A **linear function** in x and y has the form

$$P = a\,x + b\,y$$

where a and b are constants.

The problem of optimizing a linear function in two nonnegative variables, subject to constraints represented by a system of linear inequalities and linear equations, is called a **linear programming** problem in 2 variables.

The function to be maximized or minimized is called the **objective function**.

The (usually infinitely many) solutions to the system of constraints are called **feasible solutions** or **feasible points**. The collection of feasible solutions is the **feasible region**.

The solution(s) that maximizes or minimizes the value of the objective function is called the **optimum solution(s)**.

If a feasible region can be contained within a circle (of some finite radius) it is called a **bounded feasible region**; otherwise, it is **unbounded**.

If a feasible region contains at least one point it is said to be **nonempty**; otherwise, it is **empty**.

A **standard feasible region** is a bounded feasible region which includes all corners, edges and a nonempty interior.

* **Fundamental Theorem of Linear Programming**

  A linear function defined on a standard feasible region has a maximum (minimum) value and this value can be found at a corner.

* If the feasible region is empty, there is no optimum solution.

* If a feasible region is unbounded, and if the objective function has a maximum (or minimum) value, then that value will occur at a corner.

* When an objective function attains its optimum value at more than one feasible point we say that

multiple optimum solutions exist.

If (a, b) and (c, d) are corner points at which an objective function is optimum, then the function will also be optimum at all points (x, y) where

$$x = (1 - t)\, a + t\, c$$

$$y = (1 - t)\, b + t\, d$$

and $0 \leq t \leq 1$.