

ECON 310
Nazarov
Homework 3

You must enter your answers into Blackboard before the due date in order to receive credit for this assignment. The due date is March 19th, 8:00am. It is your responsibility to verify that your homework grade is correctly recorded in the gradebook.

Questions 1-3

A production process using two inputs, labor and capital, can be written as:

$$Q = 5LK$$

$$MP_K = 5L$$

$$MP_L = 5K$$

where Q represents output per day (tons). The unit costs of inputs are \$150 for labor (L) and \$1,000 for capital (K).

1. Determine the least cost amount of L when output is produced at the rate of 1,000 tons per day.
2. Determine the least cost amount of K when output is produced at the rate of 1,000 tons per day
3. Determine the required outlay for 1,000 tons per day.

Questions 4-9

Davy Metal Company produces brass fittings. Davy's engineers estimate the production function represented below as relevant for their long-run capital labor decisions.

$$Q = 500L^{0.6}K^{0.8}$$

where Q = annual output measured in pounds, L = labor measured in person hours, K = capital measured in machine hours. The marginal products of labor and capital are:

$$MP_L = 300L^{-0.4}K^{0.8}$$

$$MP_K = 400L^{0.6}K^{-0.2}$$

Davy's employees are relatively highly skilled and earn \$15 per hour. The firm estimates a rental charge of \$50 per hour on capital. Davy forecasts annual costs of \$500,000 per year, measured in real dollars.

4. Determine the firm's optimal capital-labor ratio, given the information above.
 5. Calculate the firm's output, given the \$500,000 budget.
- Davy is currently negotiating with a newly organized union. The firm's personnel manager indicates that the wage may rise to \$22.50 under the proposed union contract. Find the effect of the higher union wage on

6. the optimal capital-labor ratio.
7. the firm's employment of capital.
8. the firm's employment of labor.
9. the firm's output level.

Questions 10-17

The Tarheel Press produce memo pads in its local shop. The company can rent its equipment and hire workers at competitive rates. Equipment needed for this operation can be rented at \$30 per hour, and labor can be hired an \$7.5 worker hour. The company has allocated \$150000 for the initial run of memo pads. The production function using available technology can be expressed as:

$$Q = K^{0.5} L^{0.5}$$

where Q represents memo pads (boxes per hour), K denotes capital input (units per hour), and L denotes labor unit (units of worker time per hour). The marginal products of labor and capital are as follows:

$$MP_L = \frac{1}{2} K^{0.5} L^{-0.5}$$

$$MP_K = \frac{1}{2} K^{-0.5} L^{0.5}$$

10. Find the optimum capital level K .
11. Find the optimum labor level L .
12. Find the quantity produced Q .

Assume that the Press desires to double its output in the short-run. It may increase its number of workers, capital must remain fixed (at the level that was calculated in question 10).

13. Calculate the new level of labor, L .
14. Calculate the short-run total cost.

Assume that the Press desires to double its output in the long run (at the level that was calculated in question 12).

15. Find the new optimum capital level K .
16. Find the new optimum labor level L .
17. Calculate the long-run total cost.