VELAMMAL VIDYALAYA WEEKLONG BOARDING SCHOOL

VALUE BASED QUESTIONS(MATRICES)

1. Three shopkeepers A, B, C are using polythene, handmade bags (prepared by prisoners), and newspaper's envelope as carry bags. it is found that the shopkeepers A, B, C are using (20,30,40) , (30,40,20,) , (40,20,30) polythene , handmade bags and newspapers envelopes respectively. The shopkeepers A, B, C spent Rs.250, Rs.270 & Rs.200 on these carry bags respectively .Find the cost of each carry bags using matrices. Keeping in mind the social & environmental conditions, which shopkeeper is better? & why?

$20x+30y+40z =250 \Rightarrow 2x+3y+4z = 25$

$30x+40y+20z =270 \Rightarrow 3x+4y+2z = 27$

$40x+20y+30z=200 \Rightarrow 4x+2y+3z = 20$

$$\begin{pmatrix} 2 & 3 & 4 \\ 3 & 4 & 2 \\ 4 & 2 & 3 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 25 \\ 27 \\ 20 \end{pmatrix}$$

$AX=B$

$X=A^{-1}B$

$$|A| = \begin{vmatrix} 2 & 3 & 4 \\ 3 & 4 & 2 \\ 4 & 2 & 3 \end{vmatrix} = -27$$

$$A^C = \begin{pmatrix} +\begin{vmatrix} 4 & 2 \\ 2 & 3 \end{vmatrix} & -\begin{vmatrix} 3 & 2 \\ 4 & 3 \end{vmatrix} & +\begin{vmatrix} 3 & 4 \\ 4 & 2 \end{vmatrix} \\ -\begin{vmatrix} 3 & 4 \\ 2 & 3 \end{vmatrix} & +\begin{vmatrix} 2 & 4 \\ 4 & 3 \end{vmatrix} & -\begin{vmatrix} 2 & 3 \\ 4 & 2 \end{vmatrix} \\ +\begin{vmatrix} 3 & 4 \\ 4 & 2 \end{vmatrix} & -\begin{vmatrix} 2 & 4 \\ 3 & 2 \end{vmatrix} & +\begin{vmatrix} 2 & 3 \\ 3 & 4 \end{vmatrix} \end{pmatrix} = \begin{pmatrix} 8 & -1 & -10 \\ -1 & -10 & 8 \\ -10 & 8 & -1 \end{pmatrix}$$

$$A^{CT} = \begin{pmatrix} 8 & -1 & -10 \\ -1 & -10 & 8 \\ -10 & 8 & -1 \end{pmatrix}$$

$$A^{-1} = \frac{1}{|A|} A^{CT} = \frac{1}{-27} \begin{pmatrix} 8 & -1 & -10 \\ -1 & -10 & 8 \\ -10 & 8 & -1 \end{pmatrix}$$

$$X = A^{-1}B = \frac{1}{-27} \begin{pmatrix} 8 & -1 & -10 \\ -1 & -10 & 8 \\ -10 & 8 & -1 \end{pmatrix} \begin{pmatrix} 25 \\ 27 \\ 20 \end{pmatrix}$$

$$X = \frac{1}{-27} \begin{pmatrix} 200-27-220 \\ -25-270+160 \\ -250+216-20 \end{pmatrix} = \frac{1}{-27} \begin{pmatrix} -27 \\ -135 \\ -54 \end{pmatrix} = \begin{pmatrix} 1 \\ 5 \\ 2 \end{pmatrix}$$

Ans: [Polythene=Re.1] [Handmade bag = Rs.5] [Newspaper's envelop=Rs.2] Value: Shopkeeper A is better for environmental conditions. As he is using least no of polythene. Shopkeeper B is better for social conditions as he is using handmade bags (Prepared by prisoners)

2. In a Legislative assembly election, a political party hired a public relation firm to promote its candidate in three ways; telephone, house calls and letters. The numbers of contacts of each type in three cities A, B & C are (500, 1000, and 5000), (3000, 1000, 10000) and (2000, 1500, 4000), respectively. The party paid Rs. 3700, Rs.7200, and Rs.4300 in cities A, B & C respectively. Find the costs per contact using matrix method. Keeping in mind the economic condition of the country, which way of promotion is better in your view?

$500x+1000y+5000z =3700 \Rightarrow x+2y+10z = 37/5$

$3000x+1000y+10000z =7200 \Rightarrow 3x+y+10z = 72/10$

$2000x+1500y+4000z=4300 \Rightarrow 4x+3y+8z = 43/5$

Ans: Cost per Contact: Telephone = Rs0.40 , House calls = Re1.00 , Letters = Rs0.50.
Value: Telephone is better as it is cheap

3. A trust fund has Rs. 30,000 is to be invested in two different types of bonds. The first bond pays 5% interest per annum which will be given to orphanage and second bond pays7% interest per annum which will be given to an N.G.O. cancer aid society. Using matrix multiplication, determine how to divide Rs 30,000 among two types of Bonds if the trust fund obtains an annual total interest of Rs. 1800. What are the values reflected in the question.

X+y = 30000

$$\frac{5}{100}x + \frac{7}{100}y = 1800 \Rightarrow 5x + 7y = 180000$$

$$\begin{pmatrix} 1 & 1 \\ 5 & 7 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 30000 \\ 180000 \end{pmatrix}$$

AX=B $\Rightarrow$ X=A^{-1}B

$$|A| = 7 - 5 = 2 \neq 0$$

$$adjA = \begin{pmatrix} 7 & -1 \\ 5 & 1 \end{pmatrix}$$

$$A^{-1} = \frac{1}{|A|}adjA = \frac{1}{2}\begin{pmatrix} 7 & -1 \\ 5 & 1 \end{pmatrix}$$

$$X = \frac{1}{2}\begin{pmatrix} 7 & -1 \\ 5 & 1 \end{pmatrix}\begin{pmatrix} 30000 \\ 180000 \end{pmatrix} = \frac{1}{2}\begin{pmatrix} 210000 - 180000 \\ -150000 + 180000 \end{pmatrix}$$

$$X = \begin{pmatrix} 15000 \\ 15000 \end{pmatrix}$$

Ans: Rs. 15000 in each bond.
Value: (i)Charity,(ii) Helping orphan and poor people (iii)Awareness of disease.

4. Using matrix method solve the following system of equations x + 2y + z = 7: x − y + z =4; x + 3y +2z = 10, If X represents the no. of persons who take food at home. Y represents the no. of parsons who take junk food in market and z represent the no. of persons who take food at hotel. Which way of taking food you prefer and way?

x+2y+Z=7
x-y+z=4
x+3y+2z=10

$$\begin{pmatrix} 1 & 2 & 1 \\ 1 & -1 & 1 \\ 1 & 3 & 2 \end{pmatrix}\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 7 \\ 4 \\ 10 \end{pmatrix}$$

AX=B
X=A^{-1}B

$$|A| = \begin{vmatrix} 1 & 2 & 1 \\ 1 & -1 & 1 \\ 1 & 3 & 2 \end{vmatrix} = -3 \neq 0$$

$$A^C = \begin{pmatrix} +\begin{vmatrix} -1 & 1 \\ 3 & 2 \end{vmatrix} & -\begin{vmatrix} 1 & 1 \\ 1 & 2 \end{vmatrix} & +\begin{vmatrix} 1 & -1 \\ 1 & 3 \end{vmatrix} \\ -\begin{vmatrix} 2 & 1 \\ 3 & 2 \end{vmatrix} & +\begin{vmatrix} 1 & 1 \\ 1 & 2 \end{vmatrix} & -\begin{vmatrix} 1 & 2 \\ 1 & 3 \end{vmatrix} \\ +\begin{vmatrix} 2 & 1 \\ -1 & 1 \end{vmatrix} & -\begin{vmatrix} 1 & 1 \\ 1 & 1 \end{vmatrix} & +\begin{vmatrix} 1 & 2 \\ 1 & -1 \end{vmatrix} \end{pmatrix} = \begin{pmatrix} -5 & -1 & 4 \\ -1 & 1 & -1 \\ 3 & 0 & -3 \end{pmatrix}$$

$$A^{CT} = \begin{pmatrix} -5 & -1 & 3 \\ -1 & 1 & 0 \\ 4 & -1 & -3 \end{pmatrix}$$

$$A^{-1} = \frac{1}{|A|}A^{CT} = \frac{1}{-3}\begin{pmatrix} -5 & -1 & 3 \\ -1 & 1 & 0 \\ 4 & -1 & -3 \end{pmatrix}$$

$$X = A^{-1}B = \frac{1}{-3}\begin{pmatrix} -5 & -1 & 3 \\ -1 & 1 & 0 \\ 4 & -1 & -3 \end{pmatrix}\begin{pmatrix} 7 \\ 4 \\ 10 \end{pmatrix}$$

$$X = \frac{1}{-3}\begin{pmatrix} -35-4+30 \\ -7+4+0 \\ 28-4-30 \end{pmatrix} = \frac{1}{-3}\begin{pmatrix} -9 \\ -3 \\ -6 \end{pmatrix} = \begin{pmatrix} 3 \\ 1 \\ 2 \end{pmatrix}$$

Ans: No. of persons take food at home =3

No. of persons take junk food =1

No. of persons take hotel food =2

Value: Taking food at home is better.

5. A school has to reward the students participating in co-curricular activities (Category I) and with 100% attendance (Category II) brave students (Category III) in a function. The sum of the numbers of all the three category students is 6. If we multiply the number of category III by 2 and added to the number of category I to the result, we get 7. By adding second and third category to three times the first category we get 12.Form the matrix equation and solve it.

Let x = no. of students participating co-curricular activities

Y =No. of students with 100% attendance.

Z= No. of brave students.

x+y+Z = 6 $\Rightarrow$ x+y+Z = 6

2z+x = 7 $\Rightarrow$ x+2z = 7

Y+z+3x = 12 $\Rightarrow$ 3x+y+z = 12

$$\begin{pmatrix} 1 & 1 & 1 \\ 1 & 0 & 2 \\ 3 & 1 & 1 \end{pmatrix}\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 6 \\ 7 \\ 12 \end{pmatrix}$$

AX=B

X=A^{-1}B

$$|A| = \begin{vmatrix} 1 & 1 & 1 \\ 1 & 0 & 2 \\ 3 & 1 & 1 \end{vmatrix} = 4 \neq 0$$

$$A^C = \begin{pmatrix} +\begin{vmatrix} 0 & 2 \\ 1 & 1 \end{vmatrix} & -\begin{vmatrix} 1 & 2 \\ 3 & 1 \end{vmatrix} & +\begin{vmatrix} 1 & 0 \\ 3 & 1 \end{vmatrix} \\ -\begin{vmatrix} 1 & 1 \\ 1 & 1 \end{vmatrix} & +\begin{vmatrix} 1 & 1 \\ 3 & 1 \end{vmatrix} & -\begin{vmatrix} 1 & 1 \\ 3 & 1 \end{vmatrix} \\ +\begin{vmatrix} 1 & 1 \\ 1 & 1 \end{vmatrix} & -\begin{vmatrix} 1 & 1 \\ 1 & 2 \end{vmatrix} & +\begin{vmatrix} 1 & 1 \\ 1 & 0 \end{vmatrix} \end{pmatrix} = \begin{pmatrix} -2 & 5 & 1 \\ 0 & -2 & 2 \\ 2 & -1 & -1 \end{pmatrix}$$

$$A^{CT} = \begin{pmatrix} -2 & 0 & 2 \\ 5 & -2 & -1 \\ 1 & 2 & -1 \end{pmatrix}$$

$$A^{-1} = \frac{1}{|A|}A^{CT} = \frac{1}{4}\begin{pmatrix} -2 & 0 & 2 \\ 5 & -2 & -1 \\ 1 & 2 & -1 \end{pmatrix}$$

$$X = A^{-1}B = \frac{1}{4}\begin{pmatrix} -2 & 0 & 2 \\ 5 & -2 & -1 \\ 1 & 2 & -1 \end{pmatrix}\begin{pmatrix} 6 \\ 7 \\ 12 \end{pmatrix}$$

$$X = \frac{1}{4}\begin{pmatrix} -12+0+24 \\ 30-14-12 \\ 6+14-12 \end{pmatrix} = \frac{1}{4}\begin{pmatrix} 12 \\ 4 \\ 8 \end{pmatrix} = \begin{pmatrix} 3 \\ 1 \\ 2 \end{pmatrix}$$

Ans: No. of students participating co-curricular activities=3

No. of students with 100% attendance = 1

No. of brave students Value: Taking food at home is better=2

Value: Participating in co-curricular activities is important.

6. For keeping Fit X people believes in morning walk, Y people believe in yoga and Z people join Gym. Total no of people are 70.further 20% 30% and 40% people are suffering from any disease who believe in morning walk, yoga and GYM respectively. Total no. of such people is 21. If morning walk cost Rs 0 Yoga cost Rs 500/month and GYM cost Rs 400/ month and total expenditure is Rs 23000. (i) Formulate a matrix problem. (ii) Calculate the no. of each type of people. (iii) Why exercise is important for health?

$x + y + z = 70$

$\dfrac{20}{x} + \dfrac{30}{100}y + \dfrac{40}{100}z = 21 \Rightarrow 2x + 3y + 4z = 210$

$0x + 500y + 400z = 23000 \Rightarrow 5y + 4z = 230$
$(Try \ your \ self) \quad Ans: x = 20, y = 30, z = 20$

7. An amount of Rs 600 crores is spent by the government in three schemes. Scheme A is for saving girl child from the cruel parents who don't want girl child and get the abortion before her birth. Scheme B is for saving of newlywed girls from death due to dowry. Scheme C is planning for good health for senior citizen. Now twice the amount spent on Scheme C together with amount spent on Scheme A is Rs 500 crores. And three times the amount spent on Scheme A together with amount spent on Scheme B and Scheme C is Rs 1200 crores. Find the amount spent on each Scheme using matrices? What is the importance of saving girl child from the cruel parents who don't want girl child and get the abortion before her birth?

X+y+z = 600
2z+x = 500 $\Rightarrow$ x+2z = 500
3x+y+z = 1200
(Try yourself) Ans: Rs. 300 crores, y = Rs.200 crores, z = Rs.100 crores.

8. There are three families. First family consists of 2 male members, 4 female members and 3 children. Second family consists of 3 male members, 3 female members and 2 children. Third family consists of 2 male members, 2 female members and 5 children. Male member earns Rs 500 per day and spends Rs 300 per day. Female member earns Rs 400 per day and spends Rs 250 per day child member spends Rs 40 per day. Find the money each family saves per day using matrices? What is the necessity of saving in the family?

$A = \begin{matrix} I \\ II \\ III \end{matrix} \begin{pmatrix} M & F & C \\ 2 & 4 & 3 \\ 3 & 3 & 2 \\ 2 & 2 & 5 \end{pmatrix}$

$B(Earnings) = \begin{matrix} M \\ F \\ C \end{matrix}\begin{pmatrix} 500 \\ 400 \\ 0 \end{pmatrix} ; C(Spends) = \begin{matrix} M \\ F \\ C \end{matrix}\begin{pmatrix} 300 \\ 250 \\ 40 \end{pmatrix}$

Total Earnings $AB = \begin{pmatrix} 2 & 4 & 3 \\ 3 & 3 & 2 \\ 2 & 2 & 5 \end{pmatrix}\begin{pmatrix} 500 \\ 400 \\ 0 \end{pmatrix} = \begin{pmatrix} 1000 + 1600 + 0 \\ 1500 + 1200 + 0 \\ 1000 + 800 + 0 \end{pmatrix} = \begin{matrix} I \\ II \\ III \end{matrix}\begin{pmatrix} 2600 \\ 2700 \\ 1800 \end{pmatrix}$

Total Spends $AC = \begin{pmatrix} 2 & 4 & 3 \\ 3 & 3 & 2 \\ 2 & 2 & 5 \end{pmatrix}\begin{pmatrix} 300 \\ 250 \\ 40 \end{pmatrix} = \begin{pmatrix} 600 + 1000 + 120 \\ 900 + 750 + 80 \\ 600 + 500 + 200 \end{pmatrix} = \begin{matrix} I \\ II \\ III \end{matrix}\begin{pmatrix} 1720 \\ 1730 \\ 1300 \end{pmatrix}$

$Savings = AB - AC = \begin{pmatrix} 2600 \\ 2700 \\ 1800 \end{pmatrix} - \begin{pmatrix} 1720 \\ 1730 \\ 1300 \end{pmatrix} = \begin{matrix} I \\ II \\ III \end{matrix}\begin{pmatrix} 880 \\ 970 \\ 500 \end{pmatrix}$

9. Mahesh has three factories at A,B and C places respectively. Each factory produces clothing for boys and girls in three price styles labeled 1,2,3. The quantities produced by each factory are given as

	Factory A	Factory B	Factory C

	1	2	3	1	2	3	1	2	3
Boys	75	70	72	80	84	72	25	35	40
Girls	60	65	40	65	69	54	30	22	36

Find the total production of clothing in each style for boys and girls
Solution:

$$A = \begin{matrix} 1 & 2 & 3 \\ \begin{pmatrix} 75 & 70 & 72 \\ 60 & 65 & 40 \end{pmatrix} \end{matrix} \begin{matrix} Boys \\ Girls \end{matrix}$$

$$B = \begin{matrix} 1 & 2 & 3 \\ \begin{pmatrix} 80 & 84 & 72 \\ 65 & 69 & 54 \end{pmatrix} \end{matrix} \begin{matrix} Boys \\ Girls \end{matrix}$$

$$C = \begin{matrix} 1 & 2 & 3 \\ \begin{pmatrix} 25 & 35 & 40 \\ 30 & 22 & 36 \end{pmatrix} \end{matrix} \begin{matrix} Boys \\ Girls \end{matrix}$$

$$A + B + C = \begin{pmatrix} 75 & 70 & 72 \\ 60 & 65 & 40 \end{pmatrix} + \begin{pmatrix} 80 & 84 & 72 \\ 65 & 69 & 54 \end{pmatrix} + \begin{pmatrix} 25 & 35 & 40 \\ 30 & 22 & 36 \end{pmatrix}$$

$$= \begin{matrix} 1 & 2 & 3 \\ \begin{pmatrix} 180 & 189 & 184 \\ 155 & 156 & 130 \end{pmatrix} \end{matrix} \begin{matrix} Boys \\ Girls \end{matrix}$$

Is the total production of clothing in each style for boys and girls.

10. Two farmers Ram Kishan and Gurcharan singh cultivate only three varieties of rice namely Basmati, Permal and Naura. The sale(in Rs.) of these varieties of rice by both the farmers in the month of September and October are given by the following matrices A and B.
Solution:

$$A = \begin{matrix} Basmati & Permal & Naura \\ \begin{pmatrix} 10000 & 20000 & 30000 \\ 50000 & 30000 & 10000 \end{pmatrix} \end{matrix} \begin{matrix} September\ sales \\ RamKishan \\ GurucharanSingh \end{matrix}$$

$$B = \begin{matrix} Basmati & Permal & Naura \\ \begin{pmatrix} 5000 & 10000 & 6000 \\ 20000 & 10000 & 10000 \end{pmatrix} \end{matrix} \begin{matrix} October\ sales \\ Ram\ Kishan \\ Gurucharan \end{matrix}$$

Find: (i) What were combined sales in September and October for each farmer in each variety?   (ii) What was the change in sales from September to October?(iii)If both farmers receive 2% profit on gross rupees sales, compute the profit for each farmer and for each variety in October.
Solution:

September sales matrix = $A = \begin{pmatrix} 10000 & 20000 & 30000 \\ 50000 & 30000 & 10000 \end{pmatrix}$

October sales matrix = $B = \begin{pmatrix} 5000 & 10000 & 6000 \\ 20000 & 10000 & 10000 \end{pmatrix}$

Combined sales = A + B = $\begin{pmatrix} 10000 & 20000 & 30000 \\ 50000 & 30000 & 10000 \end{pmatrix} + \begin{pmatrix} 5000 & 10000 & 6000 \\ 20000 & 10000 & 10000 \end{pmatrix}$

$= \begin{pmatrix} 15000 & 30000 & 36000 \\ 70000 & 40000 & 20000 \end{pmatrix}$

Change in sales = A - B = $\begin{pmatrix} 10000 & 20000 & 30000 \\ 50000 & 30000 & 10000 \end{pmatrix} - \begin{pmatrix} 5000 & 10000 & 6000 \\ 20000 & 10000 & 10000 \end{pmatrix}$

$$= \begin{pmatrix} 5000 & 10000 & 24000 \\ 30000 & 20000 & 0 \end{pmatrix}$$

Profit at 2% in October = 2% of B = $\dfrac{2}{100} \begin{pmatrix} 5000 & 10000 & 6000 \\ 20000 & 10000 & 10000 \end{pmatrix} = \begin{pmatrix} 100 & 200 & 120 \\ 400 & 200 & 200 \end{pmatrix}$

Ans: Ram krishan receives Rs. 100, Rs. 200 and Rs. 120 as profit in each variety in October.
Gurucharan receives Rs. 400, Rs. 200 and Rs. 200 as profit in each variety in October.

11. In a legislative assembly election, a political group hired a public relations firm to promote its candidate in three ways, telephone, house calls and letters. The cost per contact (in paise) is given

in matrix A as $A = \begin{pmatrix} 40 \\ 100 \\ 50 \end{pmatrix} \begin{matrix} Telephone \\ House\ calls \\ Letter \end{matrix}$ *Cost per contact* . The number of contacts of each type made in

two cities X and Y is given in matrix B as :
$$\begin{matrix} & Telephone & House\ calls & Letter \\ & 100 & 500 & 5000 & X \\ & 3000 & 1000 & 10000 & Y \end{matrix}$$
Find the total amount spent by the group in two cities X and Y.

Solution:

Cost matrix = A = $\begin{pmatrix} 0.40 \\ 1.00 \\ 0.50 \end{pmatrix}$

Units used = B = $\begin{pmatrix} 100 & 500 & 5000 \\ 3000 & 1000 & 10000 \end{pmatrix}$

Total amount spent = BA = $\begin{pmatrix} 100 & 500 & 5000 \\ 3000 & 1000 & 10000 \end{pmatrix} \begin{pmatrix} 0.40 \\ 1.00 \\ 0.50 \end{pmatrix} = \begin{pmatrix} 40 + 500 + 2500 \\ 1200 + 1000 + 5000 \end{pmatrix}$

$$= \begin{pmatrix} 3040 \\ 7200 \end{pmatrix}$$

Ans: Amount spent in city X = Rs. 3040; Amount spent in city Y = Rs. 7200

12. The Book shop of a particular school has 10 <u>dozen</u> Chemistry books, 8 <u>dozen</u> Physics books, 10 <u>dozen</u> Economics books. The selling prices are Rs. 80, Rs. 60 and Rs. 40 each respectively. Find the total amount the bookshop will receive from selling all the books, using matrices. What is the benefit of book reading habit.

Solution:
No. of Chemistry books = 10 x 12 = 120

No. of Physics books   = 8 x 12 = 96

No. of Economics books = 10 x 12 = 120

Quantity Matrix = A = (120   96   120)

Price matrix (in Rs.) = B = $\begin{pmatrix} 80 \\ 60 \\ 40 \end{pmatrix}$

Total amount = AB = $\begin{pmatrix} 120 & 96 & 120 \end{pmatrix} \begin{pmatrix} 80 \\ 60 \\ 40 \end{pmatrix}$

$= (120 \times 80 + 96 \times 60 + 120 \times 40) = Rs.20160$

Ans: Book shop will receive Rs. 20160.

Value: Book reading habit will give knowledge. Apart from class observation book reading helps in revision.

13. A contractor purchased 300kg of iron and 100bags of cement from firm A, 1100kg of iron and 300 bags of cement from firm C. The cost of iron is Rs. 160 per kg and that of the cement Rs. 210 per bag. Represent the material purchased and their cost in the matrix. Find the amount paid to each firm by the contractor.

Solution:

Quantity matrix = $\begin{array}{c} I \\ II \\ III \end{array} \begin{pmatrix} \overset{Iron}{\underset{(kg)}{300}} & \overset{Cement}{\underset{(bags)}{100}} \\ 100 & 300 \\ 200 & 200 \end{pmatrix}$ Price Matrix (in Rs.) = $\begin{pmatrix} 160 \\ 210 \end{pmatrix}$

$AB = \begin{pmatrix} 300 & 100 \\ 100 & 300 \\ 200 & 200 \end{pmatrix} \begin{pmatrix} 160 \\ 210 \end{pmatrix} = \begin{pmatrix} 48000 + 21000 \\ 16000 + 63000 \\ 32000 + 42000 \end{pmatrix} = \begin{pmatrix} 69000 \\ 79000 \\ 74000 \end{pmatrix}$

Ans: Contractor paid Firm I = Rs. 69000

Contractor paid Firm II = Rs. 79000

Contractor paid Firm III = Rs. 74000

14. The sum of three numbers is -1. If we multiply second number by 2, third number by 3 and add them we get 5. If we subtract the third number from the sum of the first and second numbers we get -1. Represent it by a system of equation. Find the numbers using inverse of a matrix.
(Ans: -(7/2), (5/2), 0) (Try yourself)

15. The cost of 4kg of onion, 3kg of wheat and 2kg of rice is Rs. Rs. 60. The cost of 2kg of onion, 4kg of wheat and 6kg of rice is Rs. Rs. 90, The cost of 6kg of onion, 2kg of wheat and 3kg of rice is Rs. Rs. 70. Find the cost of each item per kg by matrix method. **(Ans: Rs.5, Rs.8 and Rs.8)(Try yourself)**