SHRI RAM COLLEGE, MUZAFFARNAGAR
DEPARTMENT OF BUSINESS ADMINISTRATION

NOTICE

DATE: 07-09-2015

"REMEDIAL CLASSES"

All the students of BBA 1st year are hereby informed that remedial classes in business mathematics is being organised by Dr. Pankaj Kaushik. The classes will be held in department itself after the lecture hours from 12th September, 2015 till 19th September,2015 from 2:30 pm to 4:30 pm. The interested students who wants to attend the classes may submit their names to the concerned teacher.

For further query consult the undersigned.

Dr. Saurabh Mittal
Head, Department of Business Administration,
Shri Ram College,Muzaffarnagar

Co-ordinator
IQAC, Shri Ram College,
Muzaffarnagar

Principal
Shri Ram College
Muzaffarnagar

SHRI RAM COLLEGE, MUZAFFARNAGAR
DEPARTMENT OF BUSINESS ADMINISTRATION

DATE: 22-09-2015

"Remedial Classes"

REPORT

Objective:

1. To give additional help to students who, for one reason or another, have fallen behind the rest of the class in the subject of Business Mathematics.
2. To help students in organising their preparations or to abstract ideas and concepts.

The Idea:
Problem solving on Matrixes

Pedagogy:
Power Point Presentation (Self Prepared)

Other Important Information:

Date of the Classes	: 12th September, 2015 till 19th September,2015
Time of the Classes	: 2:30 pm to 4:30 pm
Total Participants	: 52
Event Coordinator	: Dr. Pankaj Kaushik

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SHRI RAM COLLEGE, MUZAFFARNAGAR

DEPARTMENT OF BUSINESS ADMINISTATION (2015-16)

ATTENDENCE LIST OF REMEDIAL CLASSES

S.No.	Roll No.	Name of Student	DATE						
			12-9-15	14-9-15	15-9-15	16-9-15	17-9-15	18-9-15	19-9-15
1	1585509501	AAMIR	P	P	P	A	P	P	A
2	1585509502	ABHASH LAHORAY	P	P	P	P	P	P	P
3	1585509503	ABHAY KUMAR	P	P	P	P	P	P	P
4	1585509504	ABHISHEK SHARMA	A	P	P	P	P	P	P
5	1585509505	ABHISHEK TOMAR	P	P	P	P	A	P	P
6	1585509506	ADEEBA SHAHAR	P	P	P	P	P	P	P
7	1585509507	AJAY KUMAR	P	P	P	P	P	P	P
8	1585509508	AJAY KUMAR	A	P	P	P	P	P	P
9	1585509509	AJAY KUMAR KUSHWAHA	P	P	P	P	P	P	A
10	1585509521	ANTRIKSH GUPTA	P	P	P	A	P	P	P
11	1585509522	ANUJ KUMAR	P	P	P	P	P	P	P
12	1585509523	ANUJ KUMAR	P	P	A	P	P	P	P
13	1585509524	ANUJ KUMAR	A	P	P	P	P	P	P
14	1585509525	ARIF	P	P	P	P	P	P	P
15	1585509526	ARJUN SINGH	P	P	P	P	P	P	P
16	1585509527	ARPIT KUMAR	P	P	P	A	P	P	P
17	1585509533	BIKASH KUMAR SHARAF	P	P	P	P	P	P	P
18	1585509534	KM BUSHARA	P	P	P	P	P	P	P
19	1585509535	CHAUDHARY MAYANK KUMAR	P	A	P	P	P	P	A
20	1585509536	CHHAVI CHAUDHARY	P	P	A	P	P	P	P
21	1585509537	DEEPAK SINGH	A	P	P	P	P	P	P
22	1585509538	KM DEEPALI RANI	P	P	P	P	P	P	P
23	1585509539	FARHAN KHAN	P	P	P	P	P	P	P
24	1585509540	GOURAV KUMAR	P	P	P	P	P	P	P
25	1585509541	GULNAVAJ AHAMAD	P	P	P	P	P	P	P
26	1585509542	GUNEET	P	P	P	P	P	P	A
27	1585509543	HARSHIT	P	P	P	P	P	P	P
28	1585509544	HUNNY TYAGI	P	P	P	P	P	P	P
29	1585509545	JAI SURYA	P	P	P	A	P	P	P
30	1585509546	KM KAJAL	P	P	P	P	P	P	P
31	1585509551	KULDEEP KUMAR	A	P	P	P	P	P	P
32	1585509552	KUMAIL ABBAS	P	P	P	P	P	P	P
33	1585509553	LAVISH RATHI	P	P	P	P	A	P	P
34	1585509554	MANISH KUMAR	P	P	P	P	P	P	P
35	1585509555	KM MANJU DEVI	P	P	P	P	P	P	P
36	1585509556	KM MANJU RANI	P	P	A	P	P	P	P
37	1585509557	MAYANK	P	P	P	P	P	P	P
38	1585509558	KM MEENU	P	P	P	P	P	A	P
39	1585509559	MEGHA DHIMAN	P	P	P	P	P	P	P
40	1585509636	SUMIT SONKER	P	A	P	P	P	P	P
41	1585509637	SURAJ PUNDIR	A	P	P	P	P	P	P
42	1585509638	SWETA DEOL	P	A	P	P	P	P	P
43	1585509639	TARAB JEHRA	P	P	P	P	P	P	P
44	1585509640	TINKU KUMAR	P	P	P	P	P	A	P
45	1585509641	TUSHAR GUPTA	P	P	P	P	P	P	P
46	1585509642	VAIBHAV JAIN	P	P	P	P	P	P	P
47	1585509643	VIKAS KUMAR JOSHI	P	P	P	P	P	P	P
48	1585509644	VIKASH KUMAR	P	P	P	P	P	P	A
49	1585509645	VIKUL KUMAR	P	P	P	P	P	P	P
50	1585509646	VISHAKHA	P	P	A	P	P	P	P
51	1585509650	ZOHA ALI ZAIDI	P	A	P	P	P	P	P
52	1585509652	AMITKUMAR	P	P	A	P	P	P	A

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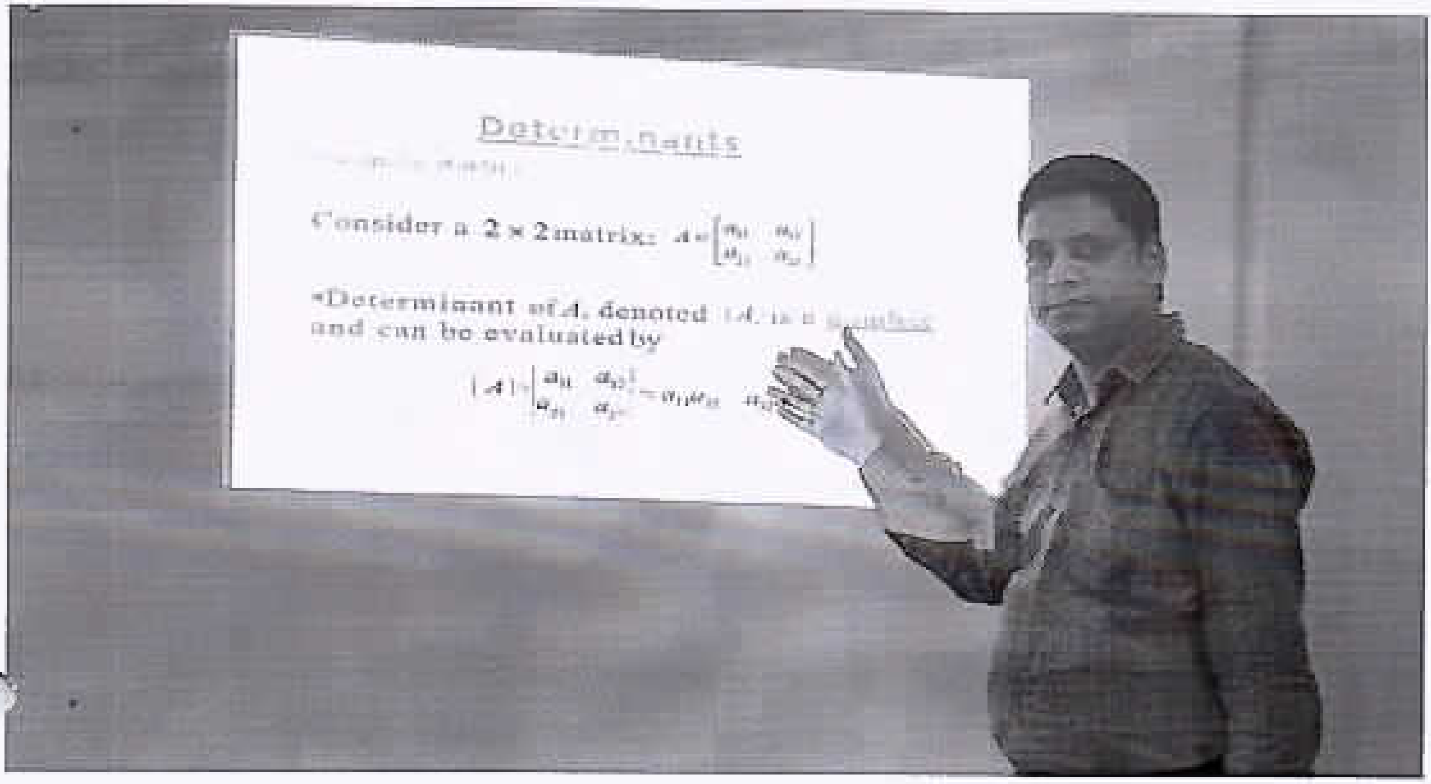

Remedial Classes on

Business Mathematics

by

Dr. Pankaj Kaushik.

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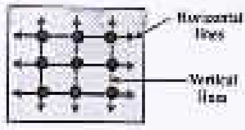
BUSINESS MATHEMATICS

Definition of matrix

A matrix is a rectangular array of numbers. In other words, a set of mn numbers arranged in the form of rectangular array of m rows and n column is called $m \times n$ matrix read as m by n matrix.

$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} & \cdots \\ a_{21} & a_{22} & a_{23} & \cdots \\ a_{31} & a_{32} & a_{33} & \cdots \end{bmatrix}_{m \times n}$$



We can understand matrix by the fig. shown above, which shows a mess of vertical and horizontal lines. The crossing points of vertical and horizontal lines are the position of elements of matrix. In above fig there are 9 crossing points which can be find out by multiplying no. of horizontal and vertical lines i.e. $3 \times 3 = 9$.

The numbers $a_{11}, a_{12}, \ldots$ etc. are called elements of the matrix A, m is the number of rows and n the number of column.

$$\text{e.g.} \quad A = \begin{bmatrix} 2 & 3 & 4 \\ 5 & 4 & 6 \\ 2 & 4 & 3 \end{bmatrix}_{3 \times 3}$$

Notation of Matrices-

- Matrices are denoted by capital letters A, B, C or X, Y, Z etc.
- Its elements are denoted by small letters a, b, c ……etc.
- The elements of the matrix are enclosed by any of the brackets i.e.
- The position of the elements of a Matrix is indicated by the subscripts attached to the element. e.g. a_{13} indicates that element lies in first row and third column i.e. first subscript denotes row and second subscript denote column.

Order of Matrices-

- The number of rows and columns of a matrix determines the order of the matrix.
- Hence, a matrix, having m rows and n columns is said to be of the order $m \times n$ (read as m by n).
- In particular, a matrix having 3 rows and 4 columns is of the order 3×4 and it is called a 3×4 matrix e.g.

• $A = \begin{bmatrix} 2 & 3 & 5 \\ 4 & 6 & 7 \end{bmatrix}$ is a matrix of order 2×3 since there are two rows and three columns.

• $A = [3 \quad 5 \quad 7]$ is a matrix of order 1×3 since there are one row and three columns.

• $A = \begin{bmatrix} 5 \\ 6 \\ 8 \end{bmatrix}$ is a matrix of order 3×1 since there are three rows and one column.

Types of Matrices

- Rectangular Matrix
- Square Matrix
- Diagonal Matrix
- Scalar Matrix
- Column Matrix
- Row Matrix
- Null Matrix
- Unit Matrix
- Upper Triangular Matrix
- Lower Triangular Matrix
- Sub Matrix

Scalar Matrix : A diagonal matrix in which diagonal elements are equal (but not equal to 0), is called a *scalar matrix* e.g.

e.g.

$$A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$$ is a scalar matrix of 3×3

Identity (or Unit) Matrix : A square matrix whose each diagonal element is unity and all other elements are zero is called and Identity (or Unit) Matrix. An identity matrix of order 3 is denoted by I_3 or simply by I.

e.g.

$$I_3 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$ is a unit matrix of order 3

Null (Zero) Matrix : A matrix of any order (rectangular or square) whose each of its element is zero is called a null matrix (or a Zero matrix) and is denoted by O. e.g.

$$O = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix} \text{ and } O = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$ are null matrices of order 2×2 and 2×3 respectively

Row Matrix : A matrix having only one row and any number of columns is called a row matrix (or a row vector) e.g.

$A = [1 \quad 2 \quad 3]$ is a row matrix of order 1×3

Column Matrix : A matrix having only one column and any number of rows is called a column matrix (or a column vector) e.g.

$A = \begin{bmatrix} 1 \\ 3 \\ 6 \end{bmatrix}$ is a column matrix or order 3×1

Upper Triangular and Lower Triangular Matrix: A square matrix is called an upper triangular matrix if all the elements below the principal diagonal are zero and it is said to be lower triangular matrix if all the elements above the principal diagonal are zero e.g.

UTM

LTM

Sub Matrix : A matrix obtained by deleting some rows or column or both of a given matrix is called its sub matrix. e.g.

$A = \begin{bmatrix} 2 & 3 & \cdot \\ \cdot & \cdot & \cdot \\ 3 & 9 & \cdot \end{bmatrix}$. Now $\begin{bmatrix} 2 & 3 \\ 3 & 9 \end{bmatrix}$ is a sub matrix of given matrix A. The sub matrix obtained by deleting 2nd row and 3rd column of matrix A.

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DEPARTMENT OF BUSINESS ADMINISTRATION

NOTICE

DATE: 28-08-2016

"REMEDIAL CLASSES"

All the students of BBA 1st year are hereby informed that remedial classes in business mathematics is being organised by Dr. Pankaj Kaushik. The classes will be held in department itself after the lecture hours from 02nd September, 2016 till 09th September, 2016 from 2:30 pm to 4:30 pm. The interested students who wants to attend the classes may submit their names to the concerned teacher.

For further query consult the undersigned.

Dr. Saurabh Mittal
Head, Department of Business Administration,
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SHRI RAM COLLEGE, MUZAFFARNAGAR
DEPARTMENT OF BUSINESS ADMINISTRATION

DATE: 12-09-2016

"Remedial Classes"

REPORT

Objective:

1. To give additional help to students who, for one reason or another, have fallen behind the rest of the class in the subject of Business Mathematics.
2. To help students in organising their preparations or to abstract ideas and concepts.

The Idea:
Problem solving on Minors, Factors and Determinants

Pedagogy:
Power Point Presentation (Self Prepared)

Other Important Information:

Date of the Classes : 02nd September, 2016 till 09th September, 2016
Time of the Classes : 2:30 pm to 4:30 pm
Total Participants : 54
Event Coordinator : Dr. Pankaj Kaushik

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SHRI RAM COLLEGE, MUZAFFARNAGAR

DEPARTMENT OF BUSINESS ADMINISTATION (2016-17)

ATTENDENCE LIST OF REMEDIAL CLASSES

S.No.	Roll No.	Name of Student	DATE						
			2-9-16	3-9-16	5-9-16	6-9-16	7-9-16	8-9-16	9-9-16
1	168559001	AAKASH	P	P	P	P	P	P	A
2	168559002	AARTI DHIMAN	P	P	P	P	P	P	P
3	168559003	AASHISH MAAN	P	P	P	P	P	P	P
4	168559004	ABHISHEK KUMAR	P	P	P	P	P	A	P
5	168559005	ADEEBA	P	P	P	P	P	P	P
6	168559006	AKANSHA JAIN	P	P	A	P	P	P	P
7	168559020	ANUSHKA JAIN	P	P	P	P	P	P	P
8	168559021	APOORV	P	P	P	P	P	P	P
9	168559026	ASHISH SONKER	P	P	P	P	P	P	P
10	168559027	ASHUTOSH	P	P	P	P	P	P	P
11	168559028	ASIM ZAIDI	A	P	P	P	P	P	P
12	168559029	BHANU PRATAP SINGH	P	P	P	P	P	P	P
13	168559034	DIXIT CHAUHAN	P	P	P	P	P	P	P
14	168559035	DUSHYANT AHLAWAT	P	P	P	P	P	P	P
15	168559036	FARHA PARVEEN	P	A	P	P	P	P	P
16	168559037	FOZIA	P	P	P	P	A	P	P
17	168559038	GAURAV KUMAR	P	P	P	P	P	P	P
18	168559039	GOURAV SINGHAL	P	P	P	P	P	P	P
19	168559047	HIMANSHU	P	P	A	P	P	P	P
20	168559048	HIMANSHU RANA	P	P	P	P	P	P	P
21	168559049	JAVED ALI	P	P	P	P	P	P	P
22	168559050	JAVED SAIFI	A	P	P	P	P	P	P
23	168559051	JUNAID ALAM	P	P	P	P	P	P	P
24	168559052	JYOTI	P	P	P	P	P	P	A
25	168559053	KAIF	P	P	P	A	P	P	P
26	168559054	KAMAL	P	P	P	P	P	P	P
27	168559055	KHUSHBOO KASHYAP	A	P	P	P	P	P	P
28	168559083	PARAS KUMAR	P	P	P	P	P	P	P
29	168559084	PARSHANT MAILK	P	P	P	P	P	P	P
30	168559085	PIYUSH CHOUDHARY	P	P	P	P	P	P	P
31	168559086	POOJA VERMA	P	P	P	P	A	P	P
32	168559087	PREETY SHERAWAT	P	P	A	P	P	P	P
33	168559088	PRINCI SINGHAL	P	P	P	P	P	P	P
34	168559089	PRIYANKA	P	P	P	P	P	P	P
35	168559090	PRIYANSHI RASTOGI	P	P	P	P	P	P	A
36	168559091	RAHUL CHAUDHRY	P	P	P	A	P	P	P
37	168559092	RAHUL KANSAL	A	P	P	P	P	P	P
38	168559093	RAJAN DHIMAN	P	P	P	P	P	A	P
39	168559094	RAJAT	P	P	P	P	P	P	P
40	168559095	RAQIB ALI	P	P	P	P	P	P	P
41	168559096	RAVINS PANWAR	P	A	P	P	P	P	P
42	168559097	SACHIN KUMAR	P	P	P	P	P	P	P
43	168559098	SADAF	P	P	P	A	P	P	P
44	168559099	SAGAR PAL	P	P	P	P	P	P	P
45	168559100	SAGER	P	P	P	P	P	P	P
46	168559101	SAKSHI	P	P	P	P	A	P	P
47	168559102	SAMEER SAIFI	P	P	P	P	P	P	P
48	168559103	SANJANA PAL	P	P	P	P	P	P	P
49	168559104	SARVESH KUMAR	P	P	P	P	P	P	P
50	168559105	SHADAB	P	P	P	P	P	P	P
51	168559106	SHAHBAZ	P	A	P	P	P	P	P
52	168559107	SHAHJAD	P	P	P	P	P	P	P
53	168559108	SHAKIR	P	P	P	P	P	P	P
54	168559109	SHIVAM TYAGI	P	P	P	P	A	P	P

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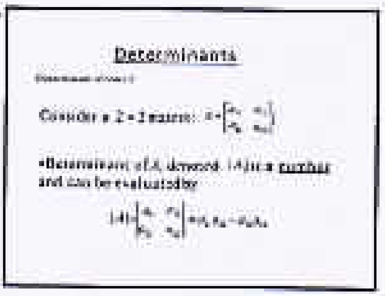

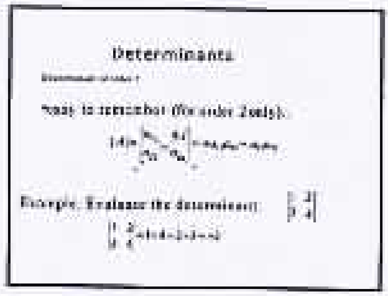

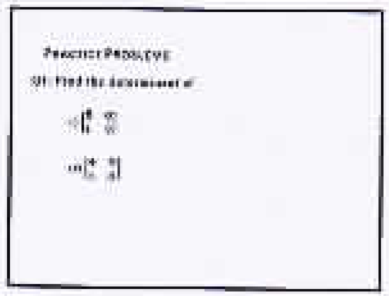

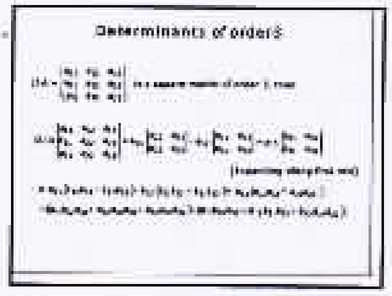

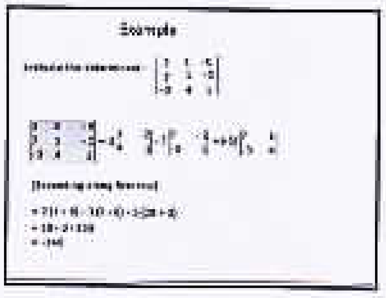

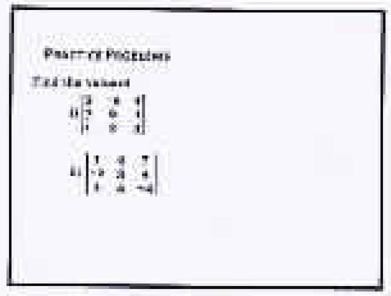

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Minors

If $A = \begin{bmatrix} 4 & 7 & 8 \\ -9 & 0 & 0 \\ 2 & 3 & 4 \end{bmatrix}$, then

M_{11} = Minor of a_{11} = determinant of the order 2 × 2 square sub-matrix is obtained by leaving first row and first column of A

$= \begin{vmatrix} 0 & 0 \\ 3 & 4 \end{vmatrix} = 0$

Similarly, M_{23} = Minor of a_{23} = $\begin{vmatrix} 4 & 7 \\ 2 & 3 \end{vmatrix} = 12 - 14 = -2$

M_{32} = Minor of a_{32} = $\begin{vmatrix} 4 & 8 \\ -9 & 0 \end{vmatrix} = 0 + 72 = 72$ etc.

Cofactors

C_{ij} = Cofactor of a_{ij} in A $= (-1)^{i+j} M_{ij}$,

where M_{ij} is minor of a_{ij} in A

Cofactors (Con.)

$A = \begin{bmatrix} 4 & 7 & 8 \\ -9 & 0 & 0 \\ 2 & 3 & 4 \end{bmatrix}$

C_{11} = Cofactor of a_{11} $= (-1)^{1+1} M_{11} = (-1)^{1+1} \begin{vmatrix} 0 & 0 \\ 3 & 4 \end{vmatrix} = 0$

C_{23} = Cofactor of a_{23} $= (-1)^{2+3} M_{23} = -\begin{vmatrix} 4 & 7 \\ 2 & 3 \end{vmatrix} = 2$

C_{32} = Cofactor of a_{32} $= (-1)^{3+2} M_{32} = -\begin{vmatrix} 4 & 8 \\ -9 & 0 \end{vmatrix} = -72$ etc.

Value of Determinant in Terms of Minors and Cofactors

If $A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$, then

$|A| = \sum_{j=1}^{3} (-1)^{i+j} a_{ij} M_{ij} = \sum_{j=1}^{3} a_{ij} C_{ij}$

$= a_{i1}C_{i1} + a_{i2}C_{i2} + a_{i3}C_{i3}$, for i = 1 or i = 2 or i = 3

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Properties of Determinants

1. The value of a determinant remains unchanged, if its rows and columns are interchanged.

$$\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = \begin{vmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\ c_1 & c_2 & c_3 \end{vmatrix} \quad \text{i.e. } |A| = |A'|$$

2. If any two rows (or columns) of a determinant are interchanged, then the value of the determinant is changed by minus sign.

$$\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = - \begin{vmatrix} a_2 & b_2 & c_2 \\ a_1 & b_1 & c_1 \\ a_3 & b_3 & c_3 \end{vmatrix} \quad [\text{Applying } R_2 \leftrightarrow R_1]$$

Properties (Con.)

3. If all the elements of a row (or column) is multiplied by a non-zero number k, then the value of the new determinant is k times the value of the original determinant.

$$\begin{vmatrix} ka_1 & kb_1 & kc_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = k \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$$

which also implies

$$\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = \frac{1}{m} \begin{vmatrix} ma_1 & mb_1 & mc_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$$

Properties (Con.)

4. If each element of any row (or column) consists of two or more terms, then the determinant can be expressed as the sum of two or more determinants.

$$\begin{vmatrix} a_1 + x & b_1 & c_1 \\ a_2 + y & b_2 & c_2 \\ a_3 + z & b_3 & c_3 \end{vmatrix} = \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} + \begin{vmatrix} x & b_1 & c_1 \\ y & b_2 & c_2 \\ z & b_3 & c_3 \end{vmatrix}$$

5. The value of a determinant is unchanged, if any row (or column) is multiplied by a number and then added to any other row (or column).

$$\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = \begin{vmatrix} a_1 + mb_1 - nc_1 & b_1 & c_1 \\ a_2 + mb_2 - nc_2 & b_2 & c_2 \\ a_3 + mb_3 - nc_3 & b_3 & c_3 \end{vmatrix} \quad [\text{Applying } C_1 \to C_1 + mC_2 - nC_3]$$

Properties (Con.)

6. If any two rows (or columns) of a determinant are identical, then its value is zero.

$$\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_1 & b_1 & c_1 \end{vmatrix} = 0$$

7. If each element of a row (or column) of a determinant is zero, then its value is zero.

$$\begin{vmatrix} 0 & 0 & 0 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = 0$$

Properties (Con.)

(8) Let $A = \begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix}$ be a diagonal matrix, then

$$|A| = \begin{vmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{vmatrix} = abc$$

Row(Column) Operations

Following are the notations to evaluate a determinant:

(i) R_i to denote ith row

(ii) $R_i \leftrightarrow R_j$ to denote the interchange of ith and jth rows.

(iii) $R_i \to R_i + \lambda R_j$ to denote the addition of λ times the elements of jth row to the corresponding elements of ith row.

(iv) λR_i to denote the multiplication of all elements of ith row by λ.

Similar notations can be used to denote column operations by replacing R with C.

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SHRI RAM COLLEGE, MUZAFFARNAGAR
DEPARTMENT OF BUSINESS ADMINISTRATION

NOTICE

DATE: 06-09-2017

"REMEDIAL CLASSES"

All the students of BBA 1st year are hereby informed that remedial classes in business mathematics is being organised by Dr. Pankaj Kaushik. The classes will be held in department itself after the lecture hours from 11th September, 2017 till 22nd, September, 2017 from 2:30 pm to 4:30 pm. The interested students who wants to attend the classes may submit their names to the concerned teacher.

For further query consult the undersigned.

Dr. Saurabh Mittal
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SHRI RAM COLLEGE, MUZAFFARNAGAR
DEPARTMENT OF BUSINESS ADMINISTRATION

DATE: 25-09-2017

"Remedial Classes"

REPORT

Objective:

1. To give additional help to students who, for one reason or another, have fallen behind the rest of the class in the subject of Business Mathematics.
2. To help students in organising their preparations or to abstract ideas and concepts.

The Idea:
Problem solving on Linear Equations

Pedagogy:
Power Point Presentation (Self Prepared)

Other Important Information:

Date of the Classes	: 11th September, 2017 till 22nd September,2017
Time of the Classes	: 2:30 pm to 4:30 pm
Total Participants	: 45
Event Coordinator	: Dr. Pankaj Kaushik

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SHRI RAM COLLEGE, MUZAFFARNAGAR

DEPARTMENT OF BUSINESS ADMINISTATION (2017-18)

ATTENDENCE LIST OF REMEDIAL CLASSES

S.No.	Roll No.	Name of Student	DATE									
			11-9-19	12-9-19	13-9-19	14-9-19	15-9-19	16-9-19	18-9-19	19-9-19	20-9-19	22-9-19
1	R1708551351	AADITYA PUNDIR	P	P	A	P	P	P	P	P	P	P
2	R1708551352	AAMIL QURESHI	P	P	P	P	A	P	P	P	P	P
3	R1708551353	ADITI GARG	P	P	P	P	P	P	P	P	P	P
4	R1708551354	ADITYA SINGH SISHODIA	A	P	P	P	P	P	P	A	P	P
5	R1708551355	AJAY KUMAR	P	P	P	P	P	P	P	P	P	P
6	R1708551356	AKASH BALIYAN	P	P	P	P	P	P	P	P	P	P
7	R1708551357	AKSHAY BALIYAN	P	P	P	P	P	P	P	P	P	P
8	R1708551358	AKSHAY JAIN	P	P	P	P	P	P	P	P	P	P
9	R1708551359	AKSHAY KUMAR	P	P	P	P	P	P	P	P	P	P
10	R1708551371	ATUL PUNDIR	P	P	P	P	P	P	P	P	P	P
11	R1708551372	BHARAT KUMAR	P	P	P	P	P	P	P	P	P	P
12	R1708551373	BINISH KHAN	P	P	P	P	P	P	P	P	P	P
13	R1708551374	DANISH ZAIDI	P	P	P	P	P	P	P	P	P	P
14	R1708551381	HIMANSHU	P	A	P	P	P	P	P	P	P	P
15	R1708551382	HIMAYUN	P	P	P	P	P	P	P	P	P	P
16	R1708551383	ISHU SHARMA	P	P	P	P	P	P	A	P	P	P
17	R1708551384	KAJAL TOMAR	P	P	P	P	P	P	P	P	P	P
18	R1708551385	KAPIL	P	P	P	P	A	P	P	P	P	P
19	R1708551386	KARTIK MENON	P	P	P	P	P	P	P	P	P	P
20	R1708551387	KM ARTI	P	P	P	P	P	P	P	P	A	P
21	R1708551416	MOHD SHAKIR	P	P	A	P	P	P	A	P	P	P
22	R1708551417	MOHD SHARIF	P	P	P	P	P	P	P	P	P	P
23	R1708551423	MUNESH KUMAR	P	P	P	P	P	P	P	P	P	P
24	R1708551424	MUSKAN PARVEEN	P	P	P	P	P	P	P	P	P	P
25	R1708551425	NAIMUZZAMA	P	P	P	P	P	A	P	P	P	P
26	R1708551426	NEESHU DEVI	P	P	A	P	P	P	P	P	P	P
27	R1708551427	NEHA	P	P	P	P	P	P	P	P	A	P
28	R1708551428	NEHA	P	P	P	P	P	P	P	P	P	P
29	R1708551429	NIGARVI RATHI	P	P	P	P	P	P	P	P	P	P
30	R1708551439	POOJA PANCHAL	P	P	P	P	P	P	P	P	P	P
31	R1708551440	PRAGATI	P	P	P	P	P	P	P	P	P	P
32	R1708551441	PRATYAKSH GOYAL	P	P	P	P	P	P	P	P	P	P
33	R1708551470	SHALU	P	P	P	A	P	P	P	P	P	P
34	R1708551471	SHIVAM TOMAR	A	P	P	P	P	P	P	P	P	P
35	R1708551472	SHIVANSHI	P	P	P	P	P	P	P	A	P	P
36	R1708551473	SHUBHAM KUMAR	P	P	P	P	P	P		P	P	P
37	R1708551474	SHUBHAM PUNDIR	P	P	P	P	A		P	P	P	P
38	R1708551475	SHUBHAM RATHI	P	P	P	P	P	P	P	P	P	P
39	R1708551476	SHUBHAM SHARMA	P	P	P	P		P	P	P	A	P
40	R1708551477	SIDDHANT NIRWAL	P	P	A	P	P	P	P	P	P	P
41	R1708551489	TUSHAR TYAGI	P	P	P	P	P	P	P	P	P	A
42	R1708551490	URWASHI GAUTAM	P	P	A	P	P	P	P	P	P	P
43	R1708551491	USMAN CHAUDHARY	A	P	P	P	P	P	P	P	P	P
44	R1708551492	VAISHALI	P	P	P	P	A	P	P	P	P	P
45	R1708551500	VISHAL VERMA	P	P	P	P	P	P	P	P	P	P

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Linear Equations (Cramer's Rule)

Let the system of linear equations be

$a_1x + b_1y = c_1$ ...(i)

$a_2x + b_2y = c_2$ ...(ii)

Then $x = \frac{D_1}{D}$, $y = \frac{D_2}{D}$ provided $D \neq 0$,

where $D = \begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix}$, $D_1 = \begin{vmatrix} c_1 & b_1 \\ c_2 & b_2 \end{vmatrix}$ and $D_2 = \begin{vmatrix} a_1 & c_1 \\ a_2 & c_2 \end{vmatrix}$

15/09/2017

Cramer's Rule (Con.)

Note:

(1) If $D \neq 0$,

then the system is consistent and has unique solution.

(2) If $D = 0$ and $D_1 = D_2 = 0$,

then the system is consistent and has infinitely many solutions.

(3) If $D = 0$ and one of $D_1, D_2 \neq 0$,

then the system is inconsistent and has no solution.

15/09/2017

Example

Using Cramer's rule, solve the following system of equations $2x-3y=7$, $3x+y=5$

Solution :

$D = \begin{vmatrix} 2 & -3 \\ 3 & 1 \end{vmatrix} = 2+9 = 11 \neq 0$

$D_1 = \begin{vmatrix} 7 & -3 \\ 5 & 1 \end{vmatrix} = 7+15 = 22$

$D_2 = \begin{vmatrix} 2 & 7 \\ 3 & 5 \end{vmatrix} = 10-21 = -11$

$\therefore D \neq 0$

$\therefore$ By Cramer's Rule $x = \frac{D_1}{D} = \frac{22}{11} = 2$ and $y = \frac{D_2}{D} = \frac{-11}{11} = -1$

15/09/2017

Linear Equations (Cramer's Rule)

Let the system of linear equations be

$a_1x + b_1y + c_1z = d_1$ ...(i)

$a_2x + b_2y + c_2z = d_2$ ...(ii)

$a_3x + b_3y + c_3z = d_3$ ...(iii)

Then $x = \frac{D_1}{D}$, $y = \frac{D_2}{D}$, $z = \frac{D_3}{D}$ provided $D \neq 0$,

where $D = \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$, $D_1 = \begin{vmatrix} d_1 & b_1 & c_1 \\ d_2 & b_2 & c_2 \\ d_3 & b_3 & c_3 \end{vmatrix}$, $D_2 = \begin{vmatrix} a_1 & d_1 & c_1 \\ a_2 & d_2 & c_2 \\ a_3 & d_3 & c_3 \end{vmatrix}$

and $D_3 = \begin{vmatrix} a_1 & b_1 & d_1 \\ a_2 & b_2 & d_2 \\ a_3 & b_3 & d_3 \end{vmatrix}$

15/09/2017

Cramer's Rule (Con.)

Note:

(1) If $D \neq 0$, then the system is consistent and has a unique solution.

(2) If $D=0$ and $D_1 = D_2 = D_3 = 0$, then the system has infinite solutions or no solution.

(3) If $D = 0$ and one of $D_1, D_2, D_3 \neq 0$, then the system is inconsistent and has no solution.

(4) If $d_1 = d_2 = d_3 = 0$, then the system is called the system of homogeneous linear equations.

(i) If $D \neq 0$, then the system has only trivial solution $x = y = z = 0$.

(ii) If $D = 0$, then the system has infinite solutions.

15/09/2017

Example

Using Cramer's rule, solve the following system of equations

$5x - y + 4z = 5$

$2x + 3y + 5z = 2$

$5x - 2y + 6z = -1$

Solution :

$D = \begin{vmatrix} 5 & -1 & 4 \\ 2 & 3 & 5 \\ 5 & -2 & 6 \end{vmatrix}$ $= 5(18+10) + 1(12-25) + 4(-4-15)$ $= 140 - 13 - 76 = 140 - 89$ $= 51 \neq 0$

$D_1 = \begin{vmatrix} 8 & -1 & 4 \\ 2 & 3 & 5 \\ -1 & -2 & 6 \end{vmatrix}$ $= 5(18+10) + 1(12+5) + 4(-4+3)$ $= 140 + 17 - 4$ $= 153$

15/09/2017

Solution Cont.

$$D_2 = \begin{vmatrix} 5 & 5 & 4 \\ 3 & 2 & 5 \\ 5 & -1 & 6 \end{vmatrix} = 5(12+5)+5(12-25)+4(-2-10) = 85+65-48 = 150-48 = 102$$

$$D_3 = \begin{vmatrix} 5 & -1 & 5 \\ 3 & 1 & 2 \\ 5 & -2 & -1 \end{vmatrix} = 5(-3+4)+1(-2-10)+5(-4-15) = 5-12-95 = 5-107 = -102$$

$\because D \neq 0$

$\therefore$ By Cramer's Rule $x = \frac{D_1}{D} = \frac{153}{51} = 3$, $y = \frac{D_2}{D} = \frac{102}{51} = 2$

and $z = \frac{D_3}{D} = \frac{-102}{51} = -2$

Example

Solve the following system of homogeneous linear equations:

$x + y - z = 0$, $x - 2y + z = 0$, $3x + 6y - 5z = 0$

Solution:

We have $D = \begin{vmatrix} 1 & 1 & -1 \\ 1 & -2 & 1 \\ 3 & 6 & -5 \end{vmatrix} = 1(10-6) - 1(-5-3) - 1(6+6)$

$= 4 + 8 - 12 = 0$

$\therefore$ The system has infinitely many solutions.

Putting $z = k$, in first two equations, we get

$x + y = k$, $x - 2y = -k$

Solution (Con.)

$\therefore$ By Cramer's rule $x = \frac{D_1}{D} = \frac{\begin{vmatrix} k & 1 \\ -k & -2 \end{vmatrix}}{\begin{vmatrix} 1 & 1 \\ 1 & -2 \end{vmatrix}} = \frac{-2k+k}{-2-1} = \frac{k}{3}$

$y = \frac{D_2}{D} = \frac{\begin{vmatrix} 1 & k \\ 1 & -k \end{vmatrix}}{\begin{vmatrix} 1 & 1 \\ 1 & -2 \end{vmatrix}} = \frac{-k-k}{-2-1} = \frac{2k}{3}$

These values of x, y and z = k satisfy (iii) equation.

$\therefore x = \frac{k}{3}$, $y = \frac{2k}{3}$, $z = k$, where $k \in R$

Thank you

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