1.8.4. Objective of the Problem

To maximise the profit how much of *X* and *Y* are to be manufactured? That is **maximization of the profit or maximization of the returns** is the objective of the problem. For this in the statement it is given that the profit contribution of X is Rs 5/- per unit and that of product Y is Rs. 7/- per unit.

1.8.5. To establish relationship between variables and constraints and build up a model

Let us say that company manufactures x units of *X* and y units of *Y*. Then as one unit of *x* consumes one hour on machine A and one unit of y consumes one hour on machine A, the total consumption by manufacturing *x* units of *X* and y units of *Y* is, $1x + 1y$ and this should not exceed available capacity of 40 hours. Hence the **mathematical relationship in the form of mathematical model is $1x + 1y \leq 40$**. This is for resource machine *A*. Similarly for machine *B* and machine *C* we can formulate the mathematical models. They appear as shown below:

$3x + 8y \leq 240$ for machine *B* **and $10x + 7y \leq 350$** for machine *C*. Therefore, the mathematical model for these resources are:

$$1x + 1y \leq 40$$
$$3x + 8y \leq 240 \text{ and}$$
$$10x + 7y \leq 350.$$

Similarly for objective function as the company manufacturing x units of *X* and y units of *Y* and the profit contribution of *X* and Y are Rs.5/- and Rs 7/- per unit of *X* and *Y* respectively, the total profit earned by the company by manufacturing *x* and *y* units is **$5x + 7y$.** This we have to maximise. Therefore **objective function is Maximise $5x + 7y$.** At the same time, we have to remember one thing that the company can manufacture any number of units or it may not manufacture a particular product, for example say $x = 0$. But it cannot manufacture negative units of *x* and *y*. Hence one more constraint is to be introduced in the model *i.e.* **a non - negativity constraint.** Hence the mathematical representation of the contents of the statement is as given below:

Maximise $Z = 5x + 7y$ Subject to a condition (written as s.t.) ⟶ **OBJECTIVE FUNCTION.**

$1x + 1y \leq 40$
$3x + 8y \leq 240$ ⟶ **STRUCTURAL CONSTRAINTS.**
$10x + 7y \leq 350$ and

Both *x* and *y* are ≥ 0 ⟶ **NON-NEGATIVITY CONSTRAINT.**

1.8.6. Identify the possible alternative solutions (or known as Basic Feasible Solutions or simply BFS)

There are various methods of getting solutions. These methods will be discussed later. For example we go on giving various values (positive numbers only), and find various values of objective function. All these are various Basic Feasible Solutions. For example $x = 0,1,2,3$, etc. and $y = 0,1,2,3$ etc are all feasible values as far as the given condition is concerned. Once we have feasible solutions on hand go on asking is it maximum? Once we get maximum value, those values of x and y are optimal values. And the value of objective function is **optimal value of the objective function**. These two steps we shall discuss in detail in the next chapter.

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