

Answer on Question #78930 – Math – Other

Question

A firm uses two inputs, K and L to manufacture final product. The price per unit of these inputs is sh. 20 and sh. 4 respectively. What combination of inputs should a firm use to maximize output given that the budget is fixed at sh. 390?

Solution

Let x = the number of units of the finished product manufactured in K input, y = the number of units of the finished product manufactured in L input.

The total number of product produced is

$$U(x, y) = x + y$$

The price per unit of these inputs is sh. 20 and sh. 4 respectively. Then, the total cost is

$$C(x, y) = 20x + 4y$$

Since the budget is fixed at sh. 390

$$20x + 4y \leq 390$$

Find the maximum value of the function $U(x, y)$, if

$$\begin{cases} U(x, y) = x + y \\ 20x + 4y \leq 390 \\ x \in \{0, 1, 2, \dots\}, y \in \{0, 1, 2, \dots\} \end{cases}$$

$$20x + 4y = 390$$

Solve for y

$$y = \frac{195}{2} - 5x$$

Substitute

$$U(x) = x + \frac{195}{2} - 5x$$

$$U(x) = \frac{195}{2} - 4x$$

Find the maximum value of the function $U(x)$, if

$$\begin{cases} U(x) = \frac{195}{2} - 4x \\ x \in \{0, 1, 2, \dots\} \end{cases}$$

Linear function $U(x)$ decreases for $x \in [0, \infty)$. Then the maximum value of the function $U(x)$ is $\frac{195}{2}$ at $x = 0$.

Since $y \in \{0, 1, 2, \dots\}$ and $20x + 4y \leq 390$ then $y = 97$.

Answer: the firm uses the only L input and manufactures 97 units of the finished product.