## Econ8500_Production_Costs

**Multiple Choice**
*Identify the choice that best completes the statement or answers the question.*

_____ 1. A firm is defined as
    a. a president, some vice presidents, and some employees.
    b. any organization that wants to make a profit.
    c. any accumulation of productive assets.
    d. any organization that turns inputs into outputs.

_____ 2. A production function measures how
    a. a firm transforms output into input.
    b. a firm transforms inputs into output.
    c. an individual maximizes utility.
    d. a firm minimizes cost.

_____ 3. The marginal physical productivity of labour is defined as
    a. a firm's total output divided by total labour input.
    b. the extra output produced by employing one more unit of labour while allowing other inputs to vary.
    c. the extra output produced by employing one more unit of labour while holding other inputs constant.
    d. the extra output produced by employing one more unit of capital while holding labour input constant.

_____ 4. If more and more labour is employed while keeping all other inputs constant, the marginal physical productivity of labour
    a. will eventually increase.
    b. will eventually decrease.
    c. will eventually remain constant.
    d. Cannot tell from the information provided.

_____ 5. The marginal physical productivity of labour is equal to
    a. the slope of the total output curve at the relevant point.
    b. the negative of the slope of the total output curve at the relevant point.
    c. the slope of the line connecting the origin with the relevant point on the total output curve.
    d. the negative of the slope of the line connecting the origin with the relevant point on the total output curve.

_____ 6. The average productivity of capital is defined as
    a. the extra output produced by employing one more unit of capital while holding other inputs constant.
    b. the extra output produced by employing one more unit of capital while allowing other inputs to vary.
    c. the ratio of total output produced to the quantity of capital employed.
    d. the ratio of total capital employed to the total output produced.

_____   7.  Graphically, the average productivity of labour would be illustrated by
        a.   the slope of the total product curve at the relevant point.
        b.   the slope of the marginal productivity curve at the relevant point.
        c.   the negative of the slope of the marginal productivity curve at the relevant point.
        d.   the slope of the chord connecting the origin with the relevant point on the total output
           curve.

_____   8.  An isoquant shows
        a.   the amount of labour needed to produce any level of output with capital held constant.
        b.   the amount of capital needed to produce any level of output with labour held constant.
        c.   the various combinations of capital and labour that will produce a given amount of
           output.
        d.   None of the above.

_____   9.  The marginal rate of technical substitution of labour for capital measures
        a.   the amount by which the capital input can be reduced while holding quantity produced
           constant when one more unit of labour is used.
        b.   the amount by which the labour input can be reduced while holding quantity produced
           constant when one more unit of capital is used.
        c.   the ratio of total labour to total capital.
        d.   the ratio of total capital to total labour.

_____  10.  A firm's marginal rate of technical substitution is represented graphically by
        a.   the slope of the line connecting the origin with the relevant point on the isoquant.
        b.   the negative of the slope of the line connecting the origin with the relevant point on the
           isoquant.
        c.   the slope of the isoquant at the relevant point.
        d.   the negative of the slope of the isoquant at the relevant point.

_____  11.  A production function may exhibit
        a.   constant returns to scale and diminishing marginal productivities to all inputs.
        b.   constant returns to scale and diminishing marginal productivities to all but one input, but
           at least one input must have a constant marginal productivity.
        c.   constant returns to scale and diminishing marginal productivity to at most one input.
        d.   constant returns to scale and diminishing marginal productivities for no inputs.

_____  12.  Suppose the production function for a good q is given by $q = 3K + 2L$, where K and L are capital and labour
        inputs. Consider three statements about this function:
        I. The function exhibits constant returns to scale.
        II. The function exhibits diminishing marginal productivities to all inputs.
        III. The function has a constant marginal rate of technical substitution.
        Which of these statements is true?
        a.   All of them.
        b.   None of them.
        c.   I and II, but not III.
        d.   I and III, but not II.

_____  13.  For a fixed proportion production function, at the vertex of any of the (L-shaped) isoquants the marginal
        productivity of either input is
        a.   constant.
        b.   zero.
        c.   negative.
        d.   a value that cannot be determined.

_____ 14. If, as a result of doubling all its inputs, a firm can more than double its output, the firm's production function exhibits
   a. constant returns to scale.
   b. increasing returns to scale.
   c. decreasing returns to scale.
   d. increasing marginal productivity to at least one point.

_____ 15. The production function $q = \sqrt{KL}$
   a. exhibits constant returns to scale and constant marginal productivities for K and L.
   b. exhibits diminishing returns to scale and diminishing marginal productivities for K and L.
   c. exhibits constant returns to scale and diminishing marginal productivities for K and L.
   d. exhibits diminishing returns to scale and constant marginal productivities for K and L.

_____ 16. A fixed-proportion production function has isoquants that are
   a. almost flat (i.e. the isoquants are almost straight lines)
   b. L-shaped.
   c. normally shaped (rectangular hyperbolas).
   d. None of the above.

_____ 17. A technical innovation in the production of automobiles by Ford Motor Company's for 1 million cars per year would necessarily
   a. shift the "1 million car" isoquant away from the origin.
   b. shift the "1 million car" isoquant towards the origin.
   c. cause 1 million cars to be produced with more capital and less labour.
   d. cause 1 million cars to be produced with more labour and less capital.

_____ 18. A rise in the average productivity of labour
   a. always reflects technical progress.
   b. reflects technical progress if other input usage hasn't changed.
   c. reflects technical progress only if labour input hasn't changed.
   d. reflects technical progress only if the quantity of output is increased.

_____ 19. The production function for economic reports is q = 0.1A + 0.25H, where q is measured in number of pages, A is the number of articles read, and H is the number of hours of writing. The marginal product of hours of writing is
   a. 0.25.
   b. 2.5 times larger than the marginal product of articles read.
   c. 0.35.
   d. both (a) and (b).

_____ 20. If the two inputs needed to produce q are perfect substitutes, their marginal product is
   a. diminishing.
   b. increasing.
   c. constant.
   d. both diminishing and constant, depending on how much q is produced.

_____ 21. If the marginal product of labour is smaller than the average product of labour
   a. the average product of labour is decreasing.
   b. the average product of labour is increasing.
   c. the average product of labour is constant.
   d. the marginal product of labour is increasing.

____ 22. The average product of labour is decreasing. This means that
    a. the marginal product of labour is larger than the average product of labour.
    b. the marginal product of labour is smaller than the average product of labour.
    c. the average product and the marginal product are equal.
    d. the marginal product of labour is decreasing.

____ 23. If the marginal product of labour is increasing and larger than the average product
    a. the average product of labour is also increasing.
    b. the average product of labour is decreasing.
    c. the average product of labour does not change.
    d. the average product of labour could be both increasing and decreasing.

____ 24. The "iso" prefix in "isoquant" means
    a. International Standard Organization (ISO).
    b. "equal" in Greek.
    c. "equal" in Latin.
    d. none of the above.

____ 25. Isoquant maps and indifference curve maps
    a. are both contour maps.
    b. contain an infinity of curves.
    c. contain non-intersecting curves.
    d. all of the above.

____ 26. (10, 16) and (12, 14) are two points on an isoquant, where the first input is labour and the second is capital. The rate of substitution of labour of capital between these two points is
    a. 0.
    b. 1.
    c. 2.
    d. 10.

____ 27. If $MP_L = 1/L$ and $MP_K = 1/K$, the MRTS of capital for labour is equal to:
    a. L/K.
    b. K/L.
    c. LK.
    d. 1/K.

____ 28. Assume energy and machinery are substitutes in the production of home heating. Home heating plants
    a. will become more sophisticated and energy efficient as gas and electricity prices rise.
    b. will become more sophisticated and energy efficient as gas and electricity prices fall.
    c. utilize only about 40% of the total energy available in the fuel they use because energy is relatively cheap and paying for a more efficient heating plant does not make economic sense.
    d. both (a) and (c).

____ 29. Consider a well-behaved production function with convex isoquants. If the function exhibits decreasing returns to scale the distance between the q = 50 and the q' = 60 isoquants is ____ the distance between the q' = 60 and the q'' = 70 isoquants.
    a. smaller than.
    b. larger than.
    c. equal to.
    d. equal to or larger than.

____ 30. The production function for iPods is $q = LK^3$, where L represents the labour input and K represents the capital input. If you draw the indifference curves for q = 1000, q' = 2000 and q'' = 3000, the distance between the first and the second is ____ the distance between the second and the third.
   a.   smaller than.
   b.   larger than.
   c.   equal to.
   d.   impossible to determine given the available information

____ 31. The production function $q(K, L, E) = K^{0.2}L^{0.5}E^{0.3}$ exhibits
   a.   constant returns to scale.
   b.   increasing returns to scale.
   c.   decreasing returns to scale.
   d.   insufficient information to answer the question.

____ 32. If the inside radius of a cylindrical oil pipeline doubles, its volume will be ____. This shows that oil pipeline transportation exhibits ____.
   a.   8 times larger; economies of scale.
   b.   two times larger; constant return to scale.
   c.   1.5 times larger; diseconomies of scale.
   d.   4 times larger; economies of scale.

____ 33. The elasticity of substitution for a fixed-proportions production function is
   a.   equal to one.
   b.   equal to zero.
   c.   diminishing as more capital is replaced by labour.
   d.   diminishing as more labour is replaced by capital.

____ 34. The inputs for the multiple-choice questions (q) from this test bank are problems (P) and possible answers (A). For every problem we need exactly four possible answers. The production function for multiple-choice questions is
   a.   q = P + 4A.
   b.   q = min (P, 4A).
   c.   q = min (4P, A).
   d.   q = min (P, A/4)

____ 35. Local breweries were able to enter the market of premium brands and charge higher prices than the national brands because
   a.   the major breweries had neglected the premium brands, leaving an opening for microbreweries.
   b.   the market for premium brews and the market for national brands are two different markets.
   c.   None of the above.
   d.   All of the above.

____ 36. The production function for fruit juice is J = min(O, 2A), where O refers to oranges, A refers to apples, and J to glasses of juice. You have six oranges and six apples. You can only make ____ glasses of juice since there is a surplus of ____.
   a.   6; oranges.
   b.   12; oranges
   c.   6; apples.
   d.   12; apples.

_____ 37. According to the new rules for the protection of the environment firms need to use more capital while keeping labour constant to produce the same level of output ($q_0$) as in the past. This leads to
  a. an inward shift of the $q_0$ isoquant.
  b. an outward shift of the $q_0$ isoquant.
  c. no change in the position of the $q_0$ isoquant.
  d. a downward shift of the isoquant.

_____ 38. The output per worker in one of Toshiba's laptop computer assembly plants has increased from 50 laptops per day to 60 laptops per day. This could mean that
  a. Toshiba has improved their production techniques.
  b. Toshiba has substituted capital for labour.
  c. Toshiba continued to use the same amount of capital but it produces the same output with less labour.
  d. Any of the above.

_____ 39. Why is it better to use multifactor productivity data than output per hour data when productivity comparisons are made?
  a. Multifactor productivity is easier to measure than output per hour.
  b. Multifactor productivity is a more intuitive concept.
  c. Output per hour figures can be misleading because they may reflect simple capital-labour substitution rather than real technical gains.
  d. All of the above.

_____ 40. The production function for automobiles is $q = KL$. Assume $q = 100$ and $K = 25$. If one more unit of labour is used while capital is held constant the marginal product of labour is equal to _____, and the average product of labour _____.
  a. 25; decreases from 25 to 20 automobiles per unit of labour.
  b. 125; remains unchanged at 25 automobiles per unit of labour.
  c. 25; remains unchanged at 25 automobiles per unit of labour.
  d. 25; decreases from 25 to 24 automobiles per unit of labour.

_____ 41. Consider the following production function: $q = K + \ln L$. The following bundles do not belong to the same isoquant:
  a. (2,3) and (2,5).
  b. (6,2) and (6,1).
  c. (10,20) and (9, 20).
  d. All of the above.

_____ 42. Consider the following production function: $q = K + L^2$. Your firm is currently using 100 units of capital and 10 of labour. Assuming that an additional unit of capital costs as much as an additional unit of labour, if you had to choose between using an additional unit of capital or one of labour you should choose:
  a. labour, because the marginal product of labour is larger than the marginal product of capital.
  b. labour, because this will decrease the unemployment rate in your city.
  c. capital, because the marginal product of capital is larger than the marginal product of labour.
  d. capital, because it would be easier for you to access the firm's financial reserves than to start a hiring process for a new employee.

_____ 43. Capital and labour are used in fixed proportions to produce safe airline flights: it takes three airport security employees and one scanner for each trip made. Due to a recent revision in security measures four airport security employees are needed for each scanner. The following statement is true:
   a.   The isoquants for safe flight are strictly convex.
   b.   The isoquant for 100 flights was closer to the origin under the old security measures.
   c.   The isoquant for 100 flights was further from the origin under the old security measures.
   d.   None of the above.

_____ 44. Your firm's production function changed from $q = KL^2$ to $q = 5KL^2$. This is a sign of
   a.   a diminishing marginal product of capital.
   b.   technical progress.
   c.   a diminishing marginal product of labour.
   d.   all of the above.

_____ 45. A firm's output increases 2.5 times when labour is doubled and capital is tripled. This is a sign of
   a.   increasing returns to scale.
   b.   decreasing returns to scale.
   c.   constant returns to scale.
   d.   none of the above.

_____ 46. The opportunity cost of producing a bicycle refers to
   a.   the out-of-pocket payments made to produce the bicycle.
   b.   the value of the goods that were given up to produce the bicycle.
   c.   the bicycle's retail price.
   d.   the marginal cost of the last bicycle produced.

_____ 47. The accountant's cost of producing a bicycle refers to
   a.   the out-of-pocket payments made to produce the bicycle.
   b.   the value of the goods that were given up to produce the bicycle.
   c.   the bicycle's retail price.
   d.   the marginal cost of the last bicycle produced.

_____ 48. A firm's economic profits are given by
   a.   total revenue minus total accounting cost.
   b.   the owner's opportunity cost.
   c.   total revenue minus total economic cost.
   d.   total revenue minus the cost of capital.

_____ 49. In order to minimize the cost of a particular level of output, a firm should produce where
   a.   labour input equals capital input.
   b.   the MRTS (of L for K) = v / w.
   c.   the MRTS (of L for K) = w / v.
   d.   none of the above.

_____ 50. The firm's output expansion path records
   a.   profit-maximizing output choices for every possible price.
   b.   cost-minimizing input choices for all possible output level when input rental rates expand along with production.
   c.   cost-minimizing input choices for all possible output levels for a fixed set of input prices.
   d.   cost-minimizing input choices for profit-maximizing output levels.

_____ 51. The shape of a firm's output expansion path depends upon
   a.   the cost of labour input.
   b.   the cost of capital input.
   c.   the shape of the firm's production function.
   d.   all of the above factors.

_____ 52. The output expansion path for a constant returns to scale production function
   a.   is a straight line through the origin with a slope greater than one if w > v.
   b.   is a straight line through the origin with a slope less than one if w < v.
   c.   is a straight line through the origin though its slope cannot be determined by w and v alone.
   d.   has a positive slope but is not necessarily a straight line.

_____ 53. A firm whose production function displays increasing returns to scale will have a total cost curve that is
   a.   a straight line through the origin.
   b.   a curve with a positive and continually decreasing slope.
   c.   a curve with a positive and continually increasing slope.
   d.   a curve with a negative and continually decreasing slope.

_____ 54. A firm's marginal cost is defined as
   a.   the ratio of total cost to total output.
   b.   the ratio of total output to total cost.
   c.   the additional cost of producing one more unit of output.
   d.   the reciprocal of total average cost.

_____ 55. A linear total cost curve which passes through the origin implies that
   a.   the average cost is constant and the marginal cost is variable.
   b.   the average cost is variable and the marginal cost is constant.
   c.   the average and marginal costs are constant and equal.
   d.   none of the above.

_____ 56. As long as marginal cost is below average cost, average cost will be
   a.   falling.
   b.   rising.
   c.   constant.
   d.   changing in a direction that cannot be determined without more information.

_____ 57. In the short run
   a.   all inputs are fixed.
   b.   all inputs are variable.
   c.   some inputs are fixed.
   d.   no production occurs.

_____ 58. In the long run
   a.   all inputs are fixed.
   b.   all inputs are variable.
   c.   some inputs are fixed.
   d.   production levels never change.

_____ 59. The shape of a firm's long-run average cost curve is determined by
   a.   the degree to which each input encounters diminishing marginal productivity.
   b.   the underlying nature of the firm's production function when all inputs can be varied.
   c.   how much the firm decides to produce.
   d.   the way in which the firm's output expansion path reacts to changes in the rental rate of capital.

_____ 60. For a constant returns to scale production function
   a.   marginal costs are constant but the average cost curve has a U-shape.
   b.   both average and marginal costs are constant.
   c.   marginal cost has a U-shape; average costs are constant.
   d.   both average and marginal cost curves are U-shaped.

_____ 61. The short-run total cost is the sum of
   a.   short-run fixed cost, short-run variable cost and short-run marginal costs.
   b.   short-run fixed cost and short-run marginal costs.
   c.   short-run variable cost and short-run costs.
   d.   short-run fixed cost and short-run variable cost.

_____ 62. A firm's marginal cost curve
   a.   is always U-shaped.
   b.   always has a positive slope.
   c.   is always below its average cost curve.
   d.   always intersects its average cost curve at its minimum point.

_____ 63. A firm's short-run average cost is defined as
   a.   the ratio of total output to short-run total cost.
   b.   the ratio of short-run total cost to total output.
   c.   the additional cost of producing one more unit of output while some input is fixed.
   d.   the additional cost of producing one more unit of output while all inputs are fixed.

_____ 64. For any given level, a firm's long-run costs
   a.   are always greater than or equal to its short-run costs.
   b.   are usually greater than or equal to its short-run costs except in the case of diminishing
         returns to scale.
   c.   are always less than or equal to its short-run costs.
   d.   are usually less than or equal to its short-run costs except in the case of diminishing
         returns to scale.

_____ 65. An increase in the wage rate will have a greater effect on average costs
   a.   the larger the proportion of labour costs in total costs and the easier it is to substitute
         capital for labour.
   b.   the larger the proportion of labour costs in total costs and the harder it is to substitute
         capital for labour.
   c.   the greater is the diminishing marginal product of labour.
   d.   the greater the returns to scale are.

_____ 66. Technical progress will
   a.   shift a firm's production function and its related cost curves.
   b.   not affect the production function, but may shift cost curves.
   c.   shift a firm's production function and alter its marginal revenue curve.
   d.   shift a firm's production function and cause more capital (and less labour) to be hired.

_____ 67. "Hadn't I spent my money on ski trips last year, I could have bought a car." This person refers to the _____
         cost of ski trips.
   a.   accounting.
   b.   opportunity.
   c.   average.
   d.   marginal.

_____ 68. Your $5000 car was so badly damaged in a car accident that it had to be written off. You called 20 companies
         and nobody was willing to offer you anything for the car. Your friend has an identical car with very old seats,
         which he would like to exchange with the intact $500 leather seats from your car, but he cannot afford to pay
         you anything. The opportunity cost of the seats is:
   a.   $5000.
   b.   $500.
   c.   $0.
   d.   not enough information to answer this question.

_____ 69. The average wage rate in your industry is $40 per hour, and your company pays $47 per hour. They need a new employee and you found someone who would be perfect for the job. He is currently working for another company for $50 per hour, and switching companies would be costless for him. If they want to hire this person, what wage rate should your company offer him?
   a. $40.
   b. $47.
   c. very little above $50
   d. $70.

_____ 70. Your company purchased a $2500 notebook computer. For accounting purposes, the value of the notebook is assumed to depreciate by $500 per year. After one year a second-hand computer store offered to purchase the notebook for $1000. The economic cost of the notebook one year after the purchase was:
   a. $2500.
   b. $2000.
   c. $1500.
   d. $1000.

_____ 71. Last year, your hardwood floor company's revenues were $200,000 (after tax). You paid $150,000 for the materials you used and you were the only employee. Alternatively, you could have worked for the Competition Bureau for $50,000 (after tax). The following statement is true:
   a. Your accounting profit was $50,000 and you made no economic profit.
   b. Your accounting and economic profits were $50,000.
   c. Your economic profit was $50,000 and you made no accounting profit.
   d. You made no accounting or economic profits.

_____ 72. When a worthless asset is removed from a firm's capital base, the firm is denied any return on the investment they had made in that asset. These costs are borne by
   a. shareholders, if the company is a crown corporation.
   b. taxpayers if the government must cover the regulated firm's deficit.
   c. nobody.
   d. both (a) and (b).

_____ 73. The production function for calendars is $c = 2f^{1/2} + p^{1/2}$, where c represents the number of calendars, f represents the number of photographs in the database, and p is the amount of paper. The marginal product of photographs is $f^{-1/2}$ and the marginal product of paper is $0.5p^{-1/2}$. The price of photographs is $p_f$ and the price of paper is $p_p$. The demand function for paper is:

   a. $p = \left( c - 2f^{\frac{1}{2}} \right)^2$.

   b. $p = \dfrac{2p^{\frac{1}{2}}}{f^{\frac{1}{2}}}$.

   c. $p = \left( \dfrac{cp_f}{4p_p + p_f} \right)^2$.

   d. all of the above.

_____ 74. Consider the following production function: $q = 2K^{1/2} + L^{1/2}$. This function exhibits:
   a. constant returns to scale.
   b. increasing returns to scale.
   c. decreasing returns to scale.
   d. all of the above, depending on the output level.

_____ 75. The production function for songs is: $S = KL^3$, where K represents singers (capital) and L represents hours of labour. The marginal product of capital is $L^3$, and the marginal product of labour is $3KL^2$. The price of capital is v, and the wage rate is w. The long-run cost function for songs is:

    a.   $LTC(S) = wL + vK$ .

    b.   $LTC(S) = wL + v\dfrac{wL}{3v}$ .

    c.   $LTC(S) = 4x3^{-\frac{3}{4}}\left(vw^3 S\right)^{\frac{1}{4}}$ .

    d.   none of the above.

_____ 76. Tracy uses whole-wheat flour (W) and wheat bran (B) to make muffins (M): M = 4W + B. The price of whole-wheat flour is $p_W$ and the price of bran is $p_B$. The long-run cost function is:

    a.   $0.25p_W M$ if $p_W < p_B$; $p_B M$ if $p_W = p_B$.

    b.   $p_B M$ if $p_W < p_B$; $0.25p_W M$ if $p_W = p_B$.

    c.   $0.25p_W M$ if $p_W < 4p_B$; $p_B M$ if $p_W = 4p_{B.}$

    d.   $p_B M$ if $p_W < 4p_B$; $0.25p_W M$ if $p_W = 4p_B$.

_____ 77. A fixed-proportions production function exhibits:

    a.   increasing returns to scale.

    b.   decreasing returns to scale.

    c.   constant returns to scale.

    d.   none of the above.

_____ 78. The long-run cost minimization procedure requires that the firm employs both inputs so that:

    a.   it gets the same "bang for the buck" for each kind of input hired.

    b.   it gets the same amount of output per dollar spent on both inputs.

    c.   the MRTS is equal to the input price ratio.

    d.   all of the above.

_____ 79. The following statement about the relationship between total costs and returns to scale is true:

    a.   The total cost curve is strictly concave when the production function exhibits constant returns to scale.

    b.   The total cost curve is concave when the production function exhibits decreasing returns to scale.

    c.   The total cost curve is convex when the production function exhibits increasing returns to scale.

    d.   None of the above.

_____ 80. Stockholm test-run traffic fees for a period of seven months at the beginning of 2006. Drivers entering or exiting the city during daytime were charged between 10 ($1.6) and 20 Swedish crowns each time. The main reason these fees had to be introduced was:

    a.   The social marginal cost generated by an additional automobile was lower than the private cost incurred by the driver, leading to severe traffic jams, and these fees were meant to align the two costs and reduce city traffic.

    b.   The social marginal cost generated by an additional automobile was higher than the private cost incurred by the driver, leading to severe traffic jams, and these fees were meant to align the two costs and reduce city traffic.

    c.   The Swedish authorities did not want financially unstable drivers within city limits.

    d.   The Swedish authorities wanted to offer equal opportunities to all drivers to access the core of the city.

_____ 81. The following statement about short-run costs is true:
   a. The average total cost is higher or equal to the average variable cost.
   b. The average fixed cost is decreasing as output increases.
   c. The short-run marginal cost crosses the short-run average variable and average total costs at their minimum points.
   d. All of the above.

_____ 82. Which kinds of economic changes are likely to change a firm's cost curves?
   a. changes in input prices.
   b. technological innovations.
   c. economies of scope.
   d. All of the above.

_____ 83. Technological progress leads to
   a. no change in a firm's output expansion path, only to a shift in its cost curves..
   b. a shift in a firm's output expansion path and cost curves.
   c. decreasing returns to scale.
   d. economies of scope.

_____ 84. Maple Leaf Foods Canada produces bacon, hot dogs, cooked roast, canned meat etc at the same location, as opposed to having separate meat processing plants for each of these products. They do this because
   a. the presence of economies of scope leads to lower costs than the costs incurred in separate plants for the same output level.
   b. the presence of constant returns to scale leads to lower costs than the costs incurred in separate plants for the same output level.
   c. the presence of economies of scale leads to lower costs than the costs incurred in separate plants for the same output level.
   d. none of the above.

_____ 85. One of the economic reasons in favour of bank mergers is the fact that
   a. the lead to the creation of monopolistic markets.
   b. they generate economies of scope.
   c. consumers will be better informed about financial products.
   d. All of the above.

_____ 86. Consider the following production function: $q = KL^2$. The total cost function is
   a. a positively sloped straight line.
   b. a positively sloped convex curve.
   c. a positively sloped concave curve.
   d. none of the above.

_____ 87. CKUA Radio's production function for hours of radio broadcasting per day (R) is $R = SN$, where S is the number of songs and N represents news (measured in hours). The price of a song is $p_S$ and the price of one hour of news broadcasting is $p_N$. They currently have four hours of daily news. The following statement is true:
   a. The short-run variable cost function is: $VC_{short\text{-}run} = 0.25p_S R$.
   b. The short-run marginal cost function is $SMC = 0.25p_S$.
   c. The short-run average variable cost curve is a horizontal line.
   d. All of the above.

_____ 88. One year ago your construction company signed a rental agreement for a crane which stipulates unlimited use of the crane for $5,000 per month for three years. Your operating expenses are $3000 per month, and your revenues from using the crane are $7000 per month. What should you do?
   a. Continue using the crane in the short run, because your revenues are higher than your operating expenses and the rental fee is a sunk cost which should not influence your short-run decision.
   b. Renew your rental contract after its expiry if the rental rate and your revenues and costs remain unchanged.
   c. Continue using the crane in the short-run because your revenues are higher than the rental rate.
   d. All of the above.

_____ 89. The Mackenzie Gas Project is a proposed 1220-km natural gas pipeline system along the Mackenzie Valley of Canada's Northwest Territories to connect northern onshore gas fields with North American markets. Assume gas transportation involves only two types of costs: pipeline construction costs and pipeline operating costs. The following statement is true:
   a. The project will be approved only if estimated total benefits exceed estimated total costs (both construction and operating costs).
   b. After the pipeline is in place, it should be used for gas transportation as long as revenues are higher than operating costs.
   c. After the pipeline is in place, it should be used for gas transportation as long as the estimated lifetime revenues cover construction costs.
   d. Both (a) and (b).

_____ 90. You want to purchase a new laptop. Your plan is to spend $900 on the laptop itself, and $400 on software and accessories. You estimate your search time will amount to 48 hours, out of which only 38 will be taken from your leisure time (valued at $0). You currently work as a sales associate and earn $12 per hour. You should purchase the laptop if the estimated total benefits are at least _____. Now assume you have just purchased the laptop, installed the new software, and realized that you have overestimated your benefits. Since the 14-day trial period has already expired you can no longer return it to the store. You found a buyer who is willing to pay $800 for it. You should keep the laptop if your estimated benefits are higher than _____.
   a. $1420; $800.
   b. $1420; $1300.
   c. $1300; $800.
   d. $1300; $1300.

# Econ8500_Production_Costs
# Answer Section

**MULTIPLE CHOICE**

1. ANS: D
   The textbook defines a firm as "any organization that turns inputs into outputs."

   PTS: 1          REF: 159
2. ANS: B
   A production function is the mathematical relationship between inputs and outputs.

   PTS: 1          REF: 159
3. ANS: C
   The marginal physical productivity of an input is defined as the quantity of extra output provided by employing one additional unit of that input while holding all other inputs constant.

   PTS: 1          REF: 162
4. ANS: B
   Labour cannot be added indefinitely, without the marginal product eventually deteriorating, since all other inputs are held constant.

   PTS: 1          REF: 163
5. ANS: A
   The slope of the total output curve shows how output changes when the amount of labour changes and the other inputs are held constant. This is the marginal physical productivity of labour.

   PTS: 1          REF: 163
6. ANS: C
   The average productivity of capital measures the output produced per unit of capital, which is given by the ratio of total output to the quantity of capital employed.

   PTS: 1          REF: 164
7. ANS: D
   A point on the total output curve shows the output corresponding to a certain amount of labour. The ratio of total output and labour at a certain point is equal to the slope of a ray from the origin to that point on the total output curve, and it is interpreted as the average productivity of labour.

   PTS: 1          REF: 164
8. ANS: C
   An isoquant shows the combinations of inputs that result in a given amount of output.

   PTS: 1          REF: 166
9. ANS: A
   MRTS is the amount by which one input can be reduced when one more unit of another input is added while holding output constant. (b) is false because it represents the MRTS of capital for labour.

   PTS: 1          REF: 167

10. ANS: D
    MRTS = -(Slope of isoquant).

    PTS: 1          REF: 167
11. ANS: A
    We can take a Cobb-Douglas constant returns to scale production function and show that all inputs exhibit

    diminishing marginal productivities. If $q = \sqrt{KL}$ then $MPP_L = \dfrac{1}{2}\sqrt{\dfrac{K}{L}}$ and $MPP_K = \dfrac{1}{2}\sqrt{\dfrac{L}{K}}$. We can see

    that the marginal physical product of labour decreases when labour increases, and the marginal physical
    product of capital decreases when capital increases. Thus both inputs for this constant returns to scale
    production function exhibit diminishing marginal productivities.

    PTS: 1          REF: 171
12. ANS: D
    If we double the amount of capital and labour output will be equal to q* = 6K + 4L = 2(3K + 2L) = 2q, so the
    function exhibits constant returns to scale and I is true.. If we increase labour by one unit q** = 3K + 2(L + 1)
    = 3K + 2L + 2. Since q** - q = 2, the marginal products of labour is equal to 2. Similarly, the marginal
    product of capital is equal to 3. Thus II is false, since both marginal productivities are constant, not
    diminishing. From equation (5.4) in the text we know that MRTS = $MP_L/MP_K$ = 2 / 3 (constant). Thus III is
    true. The correct answer is (d).

    PTS: 1          REF: 167 | 171
13. ANS: B
    If the amount of one of the inputs increases output stays the same, so the marginal product of that input is
    zero.

    PTS: 1          REF: 175
14. ANS: B
    This is how the concept of "increasing returns to scale" is defined.

    PTS: 1          REF: 171
15. ANS: C
    If we double both inputs output doubles, $q^* = \sqrt{2K2L} = 2\sqrt{KL} = 2q$, so the production function exhibits

    constant returns to scale. The marginal product of labour is $MP_L = \dfrac{\partial q}{\partial L} = \dfrac{1}{2}L^{-\frac{1}{2}}K^{\frac{1}{2}} = \dfrac{1}{2}\left(\dfrac{K}{L}\right)^{\frac{1}{2}}$, which is

    diminishing as the amount of labour increases, and the marginal product of capital is

    $MP_K = \dfrac{\partial q}{\partial K} = \dfrac{1}{2}L^{\frac{1}{2}}K^{-\frac{1}{2}} = \dfrac{1}{2}\left(\dfrac{L}{K}\right)^{\frac{1}{2}}$, which is diminishing as the amount of capital increases.

    PTS: 1          REF: 171
16. ANS: B
    The two inputs are perfect complements, and if there is too much of any of them the output does not change
    as long as the other input is held constant. This is shown by L-shaped isoquants.

    PTS: 1          REF: 175

2

17. ANS: B
    With the same amount of capital, less labour is required now, or with the same amount of labour, less capital is required. This leads to a shift of the isoquant towards the origin.

    PTS: 1          REF: 177
18. ANS: B
    A rise in the average productivity of labour reflects technical progress only if the other input usage hasn't changed. If the labour input has not changed output must have decreased. If output has increased, this could have been a movement on a higher isoquant, generated by an increase in capital and a decrease in labour. Thus we would have a higher average labour productivity, but it would not be due to technical progress. The correct answer is (b).

    PTS: 1          REF: 177
19. ANS: D
    An additional hour of writing (holding the number of articles read constant) leads to $q' = 0.1A + 0.25(H + 1)$ $= 0.1A + 0.25H + 0.25 = q + 0.25$, so the marginal product of H is equal to 0.25. The $MP_A$ is 0.1, so the $MP_H$ is 2.5 times larger.

    PTS: 1          REF: 162
20. ANS: C
    If the two inputs are perfect substitutes, we can always use more of one of them while holding the other one constant, without facing diminishing gains. An example of a production function with perfectly substitutable inputs is $q = 0.1K + 0.25L$. The marginal product of labour is 0.25, and the marginal product of capital is 0.1, and they are both constant.

    PTS: 1          REF: 163
21. ANS: A
    If your grade for the second assignment for this course is lower than your average after the first midterm and assignment, your average decreases. The same happens in the case of marginal and average products.

    PTS: 1          REF: 164
22. ANS: B
    Assume the average product is 10 units of q per hour of labour. If the marginal product of labour is only 8 units of q, the average product will decrease.

    PTS: 1          REF: 164
23. ANS: A
    An increasing marginal product which is larger than the average product will always increase the average product.

    PTS: 1          REF: 164
24. ANS: B
    In this context "iso" comes from the Greek word meaning "equal."

    PTS: 1          REF: 166
25. ANS: D
    See the textbook discussion about isoquant and indifference curve maps on pages 64 and 163.

    PTS: 1          REF: 166

26. ANS: B

$$RTS(\text{of L for K}) = -\frac{\Delta K}{\Delta L} = -\frac{-2}{2} = 1$$

PTS: 1        REF: 167

27. ANS: A

$$MRTS(\text{of K for L}) = \frac{MP_K}{MP_L} = \frac{1/K}{1/L} = \frac{L}{K}$$

PTS: 1        REF: 168

28. ANS: D

If energy and machinery are substitutes in the production of a certain amount of house heating, more efficient machines will be used only when energy becomes more expensive, thus making machinery relatively cheap.

PTS: 1        REF: 169

29. ANS: A

If the function exhibits decreasing returns to scale increasing the output by 10 units requires a larger change in inputs when moving from 60 to 70 units than from 50 to 60 units.

PTS: 1        REF: 172

30. ANS: B

The production function exhibits increasing returns to scale, so isoquants get closer and closer.

PTS: 1        REF: 172

31. ANS: A

If we double all inputs we obtain: $q'(K, L, E) = (2K)^{0.2}(2L)^{0.5}(2E)^{0.3} = 2^{0.2+0.5+0.3}K^{0.2}L^{0.5}E^{0.3} = 2q$. We can see that production is two times larger if all inputs double, so the production function exhibits constant returns to scale.

PTS: 1        REF: 171

32. ANS: D

The volume of a cylinder is equal to $\pi R^2 h$, where R is the radius and h is the length of the pipeline. If R doubles the volume quadruples, generating economies of scale in the industry.

PTS: 1        REF: 173

33. ANS: B

The elasticity of substitution is defined as the percentage change in K/L to the percentage change of MRTS along an isoquant. The elasticity of substitution for a fixed-proportions production function is equal to zero because K/L does not change at the isoquant's vertex.

PTS: 1        REF: 174

34. ANS: D

If we have one problem and four possible answers q will be equal to 1: q = min (1, 4/4) = min (1,1) = 1. If we have one more possible answer, q will not change, since the fifth answer is superfluous.

PTS: 1        REF: 175

35. ANS: D
    See Application 5.4.

    PTS: 1          REF: 173

36. ANS: C
    min(6, 12) = 6, which means that you can only make six glasses of juice. You only need half an apple for a glass of juice, so you have a surplus of apples (6 instead of 3).

    PTS: 1          REF: 174

37. ANS: B
    Since every input combination on the new isoquant contains more capital, the isoquant shifts out.

    PTS: 1          REF: 176

38. ANS: D
    An increased output per worker might be an indication of technical progress (a and c), but also of an input substitution of capital for labour (b).

    PTS: 1          REF: 177

39. ANS: C
    Multifactor productivity takes into account the possible capital-labour substitution, while output per hour does not.

    PTS: 1          REF: 178

40. ANS: C
    The firm is currently using 100/25 = 4 units of labour. If labour increases to 5 while K = 25, output will be equal to 125. The marginal product of labour is equal to 125 – 100 = 25. The average product of labour is initially equal to 100/4 = 25. After the increase in the amount of labour it will be equal to 125/5 = 25.

    PTS: 1          REF: 180

41. ANS: D
    $2 + \ln 3 < 2 + \ln 5$; $6 + \ln 2 > 6 + \ln 1$; $10 + \ln 20 > 9 + \ln 20$.

    PTS: 1          REF: 181

42. ANS: A
    The current level of output is 100 + 100 = 200. One more unit of capital increases the output to 101 + 100 = 201 units. One more unit of labour increases the output to $100 + 11^2 = 100 + 121 = 221$. The marginal product of capital is equal to 1 and the marginal product of labour is equal to 21, so labour should be chosen over capital if the costs are the same.

    PTS: 1          REF: 180

43. ANS: B
    The isoquants for a fixed-proportions production function are L-shaped, so not strictly convex. Since more employees are needed for each scanner, the new isoquant for 100 flights is further from the origin.

    PTS: 1          REF: 177

44. ANS: B
    Isoquants shift in after the technological change, so less inputs are needed to produce the same amount of output. This is a sign of technical progress.

    PTS: 1          REF: 182
45. ANS: D
    Inputs need to change in the same proportion for us to be able to analyze the returns to scale of the production function.

    PTS: 1          REF: 171
46. ANS: B
    The opportunity cost is the cost of a good as measured by the alternative uses that are forgone by producing the good.

    PTS: 1          REF: 188
47. ANS: A
    All payments made to produce the bicycle are part of accounting costs.

    PTS: 1          REF: 189
48. ANS: C
    We use economic costs, not accounting costs, when we calculate economic profits.

    PTS: 1          REF: 193
49. ANS: C
    Costs are minimized at the tangency between an isoquant and a line of equal total cost, where the slope of the isoquant (the MRTS of L for K) is equal to the slope of the cost line (w/v).

    PTS: 1          REF: 195
50. ANS: C
    The output expansion path is the set of cost-minimizing input combinations a firm will choose to produce various levels of output, when the prices of inputs are held constant.

    PTS: 1          REF: 196
51. ANS: D
    The output expansion path represents input combinations that minimize the costs of producing certain amounts of output. These points are represented by tangencies between isoquants and lines of equal total costs. The locus of these tangencies depends on the prices of inputs and on the shape of isoquants (representations of a firm's production function in an input space).

    PTS: 1          REF: 196

52. ANS: C
The slope of a ray from the origin to a point on the output expansion path is equal to the ratio of capital and labour used at that point ($K^*/L^*$). Since the production function exhibits constant returns to scale, as output expands these inputs will expand in the same proportion: for example, if output increases three times, the amounts of both inputs would triple. This means that the slope of the ray from the origin to this new point will be equal to $3K^*/3L^* = K^*/L^*$, which is the same as before. Since all rays from the origin to points on the output expansion path have the same slope, the output expansion path is a straight line through the origin. Its slope depends on input prices, but also on the shape of the isoquants. Therefore (c) is true.

PTS: 1          REF: 196

53. ANS: B
Total costs increase continuously as output increases, and this gives the positive slope of the total cost curve. Since the firm exhibits increasing returns to scale, these total costs will increase at a decreasing rate, because less and less inputs are needed for an additional unit of output.

PTS: 1          REF: 198

54. ANS: C
The marginal cost measures the change in total cost when one more unit of output is produced.

PTS: 1          REF: 199

55. ANS: C
The fact that the total cost curve is linear means that the marginal cost is constant. Since total cost increases by the same amount every time an additional unit of output is produced, the average cost is also constant, and it is also equal to the marginal cost.

PTS: 1          REF: 199

56. ANS: A
If the marginal cost is below average cost, the next unit of output will increase total costs by an amount smaller than the average cost, and the average cost will decrease.

PTS: 1          REF: 201

57. ANS: C
The difference between the long run and the short run is the fact that in the long run all inputs are variable, while in the short run only some inputs are variable, and some are fixed.

PTS: 1          REF: 205

58. ANS: B
The difference between the long run and the short run is the fact that in the long run all inputs are variable, while in the short run only some inputs are variable, and some are fixed.

PTS: 1          REF: 205

59. ANS: B
When we determine the long-run average cost curve we want to see how costs change when output changes and input prices are held constant (d – false). If the firm moves between two levels of output the shape of the long-run average cost curve does not change (c – false). The diminishing marginal productivity of each input is not involved either, because all inputs can be varied (a – false). The underlying production function is important (b – true).

PTS: 1          REF: 215

60. ANS: B
A CRS production function generates a straight-line total cost function and therefore identical and constant average and marginal costs.

PTS: 1         REF: 200

61. ANS: D
STC = short-run fixed costs + short-run variable costs.

PTS: 1         REF: 206

62. ANS: D
When the marginal cost is smaller than the average cost, the average cost is declining. When the marginal cost is above the average cost, the average cost is increasing. This means that the marginal cost curve crosses the average cost curve at its minimum point.

PTS: 1         REF: 209

63. ANS: B
SAC = STC / q.

PTS: 1         REF: 199

64. ANS: C
A firm has more flexibility in the long run in terms of being able to adjust inputs to a desired level of output, so the least it can do is have the some costs as in the short run. Long-run costs are therefore always less than or equal to short-run costs.

PTS: 1         REF: 209

65. ANS: B
If it is difficult to substitute capital for labour the firm will not be able to dramatically reduce the amount of labour used as a response to an increase in wage rates, and this will inflate the costs. If labour costs represent a large portion of total cost, an increase in wage rates will also affect total cost and therefore average costs significantly.

PTS: 1         REF: 211

66. ANS: A
Technical progress will shift isoquants towards the origin and lower production costs.

PTS: 1         REF: 211

67. ANS: B
The car would have been the next best use of the money spent on ski trips, so this is the opportunity cost of the ski trips.

PTS: 1         REF: 188

68. ANS: C
The value of the seats in their next best alternative use is zero, since nobody is willing to pay anything for them.

PTS: 1         REF: 189

69. ANS:  C
    The wage rate should be equal to what he could earn in his next best alternative employment, which is his current job. A small bonus on top of that would be sufficient to convince him to switch companies, since the problem assumes that switching companies is costless.

    PTS:  1            REF:  189

70. ANS:  D
    The economic cost is the implicit cost of the notebook, which is what the second-hand computer store would be willing to pay.

    PTS:  1            REF:  189

71. ANS:  A
    While accounting profits are calculated without subtracting the cost of the owner's labour, economic profits subtract these entrepreneurial costs from total revenues. Thus accounting profits will be equal to $200,000 - $150,000 = $50,000, and economic profits will be equal to $200,000 - $150,000 - $50,000 = $0.

    PTS:  1            REF:  192

72. ANS:  B
    Shareholders bear the costs if the company is private, and taxpayers bear the costs if the assets are excluded from the firm's capital base and the government must cover the regulated firm's deficit.

    PTS:  1            REF:  190

73. ANS:  C
    We have two conditions which determine the demand for paper:

    $$\begin{cases} c = 2f^{\frac{1}{2}} + p^{\frac{1}{2}} \\ MRTS(\text{of f for p}) = \dfrac{p_f}{p_p}. \end{cases}$$

    The second condition is the tangency condition between an isoquant and a line of equal cost (isocost line). We can re-write it as:

    $\dfrac{MP_f}{MP_p} = \dfrac{p_f}{p_p} \Leftrightarrow \dfrac{2p^{\frac{1}{2}}}{f^{\frac{1}{2}}} = \dfrac{p_f}{p_p}$. If we solve for f we obtain: $f^{\frac{1}{2}} = \dfrac{2p^{\frac{1}{2}}p_p}{p_f}$. Substitute this into the production

    function and solve for p: $p = \left(\dfrac{cp_f}{4p_p + p_f}\right)^2$. This is the demand function for paper.

    PTS:  1            REF:  195

74. ANS:  C
    If we double both inputs output becomes: q' = 2(2K)$^{1/2}$ + (2L)$^{1/2}$ = 2$^{1/2}$(2K$^{1/2}$ + L$^{1/2}$) = 2$^{1/2}$q, which is smaller than q. The function exhibits decreasing returns to scale.

    PTS:  1            REF:  198

75. ANS: C

$$\begin{cases} S = KL^3 (1) \\ MRTS \text{(of L for K)} = \dfrac{w}{v} \Leftrightarrow \dfrac{3KL^2}{L^3} = \dfrac{3K}{L} = \dfrac{w}{v} (2) \end{cases}$$ . We can solve for K in equation (2) and then substitute it

in (1) to obtain L. $K = \dfrac{wL}{3v}$, so $S = \dfrac{wL}{3v}L^3 = \dfrac{wL^4}{3v} \Rightarrow L = \left(\dfrac{3vS}{w}\right)^{\frac{1}{4}}$, $K = \left(\dfrac{3vw^4 S}{81v^4 w}\right)^{\frac{1}{4}} = \left(\dfrac{w^3 S}{27v^3}\right)^{\frac{1}{4}}$. The

long-run cost function is

$$LTC = wL + vK = w\left(\frac{3vS}{w}\right)^{\frac{1}{4}} + v\left(\frac{w^3 S}{27v^3}\right)^{\frac{1}{4}} = (3vw^3 S)^{\frac{1}{4}} + \left(\frac{vw^3 S}{27}\right)^{\frac{1}{4}} = \left(vw^3 S\right)^{\frac{1}{4}}\left(3^{\frac{1}{4}} - 3^{-\frac{3}{4}}\right) =$$

$$= 4x3^{-\frac{3}{4}}\left(vw^3 S\right)^{\frac{1}{4}}.$$

PTS: 1          REF: 195

76. ANS: C
The two inputs are perfect substitutes: Tracy can make four muffins by using one cup of wheat or four cups of bran. If the price of whole wheat flour is smaller than four times the price of bran, Tracy will exclusively use flour and the long-run total cost function will be: LTC = $p_W$W = $p_W$x(M/4)=0.25$p_W$M. If the price of whole wheat flour is larger than four times the price of bran, Tracy will exclusively use bran. LTC = $p_B$B = $p_B$M.

PTS: 1          REF: 193

77. ANS: C
Assume you always drink coffee with two teaspoons of sugar. Doubling both inputs will produce two coffees, so the function exhibits constant returns to scale.

PTS: 1          REF: 198

78. ANS: D

The first two statements come from $\dfrac{MP_L}{w} = \dfrac{MP_K}{v}$, which is equivalent to the equality between the MRTS and

the input price ratio.

PTS: 1          REF: 195

79. ANS: D
When the production function exhibits CRS, the total cost function is a straight line. When it exhibits IRS the total cost curve is concave, and when it exhibits DRS the total cost function is convex.

PTS: 1          REF: 198

80. ANS: B
Prior to these fees, the marginal cost of adding an automobile to the already crowded traffic was not fully experienced by the driver. These fees were meant to align individual incentives with social incentives.

PTS: 1          REF: 209

81. ANS: D
Average total cost (ATC)= average fixed cost (AFC) + average variable cost (AVC). If average fixed costs are positive, ATC>AVC. If average fixed costs are equal to zero, ATC = AVC. Thus (a) is true. AFC = FC / q, so the larger the output, the smaller average fixed costs will be, so (b) is also true. Whenever the marginal cost is smaller/ larger than an average cost, the average cost will decrease / increase. The average cost curve decreases while the marginal cost curve is below the average cost curve, and increases when it is above. This means that the marginal cost curve will cut the average variable and total costs at their minimum points, and (c) is also true.

PTS: 1          REF: 208

82. ANS: D
See the discussion about "shifts in cost curves," on pages 209 and 210.

PTS: 1          REF: 211

83. ANS: B
Technological innovation alters a firm's production function, leading to a change in the location of its output expansion path and cost curves.

PTS: 1          REF: 211

84. ANS: A
Maple Leaf Foods uses similar equipment for all these products, and they can also use the by-products of cooked roast and bacon to make hot dogs. Producing everything in one plant generates economies of scope, leading to lower total costs.

PTS: 1          REF: 212

85. ANS: B
Mergers make it possible for banks to offer a broader array of products, leading to lower costs due to the presence of economies of scope.

PTS: 1          REF: 212

86. ANS: C
This production function exhibits increasing returns to scale, since doubling both inputs leads to an eight times larger output level: $q' = 2K (2L)^2 = 8q$. This immediately tells us that the total cost function is increasing at a decreasing rate, and therefore is a positively sloped concave curve.

PTS: 1          REF: 198

87. ANS: D
Since $N = 4$, $S = R/4 = 0.25R$. The short-run variable cost function is $VC_{short-run} = p_S S = 0.25p_S R$. One additional hour of broadcasting increases total costs by $0.25p_S(R+1) - 0.25p_S R = 0.25p_S$, which is the short-run marginal cost function. The short-run average variable cost function is $0.25p_S R / R = 0.25p_S$, which is constant, generating a horizontal cost curve. Thus all statements are true.

PTS: 1          REF: 215

88. ANS: A
The rental rate is sunk in the short run, since you have to pay it whether you are using the crane or not, and it should not influence your short-run decision. Since your revenues are high enough to cover your operating expenses, you should continue using the crane.

PTS: 1          REF: 189

89. ANS: D
The project is viable only if estimated benefits exceed estimated construction and operating costs. After the pipeline is in place, construction costs are sunk, since there is no alternative use for the pipeline. To keep operating, only the operating costs need to be covered.

PTS: 1        REF: 189

90. ANS: A
There are not sunk costs before the actual purchase, so the estimated benefits have to be higher than the total cost for the purchase to be worthwhile. The total costs are equal to $900 + $400 + 10x$12 = $1420. Immediately after the purchase all costs will be sunk except for what you can get from reselling the laptop, which is only $800. If your estimated benefits are higher than $800 you should keep it.

PTS: 1        REF: 189