1. Given the Leontief production function \( Q = \min\{5.5K, 6.7L\} \), how much output is produced when \( K = 40 \) and \( L = 35 \)?
   A. 220
   B. 234.5
   C. 192.5
   D. 268

2. Suppose the production function is given by \( Q = K^{1/2}L^{1/2} \), and that \( Q = 30 \) and \( K = 25 \). How much labor is employed by the firm?
   A. 49
   B. 6
   C. 36
   D. 25

3. Which of the following cost functions exhibits economies of scope when three (3) units of good one and two (2) units of good two are produced?
   A. \( C = 50 - 5Q_1Q_2 + 0.5Q_1^2 + Q_2^2 \)
   B. \( C = 10 + 4Q_1Q_2 + Q_1^2 + Q_2^2 \)
   C. \( C = 15 + 5Q_1Q_2 + 2Q_1 + 4Q_2 \)
   D. \( C = 5 + Q_1Q_2 + Q_1^2 Q_2^2 \)

4. The isoquants are normally drawn with a convex shape because inputs are
   A. Not perfectly substitutable
   B. Perfectly substitutable
   C. Perfect complements
   D. Normal goods

5. If a firm's production function is Leontief and the price of capital goes down the
   A. Firm must use less labor in order to minimize the cost of producing a given level of output
   B. Firm must use more capital in order to minimize the cost of producing a given level of output
   C. Firm must use less capital in order to minimize the cost of producing a given level of output
   D. Cost minimizing combination of capital and labor does not change

6. Suppose that production for good X is characterized by the following production function, \( Q = K^{0.5}L^{0.5} \), where K is the fixed input in the short run. If the per-unit rental rate of capital, \( r \), is $25 and the per-unit wage, \( w \), is $15, then the fixed cost of using 81 units of capital and 9 units of labor is
   A. $2,160
   B. $2,025
   C. $135
   D. There is insufficient information to determine the fixed costs

7. Which of the following statements is incorrect?
   A. Fixed costs do not vary with output
   B. Sunk costs are those costs that are forever lost after they have been paid
   C. Fixed costs are always greater than sunk costs
   D. Fixed costs could be positive when sunk costs are zero
8. If the production function is $Q = KL$ and capital is fixed at 1 unit, then the marginal product of labor when $L = 25$ is
A. $\frac{1}{4}$
B. $\frac{1}{10}$
C. 15
D. None of the statements associated with this question are correct

9. The production function for a competitive firm is $Q = K^{0.5}L^{0.5}$. The firm sells its output at a price of $10$, and can hire labor at a wage of $5$. Capital is fixed at one unit. The maximum profits are
A. 5
B. 10
C. 15
D. None of the statements associated with this question are correct

10. Suppose the cost function is $C(Q) = 50 + Q - 10Q^2 + 2Q^3$. At 10 units of output, the average cost curve is
A. In the increasing stage
B. In the declining stage
C. At the minimum level
D. At the maximum level

11. The manager of a national retailing outlet recently hired an economist to estimate the firm's production function. Based on the economist's report, the manager now knows that the firm's production function is given by $Q = K^{1/2}L^{1/2}$ and that capital is fixed at 1 unit.
   a. Calculate the average product of labor when 9 units of labor are utilized.
   b. Calculate the marginal product of labor when 9 units of labor are utilized.
   c. Suppose the firm can hire labor at a wage of $10$ per hour and output can be sold at a price of $100$ per unit. Determine the profit-maximizing levels of labor and output.
   d. What is the maximum price of capital at which the firm will still make nonnegative profits?

   a. $Q = (1)^{1/2}(9)^{1/2} = 3$. The average product of labor is thus $Q/L = 3/9$.
   b. $MPL = .5K^{1/2}L^{-1/2} = .5(1)^{1/2}(9)^{-1/2} = 1/6$.
   c. The profit-maximizing level of labor and output is achieved where $VMP_L = w$, where $VMP_L = .5(100)(L^{-1/2})$ and $w = 10$. Solving for $L$ yields $L = 25$. The corresponding level of output is $Q = (25)^{1/2} = 5$.
   d. The firm's variable costs are $(25)(10) = 250$, while its total revenues are $5 \times 100 = 500$. The maximum price of capital, hence, cannot be greater than $250$ per unit.

12. The management of Morris Industries is considering a plan to terminate a new employee. The action stemmed from documented evidence supplied by the firm's accounting department that this new employee did not add as much to the firm's overall output as did a worker hired two weeks earlier. Based on this evidence, do you agree that the latest worker hired should be fired? Explain.

No. In order to maximize profits, firms should hire workers up to the point where the value marginal product equals the wage rate in the range of diminishing marginal returns. The data suggests that the last worker added less to total output than the previous worker, which means that the firm is indeed operating in the range of diminishing marginal returns, as it should. The worker should be fired if his or her value marginal product is less than the wage. Unfortunately, management is not considering this information.