1. A manufacturing firm produces two products A and B. Each of these products must be processed through two different machines. One machine has 12 hours and second machine has 8 hours of available capacity. Each unit of Product A requires two hours of time on both the machines. Each unit of product B requires three hours of time on first machine and one hour of tie on second machine. The incremental profit is Rs. 6 per unit of product A and Rs. 7 per unit of product B and the firm can sell as many units of each product it can manufacture.

The objective of the firm is to maximize profits. The problem is to determine how many units of product A and product B should be produced within the limit of available machine capacities.

2. XYZ factory manufactures two articles A and B. To manufacture articles A, a certain machine has to work for 1.5 hours and in addition a craftsman has to work for 2 hours. To manufactures articles B, the machine has to be worked for 2.5 hours and in addition the craftsman has to work 1.5 hours. In a week factory can avail of 80 hours of machine time and 70 hours of craftsman's time. The profit on each article A is Rs. 50 and that on each articles B is Rs. 40. If all the articles produced can be sold away, find how many of each kind should be produced to earn maximum profit each week.

a. formulate the problem as LP. Model.

b. Solve it graphically.

3. A toy company manufacture 2 types of dolls. A basic version – doll A, deluxe version – doll B. Each doll of type B takes twice as much to produce as one of type A and the company would have time to make a maximum of 2,000 per day. The supply of plastic is sufficient to produce 1,500 dolls per day (both A and B combined). The deluxe version requires a fancy ess of which there are only 600 per day available. If the company makes a profit of Rs. 3 and Rs. 5 per doll respectively on doll A and B, then how many of each doll should be produced per day in order to maximize the total profit.

4. R.K. Steel manufacturing Company produces two items P1 and P2. It uses sheet metal, equipment and labour. Input – Output relationship, resources available are as follows:

Input	Product requirement per unit		Availability
	P1	P2	
Sheet Metal	1 Sq.cm	1 Sq.cm	50 Sq.cm
Labour	1 Man hour	2 Man hour	80 man hours
Equipment	3 hour	2 hour	140 hours
Profit (Rs.)	Rs. 4 per unit	Rs. 3 per unit	

How many units of P1 and P2 should be manufactured to maximize the profit of the company? Use Graphical Method.

5. A company produces two products A & B each of which requires three types of processing. The time required for processing each unit of A & B & profit contributions of each product per unit are given below:

	Product A(Time required in hours)	Product B (Time required in hours)	Available capacity per day in hours.
Process I	120	120	8400
Process II	30	60	3000
Process III	80	40	4800
Profit per unit in Rs.	50	70	

How many units of each product the company should produce per day in order to maximize the profit? Use Graphical or Simplex method of Linear programming.

6. A furniture manufacturer makes two products – chairs and tables. Processing of these products is done on two types of machines A and B chair requires 2 hours on machines types A and 6 hours on machine type B. A table requires 5 hours on machine types A and no time on machine type B. There are 16 hours /day available on machine type A and 30 hours/day on machine type B. Profit gained by the manufacture from a chair and a table are Rs. 2/- and Rs. 10/- respectively. Use graphical or simplex method of Linear Programming to find the solution.

7. A diet conscious housewife to ensure certain minimum intake of vitamin A, B, C for the family. The minimum daily needs of the vitamin A,B,C for the family are 30, 20 & 16 units respectively. For the supply of these minimum vitamin requirement, the housewife relies on two fresh foods, F1 and F2. The F1 provides 7,5, 2 units of the three vitamins per gram respectively and the F2 provides 2,4,8 units of the same three vitamins per gram of the foodstuff respectively. F1 costs Rs. 3 per gram and F2 costs Rs. 2 per gram. How many grams of each foodstuff should the housewife buy everyday to keep her food bill low as possible?

8. A confectioner sells two products A and B. the contribution of A is Rs.30/- and B is also Rs. 30/- . The products are produced in a common production process. The production process has a capacity of 30,000 man – hours. It takes 3 hours to produce a unit of A and 1 hour to produce a unit of B. the market for the product Has been surveyed and confectioners knows that a maximum number of 8000 units of product A can be sold. And similarly a maximum number of 12,000 units of B can be sold. Formulate this a linear programming problem to maximize contribution and solve graphically.

9. ABC Ltd. manufactures tables & chairs. They have just acquired a new workshop that can operate 48 hours a week. Production of a table will require 2 hours & a chair will require 3 hours of production time. Each table will contribute Rs. 40/- to profit while a air contributes Rs.80/- the marketing department has determined that maximum of 15 tables & 10 chairs can be sold every week. Formulate the linear programming model & determine the optimum production mix of tables & chairs that will maximize profits for the company, by using graphical method or simplex method of linear programming.

10. A manufacture produce two different models X & Y of the same products. Model X makes a contribution of Rs. 50 per unit and model Y, Rs. 30 per unit towards total profit. Raw Material R1 & R2 are required for production. At least 18 kg or R1 and at least 12Kg of R2 must be used daily. Also at most 34 hours are to be utilized. A quantity of 2Kg of R1 is required for X and 1 Kg of R1 is required for Y. For each of X & Y, 1 kg of R2 is required. It takes 3 labour hours to manufacture X & 2 Labour hours to manufacture Y. How many units of each model should be produced to maximize the profit?

Formulate the LPP and solve graphically.

11. M/S Print Well Pvt. Ltd. are facing a tight financial squeeze and hence are attempting cost saving wherever possible. The current is to print a book in hard cover and in paperback. The cost of hard cover type is Rs. 600/- per 100 copies and Rs. 500/- per 100 copies of paperback type. The company decides to run their two printing presses PI and PII for atleast 80 hours and 60 hours respectively every week. PI can produce 100 hard cover book in 1 hour and 100 paper backs in 1 hour. PII can produce 100 hard cover books in 1 hour and 100 paper backs in 2 hours.

Determine how many books of each type should be produced to minimize costs. Use simplex or graphical method of linear programming.

12. The management of an oil refinery must decide an optimum mixing process of two qualities of oil. Process one, uses one barrel of crude oil A and three barrels of crude oil B to get an output of 40 gallon of gasoline M and 15 gallons of gasoline N. Process two, needs four barrels of crude oil A and two barrels of crude oil B for an output of 30 gallons of gasoline M and 70 gallons of gasoline N. The maximum amounts available of crude oil A and B are 100 barrels and 150 barrels respectively. It is necessary to produce at least 2500 gallons of gasoline M and 2000 gallons of 5,000 respectively.

Formulate the above problem as LP problem.

13. The owner of fancy goods shop is interested to determine how many advertisement to release in the selected three magazines A,B and C. his main purpose is to advertise in such a way that total exposure to principal, buyers of his goods is maximized. Percentages of readers for each magazine are known. Exposure in any particulars magazines is the number of advertisements released multiplied by the number of principal buyer. The following data are available.

Particulars	Magazines		
	A	**B**	**C**
Readers	1.0 lakhs	0.6 lakhs	0.4 Lakhs
Principal buyers	20%	15%	8%
Cost Per Advertisement	8,000	6,000	5,000

The budgeted amount is at the most Rs. 1.0 Lakh for the advertisement. The owner has already decided that magazine A should have no more than 15 advertisement and that B and C each gets at least 8 advertisements. Formulate a linear programming model for this problem. DO NOT SOLVE.

14. Jack is a fresh student at college. He realizes that all work (study) and no play makes Jack a dull boy as a result jack wants to apportion his time of about 10 hours a day between work and play. He estimates that play is twice as much as fun as work. He also wants to study at least as much as he play's. However jack realizes that if he is going to get all his homework assignment done he cannot play more than 4 hours a day. How should jack allocate his time to maximize his pleasure from work and play. Formulate as LPP and solve by graphical method.

15. GJ Bottling Ltd. have two bottling plants, one located at G and the other at J. Each plant bottles three soft drinks namely A, B and C. Number of bottles bottled per day is as follows:

Drink	Plant at	
	G	J
A	1,500	1,500
B	3,000	1,000
C	2,000	5,000

A market survey indicates that during the next month, there will be demand of at least 20,000 bottles of A, at least 41,000 bottles of B and at least 44,000 bottles of C. The operating cost per day for plants at G and J are 600 and 400 rupees respectively. For how many days each plant be run next month to minimize operating costs, while still meeting the market demand?
Use graphical method of Linear Programming.

**********************THE END*********************