

# PRODUCTION AND COSTS

## I. Choose the correct answer

- The formula of production function is
  - $q = f(L, K)$
  - $q = d(p)$
  - $y = f(x)$
  - none of the above
- In the short run, a firm
  - Can change all inputs
  - Cannot vary all inputs
  - can keep the inputs fixed.
  - none of the above
- The change in output per unit of change in the input is called
  - Marginal product
  - Average product
  - total product
  - product
- Cobb-Douglas production function is
  - $q = (x, x)$
  - $q = (x_1, x_2)$
  - $q = (x_1^\alpha, x_2^\beta)$
  - $q = (0)$
- TC =
  - TVC
  - TFC
  - TFC + TVC
  - AC + MC

Answers : [ 1) a 2) b 3) a 4) c 5) c ]

## II. Fill in the blanks

- In the long run, all inputs are variables.
- Average Product is defined as the output per unit of variable input.
- Marginal product and average product curves are Inverse U in shape.
- SMC curve cuts AVC curve at the Minimum point of AVC curve from below.
- Isoquant Curve is the set of all possible combinations of the two inputs that yield the same max possible level of output.

## III. Match the following

1.

A	B
1. CRS	a. $\Delta TC / \Delta Q$
2. SAC	b. Long run average cost
3. LRAC	c. Short run average cost
4. TFC + TVC	d. Constant returns to scale
5. SMC	e. TC

Answers : [ 1 - d 2 - c 3 - b 4 - e 5 - a ]

**IV.** Answer the following questions in one word/ sentence

1. What do you mean by total product?

The total volume of goods and services produced during a specified time generally a year is called total product.

2. What is average product?

Per unit production of the variable factor is known as average product.

3. Give the meaning of marginal product.

Change in output per unit of change in the input when all other inputs are held constant is called marginal product.

4. Write the meaning of cost function of the firm.

The functional relationship between cost and output is called cost function.

5. What is total fixed cost?

The cost which do not vary directly with the level of output is called fixed cost.

**V.** Answer the following in 4 sentences.

1. What is Isoquant?

The set of all possible combinations of the two inputs that yield the same maximum possible level of output is called isoquants.

For example: when factors of production such as labor and capacity are combined in different proportions and put to use, they yield the same level of output. Since any combinations of these factors yields the same level of output.

2. Give the meaning of the concepts of short run and long run .

A period in which output can be changed by changing only variable factors is called short period. In the short run, production can be changed by increasing variable factors like unskilled labor, raw materials, fuels etc.

A period in which output can be changed by changing all factors of production is called long period. In long run firm can change its factory size, adopt to new techniques of production, purchase of new machinery.

3. Mention the types of Returns to scale.

These are three types of returns to scale, they are:

- a. Increasing Returns to Scale(IRS)

- b. Constant Returns to Scale(CRS)
- c. Decreasing Returns to Scale(DRS)

4. Name the short run costs.
- a. Total fixed cost
  - b. Total variable cost
  - c. Total cost
  - d. Average fixed cost
  - e. Average variable cost
  - f. Average cost
  - g. Marginal cost.

5. What are long run costs?

The cost of output in the long run is called long run costs.

In the long run, since all factors are variable, therefore all costs are variable. The distinction between fixed and variable cost disappears in the long run.

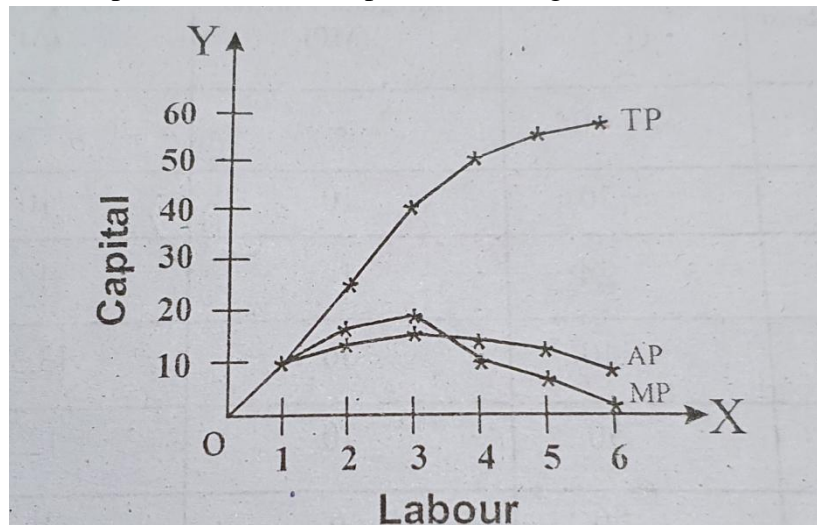
**VI.** Answer the following in 12 sentences.

1. Explain Isoquant with the help of diagram.

The set of all possible combinations of the two inputs that yield the same maximum possible level of output is called isoquants.

Isoquant curve indicates different combinations of two factors of production which can yield equal level of output to the producer of a given period.

The isoquant can be explained with the help of below diagram.



2. Explain TP, MP and AP with examples.

- a. Total Production (TP):

The total volume of goods and services produced during a specified period of time generally a year is called total product.

Total Product can be calculated using  $TP = \sum MP$

- Total product produced by 4 units of labor and capital are 70 units. They are sum of Marginal product of 1,2,3 and 4<sup>th</sup> units of labor and capital.

$$TP = \sum MP$$

$$70 = 25 + 20 + 15 + 10$$

b. Average Product(AP):

Per unit production of the variable factor is known as Average product.

When we divided total output by the quantities of a variable factor, we get average product. The following formula is used to calculate average product.

$$AP_L = TP_L / L$$

- Total product produced by 4 units of labor and capital is 70, calculate average product.

$$AP_L = TP_L / L$$

$$AP_L = 70 / 4 = 17.5$$

c. Marginal Product (MP):

The addition to total product by the employment of an additional unit of a factor is called marginal product.

Formula to calculate marginal product:

$$MP_L = TP_L - TP_{L-1}$$

Where

$MP_L$  = Marginal Production.

$TP_L$  = Total product of 'n' units.

$TP_{L-1}$  = total product of 'n - 1' units.

3. Write a brief note on return to scale.

The behavior of production or returns when all the productive factors are increased or decreased simultaneously in the same ratio is called returns to scale.

Stages of returns to scale:

When all the inputs are increase in the same proportion. The following three types of situations in output are observed. They are:

- Increasing Returns to Scale (IRS)
- Constant Returns to Scale(CRS)
- Diminishing Returns to Scale(DRS)

**Increasing Returns to Scale (IRS):**

When a proportional increase in all inputs results in increase in output by a larger proportion, is called Increasing Returns to Scale (IRS)

**Constant Returns to Scale (CRS):**

when a proportional increase in all inputs results in an increase in output by the same proportion is called Constant Returns to Scale.

**Diminishing Returns to Scale (DRS):**

When a proportional increase in all inputs results in an increase in output by a smaller proportion is called Diminishing Returns to Scale.

**VII.** Answer the following in 20 sentences.

1. Explain the various short run costs with example.

In short run there are some factors which are fixed, while others are variable.

Similarly short run cost can be divided into following types:

- a. Fixed cost:

Those which do not vary directly with the level of output is called fixed cost.

For example: rent of factory, salaries of permanent employees, licence fee

- b. Total variable cost:

Those costs which vary directly with the level of output is called variable cost.

Example: wage of temporary labors, electricity cost, raw materials.

- c. Total cost:

The total expenditure incurred by a firm on the factors of production required for the production of commodity is called total cost.

TC is the sum of total fixed cost and total variable cost at various levels of output. Total Cost can be written as  $TC = TFC + TVC$

- d. Average Fixed Cost:

The per unit of fixed cost of production is called Average Fixed Cost.

We obtain the Average fixed cost by dividing total fixed cost by the number of units produced. So  $AFC = TFC / Q$

- e. Average Variable Cost:

The per unit of variable cost of production of a commodity is called average variable cost. It is calculated by dividing TFC by total output,

$$AVC = TVC / Q$$

- f. Average Cost:

The per unit of total cost of production is called average cost. WE can obtain it by dividing cost by number of units produced ,

$$AC = TC / Q$$

g. Marginal Cost:

The cost of producing an extra unit of a commodity is called marginal cost.

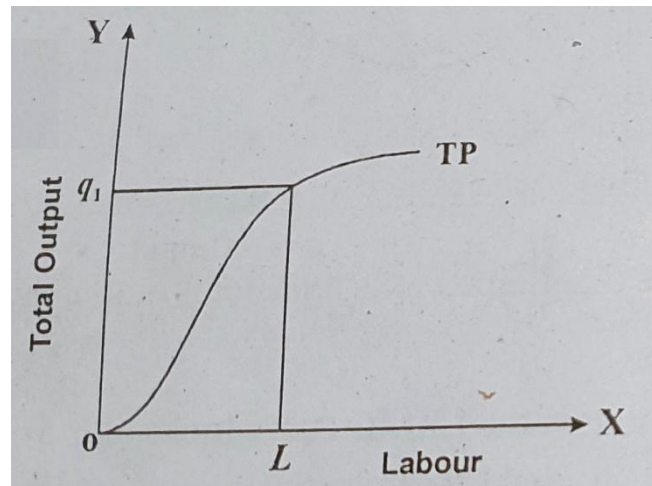
$$MC = TC_n - TC_{n-1}$$

2. Explain the shapes of TP, MP and AP curves.

a. Total Product(TP):

The total volume of goods and services produced during a specific period of time generally a year is called Total Product.

Total product can be increased by increasing the supply of variable factors in the short period. However in the longrun, total product can be raised by increasing both fixed and variable factors.



b. Marginal Product(MP):

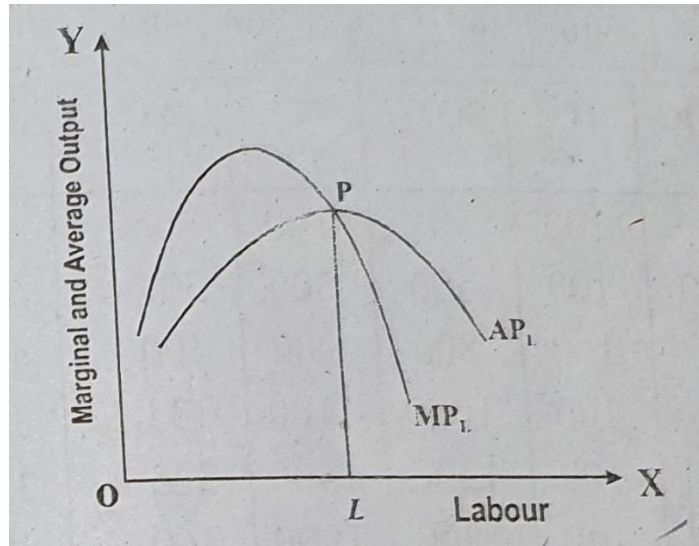
The addition to total product by the employment of an additional unit of factor is called marginal product.

According to the law of variable proportions, the marginal product of an input initially rises and then after a certain level of employment it starts falling. The MP curve therefore looks like an inverse U shaped curve.

c. Average Product(AP):

Per unit production of the variable factor is known as average product.

When we divided total output by the quantities of a variable factor we get average product. The shape of AP and MP curve can be shown in the following diagram.



3. Explain the law of variable proportions with the help of diagram.

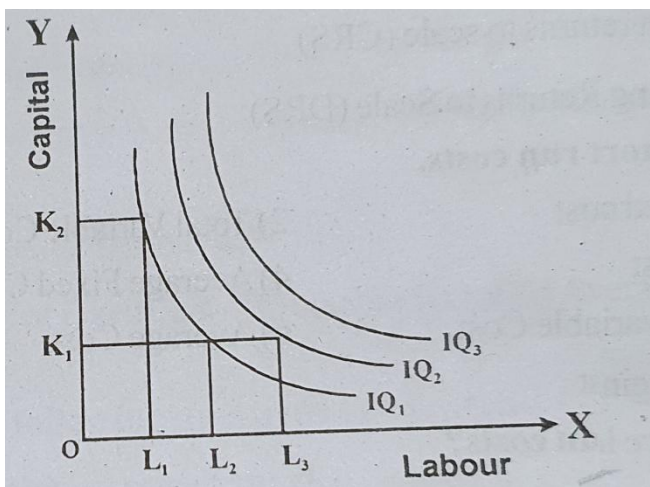
Law of variable proportions is one of the most important laws of production. It shows the nature of rate of change in output due to change in variable factors.

Statement of Law:

“ Law of variable proportions states that, as we increase quantity of only one input, keeping other inputs fixed, total product initially increases at an increasing rate, then at a decreasing rate. This can be explained with the help of following table”.

Land	Labor	Total output (TP)	Marginal Output (MP)	Average Output (AP)
4	0	0	-	-
4	1	10	10	10
4	2	24	14	12
4	3	40	16	13.33
4	4	50	10	12.5
4	5	56	6	11.2
4	6	57	1	9.5

This can be explained with the help of following diagram



In the above diagram, in the first phase, ever additional variable factor adds more and more to the total output. It means TP increases at an increasing rate and MP of each variable factor rises in a part and then falls. The average product curve rises throughout and remains below the MP curve.

**VIII.** Assignment and Project oriented questions

1. Find the missing products in the following table

<b>Factor 1</b>	<b>TP</b>	<b>MP<sub>1</sub></b>	<b>AP<sub>1</sub></b>
0	0	0	0
1	10	-	10
2	24	-	12
3	40	16	13.33
4	-	10	-
5	-	6	11.2
6	57	1	9.5

Solution

<b>Factor 1</b>	<b>TP</b>	<b>MP<sub>1</sub></b>	<b>AP<sub>1</sub></b>
0	0	0	0
1	10	10	10
2	24	14	12
3	40	16	13.33
4	50	10	12.5
5	56	6	11.2
6	57	1	9.5