Exercise 18:

A company has 2 grades of inspectors 1&2. It is required that at least 1800 pieces be inspected per 8 hour day. Grade 1 inspectors can check pieces at the rate of 25 per hour with an accuracy of 98%. Grade 2 inspectors can check at the rate of 15 pieces per hour with an accuracy of 95%. Grade 1 costs 4 L.E/hour, grade 2 costs 3 L.E/hour. Each time an error is made by an inspector costs the company 2 L.E. There are 8 grade 1 and 10 grade 2 inspectors available. The company wants to determine the optimal assignment of inspectors which will minimize the total cost of inspection/day.

Exercise 19:

Fresh Products Company is engaged in the business of breading cow's quits farm. Since it is necessary to ensure a particular level of nutrients in their diet, Fresh Product Company buys two products P1 & P2. The details of nutrient constituents in each of which are as follows:

Nutrient Type	*Nutrient Constituents in the product*		*Minimum nutrient requirements*
	P1	*P2*	
A	*36*	*6*	*108*
B	*3*	*12*	*36*
C	*20*	*10*	*100*

The cost prices of both P1 & p2 are $ 20 per unit & $ 40 per unit respectively. Formulate as a linear programming model to ascertain how much of the products P1 & p2 must be purchased so as to provide the cows nutrients not less than the minimum required.

Exercise 20:

A firm produces an alloy having the following specifications:

1. ***Specific gravity >= 0.98***
2. ***Chromium >= 8%***
3. ***Melting point >= 450 °c***

Raw materials A, B and C having the properties shown in the table can be used to make the alloy.

Property	*Raw material*		
	A	*B*	*C*
Specific gravity	*0.92*	*0.97*	*1.04*
Chromium	*7%*	*13%*	*16%*
Melting point	*440°c*	*490°c*	*480°c*

Cost of the various raw materials per unit ton are $90 for A, $280 for B and $40 for C. find the proportions in which A,B and C be used to obtain an alloy of desired properties while the cost of raw materials is minimum.

Exercise 21:

A carpenter makes tables and chairs. Each table can be sold for a profit of £30 and each chair for a profit of £10. The carpenter can afford to spend up to 40 hours per week working and takes six hours to make a table and three hours to make a chair. Customer demand requires that he makes at least three times as many chairs as tables. Tables take up four times as much storage space as chairs and there is room for at most four tables each week.
Formulate this problem as a linear programming problem.

Exercise 22:

Jimmy is baking cookies for a bake sale. He is making chocolate chip and oatmeal raisin cookies. He gets 25 cents for each chocolate chip cookie and 30 cents for each oatmeal raisin cookie. He cannot make more than 500 cookies of each kind, and he cannot make more than 800 cookies total. He must make at least one-third as many chocolate chip cookies as oatmeal raisin cookies. How many of each kind of cookies should he make to get the most money?

Exercise 23:

Consider a furniture manufacturer who produces tables and chairs. He knows two different types of wood and various amounts of labor are required for each product. Specifically, each table requires 5 board-feet (bd.ft) of oak, 2bd.ft of pine, and 4 labor-hours (labor.h). Each chair requires 2bd.ft of oak, 3bd.ft of pine, and 2labor.h. The manufacturer can sell all that is produced and make $12 profit per table and $8 profit per chair. However, only 150 bd.ft of oak, 100 bd.ft of pine, and 80 labor.h are available for the upcoming week. The manufacturer wishes to know how much of each product should be made so as to maximize profit.

Exercise 24:

A company is involved in the production of two items (X and Y). The resources need to produce X and Y are twofold, namely machine time for automatic processing and craftsman time for hand finishing. The table below gives the number of minutes required for each item:

Item	*Machine Time*	*Craftsman Time*
X	*13*	*20*
Y	*19*	*29*

The company has 40 hours of machine time available in the next working week but only 35 hours of craftsman time. Machine time cost is £10 per hour worked and craftsman time cost £2 per hour worked. Both machine

and craftsman idle times incur no costs. The revenue received for each item produced (all production is sold) is £20 for X and £30 for Y. The company has a specific contract to produce 10 items of X per week for a particular customer. Formulate the problem as a LP problem.

Exercise 25:

A furniture manufacturer makes two types of furniture, chairs and sofas. The production of the sofas and chairs requires three operations carpentry, finishing, and upholstery. Manufacturing a chair requires 3 hours of carpentry, 9 hours of finishing, and 2 hours of upholstery. Manufacturing a sofa requires 2 hours of carpentry, 4 hours of finishing, and 10hours of upholstery. The factory has allocated at most 66 labor hours for carpentry, 180 labor hours for finishing, and 200 labor hours for upholstery. The profit per chair is $90 and the profit per sofa is $75. How many chairs and how many sofas should be produced each day to maximize the profit?

Exercise 26:

The Woodell Carpentry Shop makes bookcases and cabinets. Each bookcase requires 15 hours of woodworking and 9 hours of finishing. The cabinets require 10 hours of woodworking and 4.5 hours of finishing. The profit is $60 on each bookcase and $40 on each cabinet. There are 70 hours available each week or woodworking and 36 hours available for finishing. How many of each item should be produced in order to maximize profit?

Exercise 27:

A farmer has a 100 acre farm. He can sell tomatoes, lettuce or radishes. The price he can obtain is $1 per Kg tomatoes, $.75 per head of lettuce and $2 per Kg of radishes. The average yield per acre is 2000 Kg of tomatoes, 3000 head of lettuce and 1000Kg of radishes. Fertilizer is available at $.5 per Kg and the amount required per acre is 100 Kg each for tomatoes and lettuce and 50 Kg for radishes. Labor required for sowing, cultivating and harvesting per acre is 5 man-days for tomatoes and radishes and 6 man-days for lettuce. A total of 400 man-days of labor are available at $20 per man-day. Formulate the LP model for this problem in order to maximize the farmer's total profit.