RAVI MATHS TUITION CENTER, NEAR VILLIVAKKAM RLY STATION, CH- 82.
Whatsapp - 8056206308

REDUCED PORTION - Applications of Matrices and Determinants

12th Standard

Business Maths

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52 x 1 = 52

1) If A=(1 2 3), then the rank of AA^T is
(a) 0 (b) 2 (c) 3 (d) 1

2) The rank of m×n matrix whose elements are unity is
(a) 0 (b) 1 (c) m (d) n

3) if $T=\begin{matrix} A \\ B \end{matrix}\begin{pmatrix} \overset{A}{0.4} & \overset{B}{0.6} \\ 0.2 & 0.8 \end{pmatrix}$ is a transition probability matrix, then at equilibrium A is equal to
(a) $\frac{1}{4}$ (b) $\frac{1}{5}$ (c) $\frac{1}{6}$ (d) $\frac{1}{8}$

4) If A= $\begin{pmatrix} 2 & 0 \\ 0 & 8 \end{pmatrix}$,then $\rho(A)$ is
(a) 0 (b) 1 (c) 2 (d) n

5) The rank of the matrix $\begin{pmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 4 & 9 \end{pmatrix}$ is
(a) 0 (b) 1 (c) 2 (d) 3

6) The rank of the unit matrix of order n is
(a) n −1 (b) n (c) n +1 (d) n^2

7) If $\rho(A)$ =r then which of the following is correct?
(a) all the minors of order r which does not vanish
(b) A has at least one minor of order r which does not vanish
(c) A has at least one (r+1) order minor which vanishes
(d) all (r+1) and higher order minors should not vanish

8) If A = $\begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}$ then the rank of AA^T is
(a) 0 (b) 1 (c) 2 (d) 3

9) If the rank of the matrix $\begin{pmatrix} \lambda & -1 & 0 \\ 0 & \lambda & -1 \\ -1 & 0 & \lambda \end{pmatrix}$ is 2. Then λ is
(a) 1 (b) 2 (c) 3 (d) only real number

10) The rank of the diagonal matrix $\begin{pmatrix} 1 & & & & & \\ & 2 & & & & \\ & & -3 & & & \\ & & & 0 & & \\ & & & & 0 & \\ & & & & & 0 \end{pmatrix}$
(a) 0 (b) 2 (c) 3 (d) 5

11) If $T = \begin{matrix} A \\ B \end{matrix}\begin{pmatrix} 0.7 & 0.3 \\ 0.6 & x \end{pmatrix}$ is a transition probability matrix, then the value of x is
(a) 0.2 (b) 0.3 (c) 0.4 (d) 0.7

12) Which of the following is not an elementary transformation?
(a) $R_i \leftrightarrow R_j$ (b) $R_i \to 2R_i + 2C_j$ (c) $R_i \to 2R_i - 4R_i$ (d) $C_i \to C_i + 5C_j$

13) if $\rho(A) = \rho(A, B)$ then the system is
(a) Consistent and has infinitely many solutions (b) Consistent and has a unique solution (c) Consistent (d) inconsistent

14) If $\rho(A) = \rho(A, B)$ then the system is

(a) Consistent and has infinitely many solutions (b) Consistent and has a unique solution (c) consistent (d) inconsistent

15) If $\rho(A) \neq \rho(A,B)$, then the system is

(a) Consistent and has infinitely many solutions (b) Consistent and has a unique solution (c) inconsistent (d) consistent

16) In a transition probability matrix, all the entries are greater than or equal to

(a) 2 (b) 1 (c) 0 (d) 3

17) If the number of variables in a non-homogeneous system AX = B is *n*, then the system possesses a unique solution only when

(a) $\rho(A) = \rho(A,B) > n$ (b) $\rho(A) = \rho(A,B) = n$ (c) $\rho(A) = \rho(A,B) < n$ (d) none of these

18) The system of equations 4x+6y=5, 6x+9y=7 has

(a) a unique solution (b) no solution (c) infinitely many solutions (d) none of these

19) For the system of equations x+2y+3z=1, 2x + y + 3z = 2, 5x+5y+9z =4

(a) there is only one solution (b) there exists infinitely many solutions (c) there is no solution (d) None of these

20) If $|A| \neq 0,$ then A is

(a) non-singular matrix (b) singular matrix (c) zero matrix (d) none of these

21) The system of linear equations x + y + z = 2, 2x + y − z = 3, 3x + 2y + k = 4 has unique solution, if k is not equal to

(a) 4 (b) 0 (c) -4 (d) 1

22) $|A_{n\times n}|$ =3 $|adjA|$ =243 then the value n is

(a) 4 (b) 5 (c) 6 (d) 7

23) Rank of a null matrix is

(a) 0 (b) -1 (c) ∞ (d) 1

24) For what value of k, the matrix $A = \begin{pmatrix} 2 & k \\ 3 & 5 \end{pmatrix}$ has no inverse?

(a) $\frac{3}{10}$ (b) $\frac{10}{3}$ (c) 3 (d) 10

25) The rank of an n x n matrix each of whose elements is 2 is

(a) 1 (b) 2 (c) n (d) n^2

26) The value of $\begin{vmatrix} 5^2 & 5^3 & 5^4 \\ 5^3 & 5^4 & 5^5 \\ 5^4 & 5^5 & 5^6 \end{vmatrix}$

(a) 5^2 (b) 0 (c) 5^{13} (d) 5^9

27) If $\begin{vmatrix} 2x & 5 \\ 8 & x \end{vmatrix} = \begin{vmatrix} 6 & -2 \\ 7 & 3 \end{vmatrix}$ then x =

(a) 3 (b) ± 3 (c) ± 6 (d) 6

28) If A is a singular matrix, then Adj A is.

(a) non-singular (b) singular (c) symmetric (d) not defined

29) If A, B are two n x n non-singular matrices, then

(a) AB is non-singular (b) AB is singular (c) $(AB)^{-1} = A^{-1} B^{-1}$ (d) $(AB)^{-1}$ does not exit

30) The rank of the matrix $\begin{pmatrix} 2 & -4 \\ -1 & 2 \end{pmatrix}$ is

(a) 1 (b) 2 (c) 0 (d) 8

31) The rank of the matrix $\begin{pmatrix} 7 & -1 \\ 2 & 1 \end{pmatrix}$ is

(a) 9 (b) 2 (c) 1 (d) 5

32) Which of the following is not elementary transformation?

(a) $R_i \leftrightarrow R_j$ (b) $R_i \rightarrow 2R_i + R_j$ (c) $C_i \rightarrow C_j + C_i$ (d) $R_i \rightarrow R_i + C_i$

33) Equivalent matrices are obtained by

(a) Taking Inverses (b) Taking transposes (c) Taking adjoints (d) Taking finite number of elementary transformation

34) In echelon form, which of the following is incorrect?

(a) Every row of A (b) The first (c) The number of zeros (d) 2 rows can

which has all its entries O occurs below every rdw which had a non - zero entry.	non -zero entry in each non-zero row is 1	beiore the first nonzero element in a row is less than the number of such zeros in the nert row.	have the same number of zeros before the first non-zero entry

35) If $\Delta \neq 0$ then the system is

(a) consistent and has unique solution (b) consistent and has infinitely many solution (c) inconsistent (d) either consistent or inconsistent

36) $\text{The rank of the matrix } \begin{pmatrix} 1 & -1 & 2 \\ 2 & -2 & 4 \\ 4 & -4 & 8 \end{pmatrix} \text{ is}$

(a) 1 (b) 2 (c) 3 (d) 4

37) The rank of the diagonal matrix $\begin{pmatrix} -1 & & & & \\ & 2 & & & \\ & & 0 & & \\ & & & -4 & \\ & & & & 0 \end{pmatrix}$ is

(a) 0 (b) 2 (c) 3 (d) 5

38) If A = (2 01) then rank of AA^T is

(a) 1 (b) 2 (c) 3 (d) 0

39) If A is a square matrix of order or then |adj A | is

(a) $|A|^2$ (b) $|A|^n$ (c) $|A|^{n-1}$ (d) |A|

40) $\text{If } ae^x + be^y = c, pe^x + qe^y = d \text{ and } \Delta_1 = \begin{vmatrix} a & b \\ p & q \end{vmatrix}, \Delta_2 = \begin{vmatrix} c & b \\ d & q \end{vmatrix}, \Delta_3 = \begin{vmatrix} a & c \\ p & d \end{vmatrix} \text{ then the value of } (x, y) \text{is}$

(a) $\left(\frac{\Delta_2}{\Delta_1}, \frac{\Delta_3}{\Delta_1}\right)$ (b) $\left(\log \frac{\Delta_2}{\Delta_1}, \log \frac{\Delta_3}{\Delta_1}\right)$ (c) $\left(\log \frac{\Delta_1}{\Delta_3}, \log \frac{\Delta_1}{\Delta_2}\right)$ (d) $\left(\log \frac{\Delta_1}{\Delta_2}, \log \frac{\Delta_1}{\Delta_3}\right)$

41) If the equation $-2x + y + z = l, x - 2y + z = m, x + y - 2z = n$ such that l + m + n = 0, then the system has

(a) non - zero unique solution (b) Trivial solutions (c) Infinitely many solutions (d) No solution

42) If A is a square matrix of order 3, then |Adj A| =

(a) $|A|^2$ (b) |A| (c) $|A|^3$ (d) $|A|^4$

43) If |A| = 0, then |adj A| =

(a) 0 (b) 1 (c) -1 (d) ± 1

44) The rank of n x n matrix each of whose element is 1 is

(a) 1 (b) 2 (c) n (d) n^2

45) The rank of n x n matrix each of whose element is 2 is

(a) 1 (b) 2 (c) n (d) n^2

46) The rank of a non-singular matrix of order n x n is

(a) n (b) n^2 (c) 0 (d) 1

47) If $\mathbf{T} = A \begin{pmatrix} 0.7 & 0.3 \\ x & 0.8 \end{pmatrix}$ is transition probability matrix then x =

(a) 0.3 (b) 0.2 (c) 0.4 (d) 0.7

48) Choose the correct statement

(a) The rank of a zero matrix is taken to be 1 (b) For zero matrix, the least value of the rank is1 (c) Rank of a non-singular matrtx of order n x n is n (d) $\rho(A) \neq \rho\left(A^T\right)$

49) If A is a matrix of order m x n then $\rho(A) \leq$

(a) m (b) n (c) min {m, n} (d) max {m, n}

50) Choose the odd one out: If |A | = 0, then system of equation has

(a) Unique solution (b) No solution (c) Infinitely many solutions (d) Either no solution or infinitely many solutions

51) If O (A) = 3 x 3 and p(A) 2 then, p(adjA) is

(a) 1 (b) 2 (c) 3 (d) 0

52) If a matrix is self inverse then which of the following is incorrect?

(a) (b) (c) (d)

$\text{adj}(A) = |A|A$ $A^2 = I$ $A\,\text{adj}(A) = I$ $A^3 = A^{-1}$

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53) If $A = \begin{bmatrix} a & 0 & 0 \\ 0 & a & 0 \\ 0 & 0 & a \end{bmatrix}$ then the value of |adj A| is

54) For any 2 x 2 matrix, if A (adj A = $\begin{vmatrix} 10 & 0 \\ 0 & 10 \end{vmatrix}$ then IAI is _____

55) If A is a square matrix of order n, then |Adj A|=_____

56) If A is a matrix of order 3 and IAI = 8 then |adj AI|=_____

57) If A is a square matrix such that A2 = I, then A^{-1}=_____

58) The system of equation x + y + z = 2,3x-y+2z= 6 and 3x+y-z=-18 has_____solution

59) The number of solutions of the system of equations 2x + Y - z = 7, x - 3y + 2z = 1,x + 4y - 3z = 5 is_____

60) The system of linear equations x + y + Z = 2, 2x + Y - z = 3, 3x + 2y + kz = 4 has a unique solution if k is_____

61) The value on for which the system of equations x + y + z = 5, x + 2y + 3z = 9, $x + 3y + \lambda z = \mu$ is

62) A set of values of the variable $x_1, x_2, \ldots x_n$ satisfying all the equations simultaneously is called_____ of the system

10 x 1 = 10

63) Rank of a matrix	(1) ≥ 0
64) If A is a matrix of order m x n, then	(2) infinitely many solutions
65) Rank of a zero matrix is	(3) 1
66) Rank of a non-singular matrix of order n x n is	(4) unique solution
67) If A is of rank 2, then adj A is of rank	(5) inconsistent
68) A row having at least one non-zero element is	(6) ρ(A) ≤
69) For the system of equations AX = B, the solution is X = A^{-1} B provided	(7) |A| ≠ 0
70) If $\rho(A, B) = \rho(A) < n$ then the system has	(8) non-zero row
71) If $\rho(A, B) = \rho(A) = n$ then the system has	(9) n
72) If $\rho(A, B) \neq \rho(A)$ then the system is	(10) 0

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73) The system of non-homogeneous equations will have.
   (a) unique solution
   (b) Infinitely many solutions
   (c) No solution
   (d) Trivial solution

74) Rank of a 2 x 2 matrix may be
   (a) 0
   (b)1
   (c) 2
   (d)3

75) The transition probabilities P_{jk} satisfy
   (a) $P_\mu > 0$
   (b) $\sum_k^1 P_{jk} = 1$

(c) $P_{jk} \leq 0$
(d) $P_{jk} > 1$

76) Which is one correct?
(a) $R_1 \rightarrow R_1 + R_2$
(b) $C_1 \rightarrow C_1 - 2C_2$
(c) $R_3 \leftrightarrow R_1$
(d) $R_1 \leftrightarrow C_1$

77) If IAI = 0, then
(a) A is a singular matrix
(b) System has either no solution or infinitely many solutions
(c) No solution
(d) non-singular matrix

16 x 2 = 32

78) Find the rank of the matrix $\begin{pmatrix} 1 & 5 \\ 3 & 9 \end{pmatrix}$

79) Find the rank of the matrix $\begin{pmatrix} -5 & -7 \\ 5 & 7 \end{pmatrix}$

80) Find the rank of the matrix $\begin{pmatrix} 5 & 3 & 0 \\ 1 & 2 & -4 \\ -2 & -4 & 8 \end{pmatrix}$

81) Find the rank of the matrix A = $\begin{pmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 5 & 7 \end{pmatrix}$

82) Find the rank of the following matrices.
$\begin{pmatrix} 5 & 6 \\ 7 & 8 \end{pmatrix}$

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

84) Find the rank of the following matrices
$\begin{pmatrix} 1 & -1 \\ 3 & -6 \end{pmatrix}$

85) Find the rank of the following matrices
$\begin{pmatrix} 1 & 4 \\ 2 & 8 \end{pmatrix}$

86) Find the rank of the matrix $\begin{bmatrix} 7 & -1 \\ 2 & 1 \end{bmatrix}$

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

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

89) Show that the equations x +y + Z = 6, x.+ 2y + 3z = 14 and x + 4y + 7z = 30 are consistent

90) If A and B are non-singular matrices, prove that AB is non-singular.

91) For what value of x, the matrix

$A = \begin{vmatrix} 1 & -2 & 3 \\ 1 & 2 & 1 \\ x & 2 & -3 \end{vmatrix}$ is singular?

92) If $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 1 \\ -1 \\ 0 \end{pmatrix}$ find x.y- and z

93) Two newspapers A and B are published in a city . Their 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

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94) Find the rank of the matrix $\begin{pmatrix} 0 & -1 & 5 \\ 2 & 4 & -6 \\ 1 & 1 & 5 \end{pmatrix}$

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

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

97) Find the rank of the matrix A = $\begin{pmatrix} 1 & 1 & 1 & 1 \\ 3 & 4 & 5 & 2 \\ 2 & 3 & 4 & 0 \end{pmatrix}$

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

99) Show that the equations 2x+y=5,4x+2y=10 are consistent and solve them.

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

101) 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.

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

$$\begin{matrix} \\ A \\ B \end{matrix} \begin{pmatrix} \overset{A}{0.9} & \overset{B}{0.1} \\ 0.3 & 0.7 \end{pmatrix}$$

Determine the market share of each brand in equilibrium position.

103) 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?

104) Akash bats according to the following traits. If he makes a hit (S), there is a 25% chance that he will make a hit his next time at bat. If he fails to hit (F), there is a 35% chance that he will make a hit his next time at bat. Find the transition probability matrix for the data and determine Akash's long- range batting average.

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

106) Find the rank of the matrix A = $\begin{pmatrix} 4 & 5 & 2 & 2 \\ 3 & 2 & 1 & 6 \\ 4 & 4 & 8 & 0 \end{pmatrix}$

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

108) Find the rank of the following matrices

$\begin{pmatrix} 2 & -1 & 1 \\ 3 & 1 & -5 \\ 1 & 1 & 1 \end{pmatrix}$

109) Find the rank of the following matrices

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

110) Find the rank of the following matrices

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

111) Find the rank of the following matrices

$$\begin{pmatrix} 3 & 1 & -5 & -1 \\ 1 & -2 & 1 & -5 \\ 1 & 5 & -7 & 2 \end{pmatrix}$$

112) Find the rank of the following matrices

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

113) Find the rank of the matrix

$$A = \begin{pmatrix} 2 & 4 & 5 \\ 4 & 8 & 10 \\ -6 & -12 & -15 \end{pmatrix}$$

114) Findtherankofthematrix $A = \begin{pmatrix} 1 & 2 & -4 & 5 \\ 2 & -1 & 3 & 6 \\ 8 & 1 & 9 & 7 \end{pmatrix}$

115) Show that the equations 2x - Y + z = 7, 3x +y- 5z = 13, x +y + z = 5 are consistent and have a unique solution.

116) Show that the equations x + 2y = 3, Y - z = 2, x +y + z = 1 are consistent and have infinite sets of solution.

117) Show that the equations x- 3y + 4z = 3, 2x - 5y + 7z = 6, 3x - 8y + 11z = 1 are inconsistent

118) If $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 2 \\ -1 \\ 3 \end{bmatrix}$ find x,y and z

119) If $A = \begin{pmatrix} 2 & 4 \\ 4 & 3 \end{pmatrix}, X = \begin{pmatrix} n \\ 1 \end{pmatrix} B = \begin{pmatrix} 8 \\ 11 \end{pmatrix}$ and AX = B then find n.

120) Solve: 2x + 3y = 5, 6x + 5y= 11

121) Two products A and B currently share the market with shares 60% and 40% each respectively. Each week some brand switching latees place. Of those who bought A the previous week 70% buy it again whereas 30% switch over to B. Of those who bought B the previous week, 80% buy it again whereas 20% switch over to A. Find their shares after one week and after two weeks.

25 x 5 = 125

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

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

124) Show that the equations x−4y+7z=14,3x+8y−2z=13,7x−8y+26z =5 are inconsistent.

125) Find k, if the equations x+2y−3z= −2,3x−y−2z=1,2x+3y−5z=k are consistent.

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

127) 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.

128) 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.

129) Solve the following system of equations by rank method
x+y+z=9,2x+5y+7z=52,2x−y−z =0

130) Show that the equations5x+3y+7z=4,3x+26y+2z=9,7x+2y+10z =5 are consistent and solve them by rank method.

131) Show that the following system of equations have unique solution:
x+y+z=3,x+2y+3z=4,x+4y+9z = 6 by rank method.

132) For what values of the parameter λ , will the following equations fail to have unique solution: 3x−y+λz=1,2x+y+z=2,x+2y−λz = −1 by rank method.

133) 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`5,500/- respectively Find the prices per unit of three commodities by rank method.

134) 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 `70/- more than the income from the third, then find the amount of investment in each bond by rank method.

135) 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.

136) 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?

137) 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?

138) 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?

139) 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?

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

141) Find k if the equations $x+y+z=1, 3x-y-z=4, x+5y+5z=k$ are inconsistent.

142) 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?

143) The sum of three numbers is 6. If we multiplythe third number by 2 and add the first number to the result we get 7. By adding second and third numbers to three times the first number we get 12. Find the numbers using rank method

144) For what values of k, the system of equations $kx+ y+z = 1, x+ ky+z= 1, x+ y+kz= 1$ have
(I) Unique solution
(ii) More than one solution
(iii) no solution

145) Using determinants, find the quadratic defined by $f(x) = ax^2 + bx + c$ if $f(1) = 0, f(2) = -2$ and $f(3) = -6$.

146) A new transit system has just gone into operation in a city. Of those who use the transit system this year, 10% will switch over to using their own car next year and 90% will continue to use the transit system. Of those who use their cars this year, 80% will continue to use their cars next year and 20% will switch over to the transit system. Suppose the population of the city remains constant and that 50% of the commuters use the transit system and 50% of the commuters use their own car 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?

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