Matrices

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◎ Matrix is defined asarectangulararrangementof mn numbers into m horizontal rows and n vertical columns. An m×n matrix is usually written as.

  ◎ $[a_{11}a_{12}\cdots\cdots a_{1n}]$

◎ $A=[a_{21}a_{22}\cdots\cdots a_{2n}]$

  ◎ $[a_{m1}a_{m2}\cdots\cdots a_{mn}]$

◎ The number $a_{11}, a_{12}\ldots$ are known as the elements of matrix A

Types of Matrices

- Row matrix- A matrix having only one row.

- Column matrix- A matrix having only one column.

- Null matrix- A matrix having all elements as zero.

- Unit matrix- Diagonal elements are 1 and non diagonal elements zero.

- Square matrix- Number of rows is equal to number of columns.

Application

▶ Matrices can be used for representing the data in the compact manner. Here are few examples.

▶ Distribution of jobs among different members

	J1	J2	J3	
M_1	2	5	3	
M2	6	2	4	
M3	3	4	4	

▶ Sale of products in different markets.

	M1 `	M2	M3	
P1	8	4	5	
P2	6	3	2	
P3	2	1	2	

° Addition- Addcorrespondingelementsfrom two differentmatrices.

a   b   c   j   k   l

A   d   e   f and B   m   n   0

g   hip q   r

Then A+B is

a+jb+kc+l

d+me+nf+o

g+ph+qi+r

Problems based on addition

° Quarterly sales of Jute,CottonandYarnfortheyear2002 and 2004 are

givenbelowQ1Q2 Q3Q4Q1Q2Q3 Q4

° Jute 20 25 22 2010152020

° Cot10   2018 1005   201530

° Yarn 15 20 151508301510

° Find the total quarterly sale of Jute, Cotton and Yarn for two years.

Subtraction of Matrices

▶ Subtraction- Subtract corresponding elements from two different matrices.

3	8		4	7	
A	9	6 and B	8	3	
3	2		1	0	

Then A –B is

3-4	8-7	-1	1
9-8	6-3 = 1	3	
3-1	2-0	2	2

⊙Acompany'ssales positionofits products AandBatitstwocentresPand

Qforthe yearisgiveninfirst matrix. If the sales position for the first quarter is

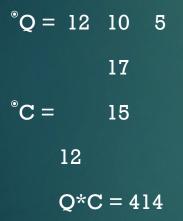given in secondmatrixfindthesales position for remaining period of the

year.

	P	Q	P	Q
A	50	45	30	15
B	6070		20	20

Multiplication of Matrices

◦ MultiplicationofMatrices is achieved by multiplyingelements in the row with elements in column.

◦ It is necessary that number of columns in A should be equal to the number of rows in B.

◦ If the number of columns in A is different from the number of rows in B then the product AB is not defined.

◦ If A is of the order of m*n and B be of the order of n*p then AB will be of the order pf m*p

◦ If the product of AB exists, then it is not necessary that the product BA will also exist.

°A man buys 12 kg of sugar, 10 kg of pulses and 5 kgs of salt. Sugar costs Rs. 17 per kg, pulses cost Rs. 15 per kg and salt costs Rs. 12 per kg. Using matrix multiplication, determine the total amount spent by the man.

°Q = 12   10   5

17

°C =   15

12

Q*C = 414

Problem for Practice

▶ Saritapurchased 10 greetings cards, 12keyringsand 18 showpieces. The cost of a greeting card,keyringand showpiece areRs. 10, 12 and 13 respectively. Determine the total amount spent bySaritausing matrix multiplication.

▶ Mr X hasRs. 100,000 as investible fund. The fund is to be invested in two kinds of securities offering return of 10% and 20% p.a. Determine the amount to be invested in each securities if the return ofRs. 12,000 is to be earned.

Multiplication by ascaler

▶ While multiplying a matrix by ascalerquantity we need to multiply every element by thatscalerquantity (k).

▶ Some properties ofscalermultiplication

k (A+B) = kA + kB

(k+l) A = kA +lA

(kl) A = l (kA)

(-k) A = - (kA) = k (-A)

(-1) A = -A

Problem onScalerMultiplication

◦A company hastwoplants.Plant1manufactures5units of X, 7 unitsofYand8 units of Z per hour. Plant2manufactures 7unitsof X, 7 units of Y and 9 units Z at the same time.

◦Usingmatrixmultiplication find the number of items X, Y and Z produced if plant is operated for 8 hours and plant 2 is operated for9hours.

Problem for Practice

► A factory produces three varieties f Alcohol (Methanol, Propanol andEthonol). The proportion of constituents A B C an D used for manufacturing these products is given below.

	A	B	C	D
Methanol	0.4	0	0.6	0
Propanol	0.1	0.3	0	0.6
Ethanol	0.2	0.2	0.1	0.5

► (of e

► (galcohol

► (c) what is the total cost per week?

Thank you

Practice and be Perfect