NCERT Solutions for Class 12 Micro Economics

Chapter 3 – Production and Costs

1.

Explain the concept of a production function.

The link between the physical inputs utilized in production and the corresponding physical output is known as the production function. This illustrates how many input units result in the highest possible output. It can be shown as:

$$Q_x = f(L, K)$$

Where,

Q_x is the number of output units (x) generated.

L denotes units of labour employed

K stands for units of employed capital.

2.

What is the total product of an input?

Ans: It is the sum of all goods and services produced by a company using the inputs given to it within a given time frame.

3.

What is the average product of an input?

Ans: An input's average product is calculated by dividing its total product by the entire quantity of the variable input that was utilized to create it.

4.

What is the marginal product of an input?

Ans: The marginal product is the extra output that comes from hiring one more unit of labour. To put it another way, it's the change in total output that comes from hiring one more unit of

labour. In algebra, it is the ratio of the change in the total product to the change in the units of labour used.

5.

Explain the relationship between the marginal products and the total product of an input.

Ans: The law of varying proportions can be used to explain this. According to this law, the following alterations occur when all other inputs are held constant and only one variable factor input is permitted to increase:
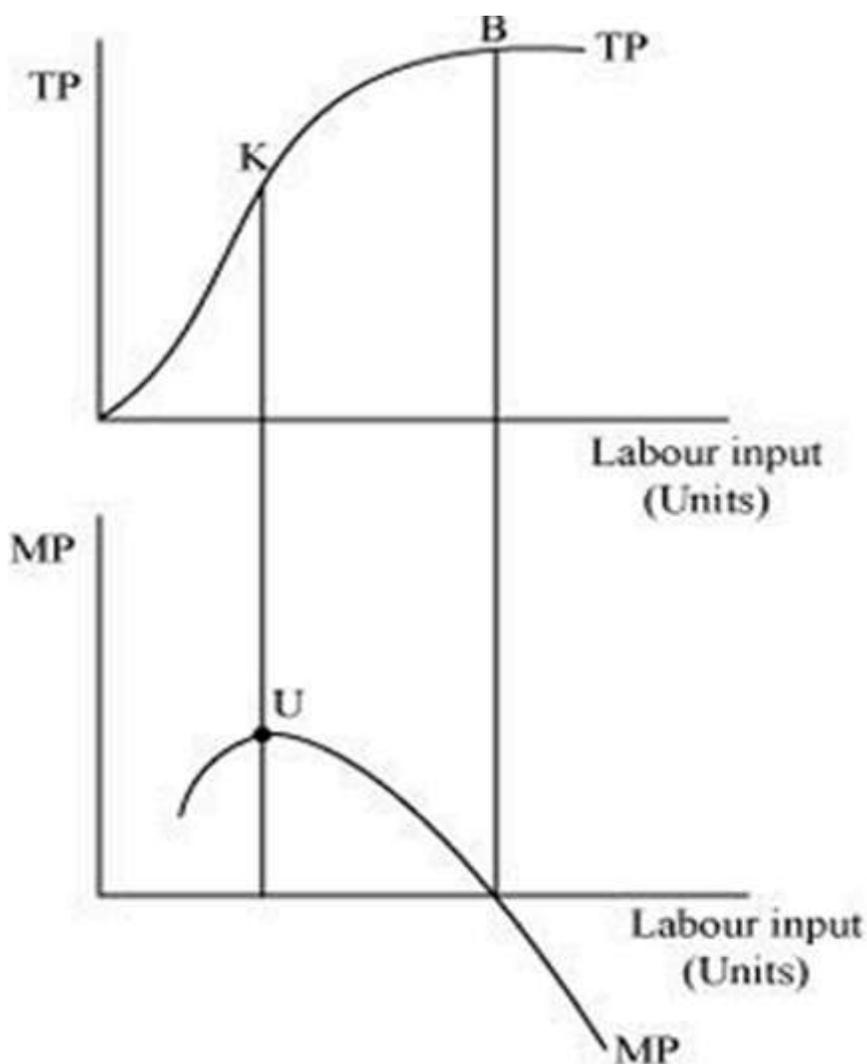
1. Total Product (TP) increases in tandem with an increase in Marginal Product (MP). Until the MP curve reaches its maximum, the effect produces a convex curve.

2. When MP decreases but remains positive, TP rises as the rate decreases, resulting in a concave total product.

3. The TP is at its highest when MP is at zero.

4. The TP decreases as MP turns negative.

6.

Explain the concepts of the short run and the long run.

Ans: The long run is a time frame during which the manufacturer has the ability to alter any aspect of the production, including the structure, machinery, etc. The manufacturer has a limited amount of time to alter the production method throughout the short-run. At least one production component is fixed over this time, while other factors may be altered or enhanced. A farmer with a set plot of land is an example of a short run.

7.

What is the law of diminishing marginal product?

Ans: This law states that the marginal product of the variable factor will first increase but eventually reach a point where it will begin to decline if the units of the variable factor continue to increase while the level of the fixed factor remains constant. Any more variable factors will have a marginal product of zero or maybe negative after this.

8.

What is the law of variable proportions?

Ans: The law of variable proportions says that if you combine more and more units of the variable factor (labor) with the same amount of the fixed factor (capital), the total result will go up at first, but after a certain point, it will start going down.

9.

When does a production function satisfy constant returns to scale?

Ans: Constant returns to scale apply when a proportionate increase in all factors of production results in an equal proportional rise in output. For example, if both labour and capital are increased by 10%, and output increases by 10%, we say that the production function has constant returns to scale. Algebraically, constant returns to scale exist when $F(nL, nK) = n(L, K)$. This means that if both labor and capital are grown by 'n' times, so will production.

10.

When does a production function satisfy increasing returns to scale?

Ans: Increasing returns to scale occur when the alteration in production factors results in a greater than proportional increase in total output. This indicates that the organization has enhanced its productivity.

11.

When does a production function satisfy decreasing returns to scale?

Ans: When changes in the elements of production lead to a reduction in changes in the overall output, this is known as decreasing returns to scale. This suggests that rather than boosting production, the modifications have had the opposite effect.

12.

Briefly explain the concept of the cost function.

Ans: The cost function is the relationship between the total output and the cost of production.

13.

What are the total fixed cost, total variable cost and total cost of a firm? How are they related?

Ans:

Total Fixed Cost: The term "total fixed cost" describes the expenses a business incurs to purchase the fixed components of production, such as buildings, machinery, depreciation, etc. Since fixed factors cannot change in the short term, the fixed cost is constant across all output levels. Another name for this is overhead costs.

Total Variable Cost: This is the sum of a company's expenses for variable manufacturing inputs. The variable cost increases in proportion to the quantity of variable inputs. It is also referred to as "Prime cost" or "Direct cost" and comprises costs such as labor compensation, fuel expenses, and so forth.

Total Cost (TC): The total cost is the sum of the total fixed and variable costs. Total cost is equal to the sum of the fixed and variable costs. TFC + TVC = TC

14.

What are the average fixed cost, average variable cost and average cost of a firm? How are they related?

Ans: The fixed cost per unit of output generated is known as the average fixed cost.
The variable cost per unit of output produced is known as the average variable cost.

The sum of a company's average fixed and variable costs is its average cost.

## 15.

Can there be some fixed cost in the long run? If not, why?

Ans: There can be no fixed costs in the long run. A company has the ability to change the production scale and factor ratio throughout time. Over time, there are no fixed costs because the company can change the amount of any production ingredient.

16.

What does the average fixed cost curve look like? Why does it look so?

Ans: The average fixed cost curve is characterized by a rectangular hyperbola. It is defined as the ratio of TFC to output. We are aware that TFC remains constant across all output levels, and as output increases, AFC decreases in conjunction with TFC's constancy. In contrast, AFC is infinitely large when the output level is at or near zero, while it tends to zero but never reaches it when the output level is extremely high. AFC is a rectangular hyperbola that never intersects the x-axis, which means that it can never be zero.
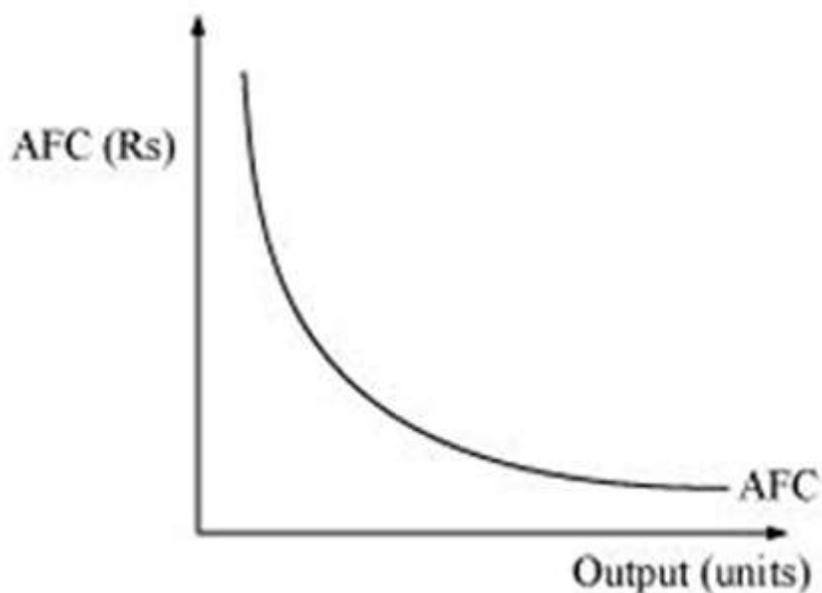
17.

What do the short run marginal cost, average variable cost and short run average cost curves look like?

Ans: Short-run marginal cost (SMC), average variable cost (AVC), and average cost (SAC) curves are U-shaped. The law of variable proportion causes U-shaped curves. All costs (average and marginal) reduce in early production due to rising labour returns. In addition, short-term MP of

labour increases, allowing more output per unit of labour, lowering all costs curves. With constant returns to labour, cost curves become constant and reach their minimal point (the optimal capital-labour combination). Exceeding this optimal combination, supplementary units of labour elevate costs, and as marginal product diminishes, the cost curve rises due to diminishing returns to labour.

18.

Why does the SMC curve cut the AVC curve at the minimum point of the AVC curve?

Ans: The points listed below can help to explain it:

1. The Short Marginal Curve (SMC) is smaller than the Average Variable Cost (AVC) when the AVC decreases.
2. SMC surpasses AVC when AVC increases.
3. SMC equals AVC when AVC is minimum and constant.

Consequently, at the minimum position, the SMC curve intersects the AVC curve.

19.

At which point does the SMC curve cut the SAC curve? Give reason in support of your answer.

Ans: The following points can be used to explain this:
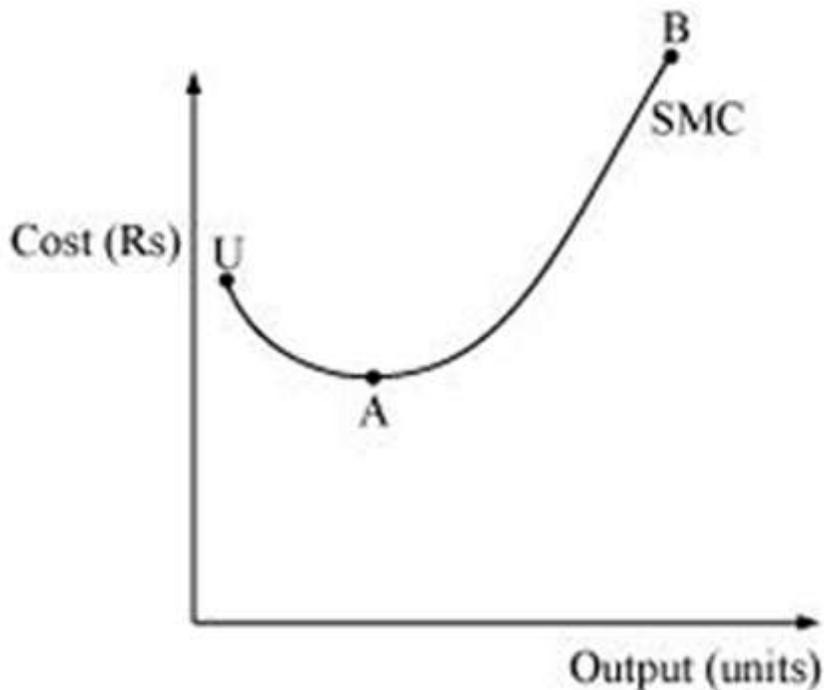
1. SMC is below SAC when SAC declines.
2. SMC is above SAC when SAC increases.

Consequently, because SMC = SAC at its minimum, the SMC curve crosses the SAC curve there.

20.

Why is the short run marginal cost curve 'U'-shaped?

Ans:

Because of the law of changing proportions, the SMC curve is in the shape of a U. In order to figure out why SMC has a U-shape, let's use the law of variable proportions to split the SMC curve (UAB) into three parts:

(a) The UA part is the same as growing returns to factor.

**(b)** The lowest point A is where the returns to factor stay the same.

(c) The AB part is the same as falling returns to factor. The part of SMC (UA) that is falling in the early stages of production is because of applying rising returns to factor. Then the SMC stops going down and hits its lowest point, "A," because there are constant returns to a factor. The 'AB' part of SMC starts going up after the minimum point A because the variable factor's returns start going down. The way the SMC curve moves (first dropping, then staying the same at its lowest point, and then rising) makes it look like the letter "U" in English.

21.

What do the long run marginal cost and the average cost curves look like?

The Long Run Marginal Cost (LMC) and Long Run Average Cost (LAC) exhibit a U-shaped curve due to the law of returns to scale. According to this law, a company or organization experiences three phases in production: Increasing Returns to Scale (IRS), Constant Returns to Scale (CRS), and Diminishing Returns to Scale (DRS). The curve assumes a U-shape as the Long-Run Average Cost (LAC) declines due to economies of scale (increasing returns to scale); it reaches a constant output at the constant returns to scale (CRS) level, and ultimately, if the business encounters

diseconomies of scale and persists in production beyond this point, it will experience an increase or decreasing returns to scale (DRS).
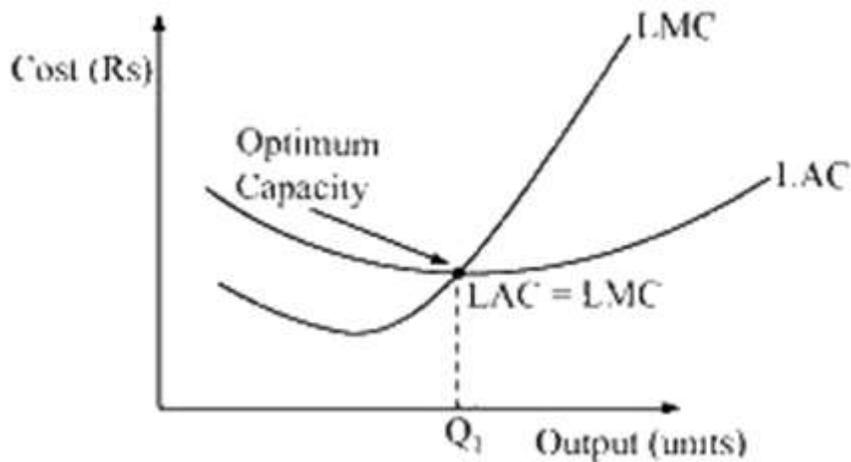
22.

The following table gives the total product schedule of labour. Find the corresponding average product and marginal product schedules of labour.

L	TPL
0	0
1	15
2	35
3	50
4	40
5	48

Ans:

L	TP_L	$AP = \dfrac{TP}{L}$	$MP = TP_n - TP_{n-1}$
0	0	0	-
1	15	15	15
2	35	17.5	20
3	50	16.67	15
4	40	10	-10
5	48	9.6	-8

23.

The following table gives the average product schedule of labour. Find the total product and marginal product schedules. It is given that the total product is zero at zero level of labour employment.

L	AP$_L$
1	2
2	3
3	4
4	4.25
5	4
6	3.5

Ans:

L	AP$_L$	TP$_L$ = AP X L	MP$_L$ = TP$_n$ − TP$_{n-1}$
1	2	2x1 = 2	2
2	3	3x2 = 6	6-2 = 4
3	4	4x3 = 12	12−6 = 6
4	4.25	4.25x4 =17	17-12 = 5
5	4	4x5 = 20	20-17= 3
6	3.5	3.5x6 = 21	21-20 = 1

24.

The following table gives the marginal product schedule of labour. It is also given that total product of labour is zero at zero level of employment. Calculate the total and average product schedules of labour.

L	MP$_L$
1	3
2	5
3	7
4	5
5	3
6	1

Ans:

L	MP$_L$	TP$_n$ = TP$_{n-1}$ + MP$_n$	APL $= \frac{TP_L}{L}$
1	3	3	$\frac{3}{1} = 3$
2	5	3+5=8	$\frac{8}{12} = 4$
3	7	8+7=15	$\frac{15}{3} = 5$
4	5	15+5=20	$\frac{20}{4} = 5$
5	3	20+3=23	$\frac{23}{5} = 4.6$
6	1	23+1=24	$\frac{24}{6} = 4$

25.

The following table shows the total cost schedule of a firm. What is the total fixed cost schedule of this firm? Calculate the TVC, AFC, AVC, SAC and SMC schedules of the firm.

Q	TC
0	10
1	30
2	45
3	55
4	70
5	90
6	120

Ans:

L	TC	TFC = TC - TVC	TVC=TC -TFC	$AFC = \frac{TFC}{Q}$	$AVC = \frac{TVC}{Q}$	SAC=AFC+AVC	$SMC = TC_n - TC_{n-1}$
0	10	10	0	-	-	-	-
1	30	10	20	10	20	30	20
2	45	10	35	5	17.5	22.5	15
3	55	10	45	3.33	15	18.33	10
4	70	10	60	2.5	15	17.5	15
5	90	10	80	2	16	18	20
6	120	10	110	1.66	18.33	19.99	30

26.

The following table gives the total cost schedule of a firm. It is also given that the average fixed cost at 4 units of output is Rs 5. Find the TVC, TFC, AVC, AFC, SAC and SMC schedules of the firm for the corresponding values of output.

Q	TC
1	50
2	65
3	75
4	95
5	130
6	185

Ans:

L	TC	$TFC = TC - TVC$	$TVC = TC - TFC$	$AFC = \frac{TFC}{Q}$	$AVC = \frac{TVC}{Q}$	SAC=AFC+AVC	$SMC = TC_n - TC_{n-1}$
1	50	20	30	20	20	50	30
2	65	20	45	10	22	32.5	15
3	75	20	55	6.66	27.5	34.16	10
4	95	20	75	5	18.75	23.75	20
5	130	20	110	4	22	26	35
6	185	20	165	3.33	27.5	30.83	55

27.

A firm's SMC schedule is shown in the following table. The total fixed cost of the firm is Rs 100. Find the TVC, TC, AVC and SAC schedules of the firm.

Q	TC
0	-
1	500
2	300
3	200
4	300
5	500
6	800

Ans:

L	SMC	TFC = 100	$TVC_n = SMC_n - TVC_{n-1}$	TC = TFC + TVC	$AVC = \dfrac{TVC}{Q}$	SAC=AFC+AVC
0	-	100	-	100	-	-
1	500	100	500	600	500	600
2	300	100	800	900	400	450
3	200	100	1000	1100	333.33	366.67
4	300	100	1300	1400	325	350
5	500	100	1800	1900	360	380
6	800	100	2600	2700	433.33	450

28.

Let the production function of a firm be
        $Q = 5L^{1/2} K^{1/2}$
Find out the maximum possible output that the firm can produce with 100 units of L and 100 units of K.

Ans:

$Q = 5L^{\frac{1}{2}}K^{\frac{1}{2}}$ .... Equation (1)

L = 100 units of labour

K = 100 units of capital

Putting these values in equation (1)

$Q = 5(100)^{\frac{1}{2}}(100)^{\frac{1}{2}}$

$= 5(10)\ (10)$

$= 500$ units

Thus, the maximum possible output that the firm can produce is 500 units.

29.

Let the production function of a firm be

$$Q=2L^2K^2$$

Find out the maximum possible output that the firm can produce with 5 units of L and 2 units of K. What is the maximum possible output that the firm can produce with zero unit of L and 10 units of K?

Ans:

(a) $Q = 2L^2k^2$ .... (1)

L = 5 units of labour

K = 2 units of capital

Putting these values in equation (1)

$Q = 2(5)^2(2)^2$

$= 2\ (25)\ (4)$

$Q = 200$ units

(b) If L = 0 units and K = 100 units

Putting these values in equation (1)

$Q = 2(0)^2(100)^2$

$Q = 0$ units

30.

Find out the maximum possible output for a firm with zero unit of L and 10 units of K when its production function is

$$Q=5L+2K$$

Ans:

$Q = 5L + 2K$ .... (1)

If L = 0 and K = 10, then putting these values in equation (1)

$Q = 5\ (0) + 2\ (10)$

$= 20$ units of output