:

Sample number	1	2	3	4	5	6	7	8	9	10
$\overline{X}$	49	45	48	53	39	47	46	39	51	45
R	7	5	7	9	5	8	8	6	7	6

Calculate the control limits in respect of $\overline{X}$ chart. (Given A_2 = 0.58, D_3 = and D_4 = 2.115) Comment on the state of control.

353)   Construc $\overline{X}$ and R charts for the following data:

Sample Number	Observations		
1	32	36	42
2	28	32	40
3	39	52	28
4	50	42	31
5	42	45	34
6	50	29	21
7	44	52	35
8	22	35	44

(Given for n = 3, A_2 = 0.58, D_3 = 0 and D_4 = 2.115)

354) The annual production of a commodity is given as follows :

Year	Production (in tones)
1995	155
1996	162
1997	171
1998	182
1999	158
2000	180
2001	178

Fit a straight line trend by the method of least squares.

355) Solve the following assignment problem. Cell values represent cost of assigning job A, B, C and D to the machines I, II, III and IV.

machines

jobs	I	II	III	IV
A	10	12	19	11
B	5	10	7	8
C	12	14	13	11
D	8	15	11	9

356) Consider the problem of assigning five jobs to five persons. The assignment costs are given as follows. Determine the optimum assignment schedule.

job

Person	1	2	3	4	5
A	8	4	2	6	1
B	0	9	5	5	4
C	3	8	9	2	6
D	4	3	1	0	3
E	9	5	8	9	5

357) Find the optimal solution for the assignment problem with the following cost matrix.

Area

Salesman	1	2	3	4
P	11	17	8	16
Q	9	7	12	6
R	13	16	15	12
S	14	10	12	11

358) Assign four trucks 1, 2, 3 and 4 to vacant spaces A, B, C, D, E and F so that distance travelled is minimized. The matrix below shows the distance.

	1	2	3	4
A	4	7	3	7
B	8	2	5	5
C	4	9	6	9
D	7	5	4	8
E	6	3	5	4
F	6	8	7	3

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