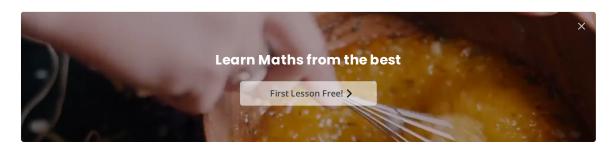
Linear Programming Examples

Resources > Academic > Maths > Linear Algebra > Linear Programming > Linear Programming Examples





Chapters

Example 1

Solution

Example 2

Solution

hat is Linear Programming?

Linear programming is used to optimize a linear objective function and a system of linear inequalities or equations. The limitations set on the objective function are called as constraints. The objective function represents the quantity which needs to be minimized or maximized. Linear programming's main objective is to optimize the objective function.

The assumptions for a linear programming problem are given below:

- The limitations on the objective function known as constraints are written in the form of quantitative values.
- The objective function must be a linear function.
- The relationship between the objective function and the constraints must be linear.
 Linear programming problems can be solved using multiple methods. The most common methods are simplex method, solving the problems using R or open solver, and graphical method. In this article, we will solve the linear programming problems using the graphucal method.

Example 1

A store has requested a manufacturer to produce pants and sports jackets.

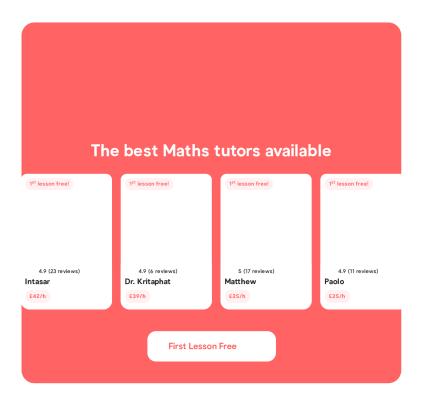
of polyester. Every pair of pants (1 unit) needs

of cotton and

of polyester. Every jacket needs

of cotton and

of polyester. The price of the pants is fixed at \$50 and the jacket, \$40. What is the number of pants and jackets that the manufacturer must give to the stores so that these items obtain a maximum sale?



Solution

Choose the unknowns. x = number of pants y = number of jackets Step 2 - Write the <u>objective function</u>.

Step 3 - Identify the set of Constraints

To write the constraints, use a table:

	pants	jackets	available
cotton	1	1,5	750
polyester	2	1	1,000

As the number of pants and jackets are $\underline{natural\ numbers},$ there are two more constraints:

x ≥ 0

y ≥ 0

Step 4 - Choose the method for solving the problem

There are many methods to solve a linear programming method. In this problem, we will find the solution of the problem graphically.

Step 5 - Construct the graph

Represent the constraints graphically.

As $x \ge 0$ and $y \ge 0$, work in the first quadrant.

 $\label{lem:continuous} \textbf{Represent the straight lines from their points of intersection with the axes.}$

Solve the inequality graphically: plane, for example (0,0).	, and take a point on the
Since inequality is satisfied.	then the point (0,0) is in the half plane where the
Similarly, solve	•
Step 6 - Identify the feasible region The area of intersection of the solutions of the ineq	
inequalities, which is the set of feasible solution	
Step 7 - Find the optimum point	

Calculate the coordinates of the vertices from the compound of feasible solutions.

The optimal solution, if unique, is in a vertex. These are the solutions to the systems:

:

Now,

we

will

c alculate the value of the objective function at each of the vertices to determine which of them has the maximum or minimum values. It must be taken into account the possible non-existence of a solution if the compound is not bounded.

In the objective function, place each of the vertices that were determined in the previous step.

Maximum

The optimum solution is to make 375 pants and 250 jackets to obtain a benefit of \$28,750.

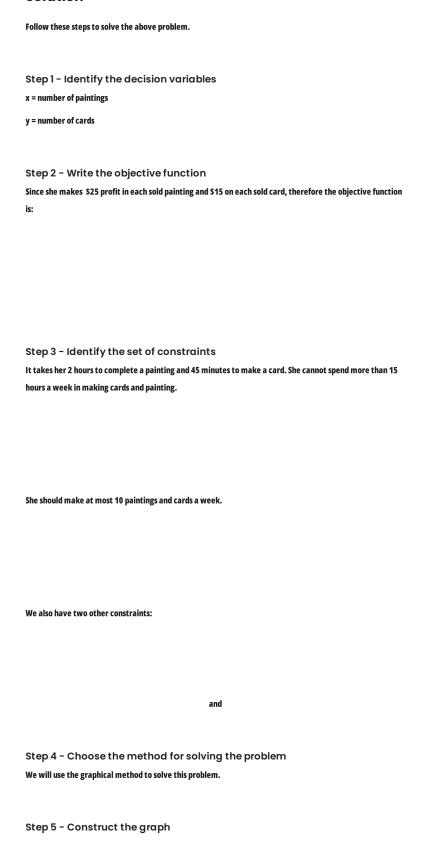
The solution is not always unique, so we can also find other solutions.

Example 2

each week to maximize her profit.

Maria has an online shop where she sells hand made paintings and cards. She sells the painting for \$50 and the card for \$20. It takes her 2 hours to complete 1 painting and 45 minutes to make a single card. She also has a day job and makes paintings and cards in her free time. She cannot spend more than 15 hours a week to make paintings and cards. Additionally, she should make not more than 10 paintings and cards per week. She makes a profit of \$25 on painting and \$15 on each card. How many paintings and cards should she make

Solution



Step 6 - Identify the feasible region

The green highlighted area is the feasibility region of the graph

Feasibility region of the graph

Step 7 - Find the optimum point

Use the coordinates of the vertices and substitute them in the objective function to yield the maximum point.

Maximum

The above calculations show that Maria can make the maximum profit of \$210 a week by making 6 paintings and 4 cards.



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Emma

I am passionate about travelling and currently live and work in Paris. I like to spend my time reading, gardening, running, learning languages and exploring new places.

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Q1.A manufacturer of purses makes four styles of pur minutes to assemble: a shoulder-strap bag. taking on minutes for assembly, and pocket purse requiring 30 assembly time available per day. The profit contributi 16, Rs 25 on a shoulder-strap hag. and Rs 12 each on to A special kind of fancy pins are used in decorating popieces. Diferent types of pins are used in other three to Enough raw material is available for a total of sixty populatity of raw material. The manufacturer estimates shoulder strup bags every day. Formulate a linear profits of the second	e hour to assemble; a tote hag, needing 45 minutes to assemble. There are 32 hours of ion on the sale of a three-compartment bag is Rs. nte hag and pocket rurse cket purses and they are available for only thirty types of bags of which only seventy are in stock. beket purses and tote bags which need the same is a minimum demand of six pocket purses and the

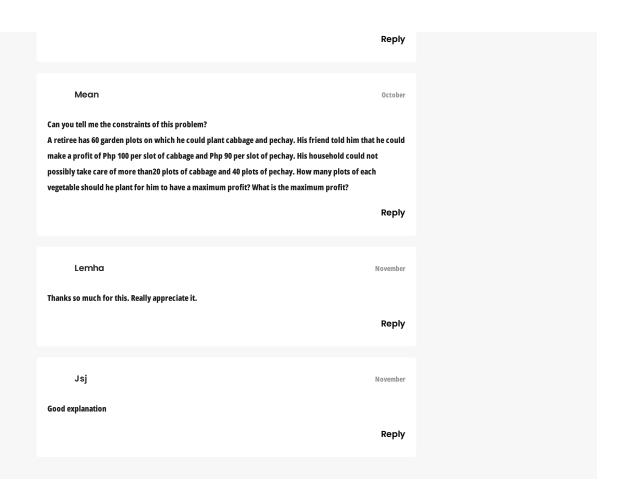
1. Evening shift resident doctors in a government hospital work five consecutive days and have two consecutive days off.

December

Anurag

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indefinitely. The hospital requires the
             following minimum number of doctors working:
             Sun Mon Tues Wed Thurs Fri Sat
             35 55 60 50 60 50 45
             No more than 40 doctors can start their five working days on the same day. Formulate a LPP
             model to minimize the
             number of doctors employed by the hospital.
                                                                                              Reply
                     Efrata
                                                                                            December
             Awesome
                                                                                              Reply
                     Maximum Prime
                                                                                              January
             w – 3 Compartment Bag
             x – shoulder Strap
             y – tote bag
             z – pocket purse
             Objective Function:
             16w+25x+12y+12z – Maximize
             Contraints:
             C1: .75w + x + .75y + .5z <= 32
             C2: 0 <= w <= Infinity
             C3: 6 <= x <= Infinity
             C4: 0 <= y <= infinity
             C5: 6 <= z <= 30
             C6: y+z <= 60
             C7: w+x+y <= 70
             Solution:
             Prod 3 Compartment bag, units 0.0
             Prod Shoulder Strap , units 29.0
             Prod Tote Bag, units 0.0
             Prod Pocket Purse , units 6.0
                                                                                              Reply
       ramchax
                                                                                                April
Owesome
                                                                                              Reply
       Fungo
Wow that's nice
                                                                                              Reply
       Andrew
                                                                                           September
Thanks for posting this. It's a great help. Very clear and detailed.
```

Their five days of work can start on any day of the week and the schedule rotates





Theory

Steps to Solve a Linear Programming Problem

Linear Programming



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