**1.**

You are a manager at the Donnelly Corporation—a mirror and window supplier to the major automakers. Recently, you conducted a study of the production process for your DirectBond

single-side encapsulated window. The results from the study are summarized in the table below, and are based on the 5 units of capital currently available at your plant. Workers are paid $50 per unit, per-unit capital costs are $10, and you windows sell for $5 each. Given this information, optimize your human resource and production decisions. Complete the table and answer to questions that follow:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Labor** | **Capital** | **Output** | **Marginal Product** | **Marginal Revenue** | **Marginal Revenue** |
|  |  |  | **of Labor** | **or** | **Product** |
| **L** | **K** | **Q** | **MP** | **Price** | **MRP** |
| 0 |  | 0 |  |  |  |
| 1 |  | 10 |  |  |  |
| 2 |  | 30 |  |  |  |
| 3 |  | 60 |  |  |  |
| 4 |  | 80 |  |  |  |
| 5 |  | 90 |  |  |  |
| 6 |  | 95 |  |  |  |
| 7 |  | 95 |  |  |  |
| 8 |  | 90 |  |  |  |
| 9 |  | 80 |  |  |  |
| 10 |  | 60 |  |  |  |
| 11 |  | 30 |  |  |  |

1. Identify the fixed and variable inputs.
2. What are the firm’s fixed costs?
3. What is the variable cost of producing 60 units of output?
4. How many units of the variable input should be used to maximize profits?
5. What are the maximum profits this firm can earn?
6. Over what range of the variable input usage do increasing marginal returns exist?

**2.**

 To better serve customers interested in buying cars over the Internet, Smart Motors, Inc., hired Nora Jones to respond to customer inquiries, offer price quotes, and write orders for leads generated by the company’s Web site. During the last year, Jones averaged 1.5 vehicle sales per week. On average, these vehicles sold for a retail price of $25,000 and brought the dealership a profit contribution of $1,000 each.

1. Estimate Jones’ annual (50 workweek) marginal revenue product.
2. Jones earns a base salary of $60,000 per year, and Smart Motors pays an additional 28 percent of this base salary in taxes and various fringe benefits. Is Jones a profitable employee?

**3.**

The First National Bank received 3,000 inquiries following the latest advertisement describing its 30-month IRA accounts in the Boston World, a local newspaper. The most recent ad in a similar advertising campaign in Massachusetts Business, a regional business magazine, generated 1,000 inquiries. Each newspaper ad costs $500, whereas each magazine ad costs $125.

1. Assuming that additional ads would generate similar response rates, is the bank running an optimal mix of newspaper and magazine ads? Why or why not?
2. Holding all else equal, how many inquiries must a newspaper ad attract for the current advertising mix to be optimal?

**4.**

**Draw a Marshallian long run production function of the form Q = f (Labor, Capital).**

 (A) Draw three production isoquants indicating output levels of 3,000 units, 4,000

 units, and 5,000 units resulting from capital and labor inputs of zero to 100 unit

 each. (Does not have to be drawn to scale on graph paper.)

 (B) Given the price of Labor at $40 per unit and the price of Capital at $20,

 construct isocost (budget) curves and show three equilibrium points through which the

 firm’s expansion path passes. Use an initial budget parameter of $800.

 (C**)** Show the firm’s expansion path and explain what is true of input

 cost at each point along the path, i.e. are there economies of scale?

**5.**

**Work the following multiple choice questions:**

1. A basic tenet of the theory of the firm is that the firm’s primary objective is to

 a. stay out of debt.

 b. produce a given level of output at a specified cost.

 c. maximize profits.

 d. operate for the benefit of society.

2. Production functions indicate the relationship between:

 a. factor costs and output prices.

 b. factor inputs and the quantity of output.

 c. the value of inputs and the average costs

 d. factor inputs and factor prices.

3. Economist generally define the short run as being

 a. that period of time in which at least on of r the firm’s inputs, usually plant size is

 fixed.

 b. that period of time in which all inputs are variable.

 c. any period of time less than one year.

 d. any period of time less than six months.

4. A basic distinction between long run and the short run is that

 a. if a firm produces no output in the long run, it still incurs a cost.

 b. the opportunity costs of production are lower in the short run than in the long run.

 c. in the long run, some inputs are fixed while in the sort run all inputs are variable.

 d. in the short run complete adjustment of all inputs is impossible, while in the long

 run all inputs can be adjusted.

5. Marginal product is:

 a. The change in total input needed to produce one additional output unit.

b. The change in total output resulting from one additional input unit.

 c. The number of output units obtained from all input units employed.

 d. Another name for total output.

6. A firm’s production isoquant:

 a. relates output to the amount of labor used keeping all other inputs constant.

 b. a curve showing all possible combinations of inputs that result in an equal output

 for the firm.

 c. a ray from the origin which describes all input combinations where the

 capital/labor ratio is constant.

 d. a line along which the total cost of the firm is constant.

7. The marginal rate of technical substitution, other things being equal, is:

 a. the rate at which a firm can trade labor for capital at constant cost.

 b. the slope of the production isoquant.

 c. the rate at which a firm can trade capital for labor at constant cost.

 d. the slope of the isocost curve, or budget constraint.

8. A firm’s isocost (or equal total cost) line:

 a. reflects all the combinations of labor and capital that will produce a

 given level of output.

 b. reflects all the combinations of labor and capital that cost the firm the

 same amount.

 c. has a slope equal to the ratio of the input prices, i.e. labor (wage rate)

 and capital (interest rate).

 d. b and c.

 9. In order to produce a given amount of output at least cost, a firm will choose the

 input combination at which:

 a. its ratio of marginal product of labor and marginal product of capital (marginal

 rate of substituion) equals the ratio of input prices

 b. its ratio of labor to capital used equals the ratio of input prices.

 c. its ratio of the average labor productivity to the average capital productivity

 equals the ratio of input prices.

 d. the amount of labor used is minimized.

10. A farmer purchases nitrate and phosphate fertilizers to produce corn. The price of

 phosphate is 24 cents a pound and the price of nitrate is 36 cents per pound. The

 farmer chooses an input combination where the marginal product of a pound of

 nitrate is 4 bushels of corn and the marginal product of a pound of phosphate is 3

 bushels. Which of the following should the farmer buy in order to minimize cost?

 a. more nitrate and more phosphate.

 b. less nitrate and more phosphate.

 c. more nitrate and less phosphate.

 d. less nitrate and less phosphate.

11. The expansion path is

 a. the locus of least-cost combinations of inputs that will be chosen at different

 levels of output when the price of one input is allowed to vary.

 b. the locus of all alternate quantities of several outputs that can be

 produced with fixed amounts of inputs.

 c. the locus of least-cost combinations of inputs that will be chosen at

 different levels of output when input prices are held constant.

 d. the trail followed by Lewis and Clark.

12. If a firm’s production function exhibits constant returns to scale, a doubling of all

 inputs will:

 a. less and double output.

 b. more than double output.

 c. exactly double output.

 d. increase the rate of technical substitution.