

“Answer on question #59000- Economics - Microeconomics”

A firm faces the production function $Q = 10L^2K^2$.

The wage rate is 2 and the rental rate of capital is 1.

What are the optimal amounts of L and K if the firm's objective is to produce $Q = 25,000$

Solution

The optimal combination of capital and labor usage is defined by condition

$$MPL/MPK = Pl/Pk.$$

This condition may be rewritten as $MPL/Pl = MPK/Pk$

$$MPL = \partial Q/\partial L = 2(10)L^{-2}K^2$$

$$MPK = \partial Q/\partial K = 2(10)L^2K^{-2}$$

$$[2(10)L^{-2}K^2]/[2(10)L^2K^{-2}] = \frac{1}{2}$$

Solving for the optimal capital-labor ratio we obtain:

$$K/L = 1/2,$$

$$K = 0,5L$$

The firm's goal isocost equation is $TCO = PL * L + PK * K$

$$25000 = 2L + K$$

Substituting we obtain

$$2500 = 2L + 0,5L = 2,5L$$

The optimal level of labor usage is

$$L = 1000$$

The optimal level of capital usage is

$$2500 = 2(1000) + K$$

$$K = 500$$

Answer

Optimal amounts of L and K if the firm's objective is to $Q = 25,000$ are 1000 and 500 respectively.