Multiple Choice

9-1 A producer is hiring 20 units of labor and 6 units of capital (bundle A). The price of labor is $10, the price of capital is $2, and at A, the marginal products of labor and capital are both equal to 20. Beginning at A, if the producer increases labor by one unit and decreases capital by 1 unit, then
a. cost remains constant and output increases by 20 units.
b. cost remains constant and output decreases by 20 units.
c. output remains constant and cost increases by $8.
d. output remains constant and cost decreases by $8.
e. both cost and output remain constant.
Answer: c
Difficulty: 02 Medium
Topic: Finding the Optimal Combination of Inputs
AACSB: Reflective Thinking
Blooms: Understand
Learning Objective: 09-03

9-2 A producer is hiring 20 units of labor and 6 units of capital (bundle A). The price of labor is $10, the price of capital is $2, and at A, the marginal products of labor and capital are both equal to 20. Beginning at A, if the producer increases expenditures on labor by $1 and decreases expenditures on capital by $1, then
a. cost remains constant and output decreases by 8 units.
b. cost remains constant and output increases by 12 units.
c. cost remains constant and output increases by 20 units.
d. output remains constant and cost increases by $8.
e. output remains constant and cost decreases by $2.
Answer: a
Difficulty: 02 Medium
Topic: Finding the Optimal Combination of Inputs
AACSB: Analytic
Blooms: Apply
Learning Objective: 09-03

9-3 A producer is hiring 20 units of labor and 6 units of capital (bundle A). The price of labor is $10, the price of capital is $2, and at A, the marginal products of labor and capital are both equal to 20. The producer
a. is using the optimal combination of capital and labor.
b. should use more labor and less capital.
c. should use more capital and less labor.
d. cannot determine without more information.
Answer: c
Difficulty: 01 Easy
Topic: Finding the Optimal Combination of Inputs
AACSB: Analytic
Blooms: Apply
Learning Objective: 09-03
9-4 A producer is hiring 20 units of labor and 6 units of capital (bundle A). The price of labor is $10, the price of capital is $2, and at A, the marginal products of labor and capital are both equal to 20. In equilibrium,
   a. $MP_L$ will be less than 20.
   b. $MP_K$ will be more than 20.
   c. $MP_L$ will be 5 times $MP_K$.
   d. $a$ and $b$
   e. none of the above
   Answer: c
   Difficulty: 01 Easy
   Topic: Finding the Optimal Combination of Inputs
   AACSB: Reflective Thinking
   Blooms: Understand
   Learning Objective: 09-03

9-5 Which of the following is FALSE?
   a. A change in input prices shifts the isoquant map.
   b. Convex isoquants mean that the marginal rate of technical substitution decreases as the firm substitutes labor for capital.
   c. A change in cost shifts the isocost curve.
   d. At the optimal input choice, the rate at which the firm can substitute labor for capital in production is equal to the rate at which the firm can substitute labor for capital in the market.
   e. none of the above.
   Answer: a
   Difficulty: 01 Easy
   Topic: Production Isoquants
   AACSB: Reflective Thinking
   Blooms: Understand
   Learning Objective: 09-01

9-6 The expansion path shows how
   a. input prices change as the firm's output level changes.
   b. the marginal products change as the firm's output level changes.
   c. the cost-minimizing input choices change as the firm's output level changes.
   d. the profit-maximizing input choices change as the firm's output level changes.
   e. the cost-minimizing input prices change as the firm's output level changes.
   Answer: c
   Difficulty: 02 Medium
   Topic: Production Isoquants
   AACSB: Reflective Thinking
   Blooms: Remember
   Learning Objective: 09-01

9-7 Refer to the following figure. The price of capital is $50 per unit:
What is the price per unit of labor?

a. $25
b. $20
c. $10
d. $2

Answer: b

Difficulty: 01 Easy
Topic: Isocost Curves
AACSB: Reflective Thinking
Blooms: Understand
Learning Objective: 09-02

Refer to the following figure. The price of capital is $50 per unit.
How many units of labor should the firm use in order to produce 400 units of output at the least cost?

a. 100
b. 105
c. 110
d. 115

Answer: a

Difficulty: 01 Easy
Topic: Isocost Curves
AACSB: Reflective Thinking
Blooms: Understand
Learning Objective: 09-02

Refer to the following figure. The price of capital is $50 per unit:
The minimum cost of producing 800 units of output is
a. $  6,000.
b. $  7,500.
c. $  8,000.
d. $10,000.
Answer: b
Difficulty: 01 Easy
Topic: Isocost Curves
AACSB: Reflective Thinking
Blooms: Understand
Learning Objective: 09-02

Refer to the following figure. The price of capital is $50 per unit:
Which of the following combinations of capital and labor lies on the expansion path?

a. $110K, 120L$

b. $60K, 120L$

c. $130K, 200L$

d. $130K, 175L$

Answer: d

**Difficulty: 02 Medium**

**Topic: Optimization and Cost**

**AACSB: Reflective Thinking**

**Blooms: Understand**

**Learning Objective: 09-04**

9-11 Refer to the following figure. The price of capital is $50 per unit:

How many units of capital should the firm use to produce 800 units of output at least cost?

a. 110

b. 98

c. 108

d. 102

e. 120

Answer: d

**Difficulty: 02 Medium**

**Topic: Isocost Curves**

**AACSB: Reflective Thinking**

**Blooms: Understand**

**Learning Objective: 09-02**

9-12 Refer to the following figure. The price of capital is $50 per unit:
What is the minimum cost of producing 400 units of output?

a. $3,000
b. $4,000
c. $5,000
d. $6,000
e. none of the above

Answer: c

Difficulty: 01 Easy
Topic: Finding the Optimal Combination of Inputs
AACSB: Reflective Thinking
Blooms: Understand
Learning Objective: 09-03

Refer to the following figure. The price of capital is $50 per unit:
What is the minimum cost of producing 1,200 units of output?

a. $7,000  
b. $8,000  
c. $9,000  
d. $10,000  
e. $11,000  
Answer: d  
Difficulty: 01 Easy  
Topic: Finding the Optimal Combination of Inputs  
AACSB: Reflective Thinking  
Blooms: Understand  
Learning Objective: 09-03

9-14 Refer to the following figure. The price of capital is $50 per unit:
How many units of labor should the firm use to produce 1,200 units of output at least cost?

a. 120  
b. 500  
c. 240  
d. 128  
e. 175  

Answer: e  
Difficulty: 01 Easy  
Topic: Finding the Optimal Combination of Inputs  
AACSB: Reflective Thinking  
Blooms: Understand  
Learning Objective: 09-03

Refer to the following figure. The price of capital is $50 per unit:
What is the marginal rate of technical substitution at each cost minimizing equilibrium point?

a. 0.80  
b. 0.40  
c. 2.50  
d. 2.00  
e. impossible to tell without marginal products

Answer: b

Difficulty: 02 Medium
Topic: Finding the Optimal Combination of Inputs
AACSB: Analytic
Blooms: Apply
Learning Objective: 09-03

The marginal rate of technical substitution is

a. the rate at which the firm can substitute labor for capital while holding total cost constant.
b. the rate at which the firm can substitute labor for capital while holding output constant.
c. the slope of the isocost curve.
d. both a and c  
e. none of the above

Answer: b

Difficulty: 01 Easy
Topic: Production Isoquants
AACSB: Reflective Thinking
Blooms: Remember
Learning Objective: 09-01
9-17 A firm is using 500 units of capital and 200 units of labor to produce 10,000 units of output. Capital costs $100 per unit and labor $20 per unit. The last unit of capital added 50 units of output, while the last unit of labor added 20 units of output. The firm
a. is using the cost−minimizing combination of capital and labor.
b. should use more of both inputs in equal proportions.
c. should use less of both inputs in equal proportions.
d. could produce the same level of output at a lower cost by using more capital and less labor.
e. could produce the same output at a lower cost by using less capital and more labor.
Answer: e
Difficulty: 02 Medium
Topic: Finding the Optimal Combination of Inputs
AACSB: Analytic
Blooms: Apply
Learning Objective: 09-03

9-18 Suppose that when a firm increases output by 50%, long-run total cost increases by less than 50%. The firm will experience
a. diminishing marginal returns.
b. decreasing marginal rate of technical substitution.
c. economies of scale
d. diseconomies of scale
Answer: c
Difficulty: 01 Easy
Topic: Forces Affecting Long-Run Costs
AACSB: Reflective Thinking
Blooms: Understand
Learning Objective: 09-06

9-19 Refer to the following graph. The price of labor is $3 per unit:

What is the price per unit of capital?

Chapter 9: PRODUCTION AND COST IN THE LONG RUN
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a. $1.50  
b. $2.00  
c. $2.10  
d. $5.00  
Answer: d  
Difficulty: 01 Easy  
Topic: Isocost Curves  
AACSB: Reflective Thinking  
Blooms: Understand  
Learning Objective: 09-02
Refer to the following graph. The price of labor is $3 per unit:

How many units of capital should a firm use in order to produce 300 units of output at the least cost?

a. 17 units of capital  
   b. 18 units of capital  
   c. 19 units of capital  
   d. 20 units of capital  

Answer: b

Difficulty: 02 Medium  
Topic: Isocost Curves  
AACSB: Reflective Thinking  
Blooms: Understand  
Learning Objective: 09-02
What is the marginal rate of technical substitution at point B?

a. 0.6  
b. 0.75  
c. 1  
d. 1.7  
Answer: a

Difficulty: 02 Medium  
Topic: Production Isoquants  
AACSB: Reflective Thinking  
Blooms: Understand  
Learning Objective: 09-01

Refer to the following graph. The price of labor is $3 per unit:

What is the minimum cost of producing 100 units of output?

a. $150  
b. $105  
c. $ 75  
d. $ 60  
Answer: b

Difficulty: 01 Easy  
Topic: Isocost Curves  
AACSB: Reflective Thinking  
Blooms: Understand  
Learning Objective: 09-02
9-23 Refer to the following graph. The price of labor is $3 per unit:

![Graph](image)

How many units of labor should a firm use in order to produce 100 units of output at the least cost?

a. 5 units of labor  
b. 10 units of labor  
c. 15 units of labor  
d. 20 units of labor

Answer: b

Difficulty: 01 Easy
Topic: Isocost Curves
AACSB: Reflective Thinking
Blooms: Understand
Learning Objective: 09-02

9-24 Refer to the following graph. The price of capital \( (r) \) is $20.
What is the price of labor \( (w) \)?

a. \$20  
b. \$30  
c. \$25  
d. \$35  
en. none of the above

Answer: b  
Difficulty: 01 Easy  
Topic: Isocost Curves  
AACSB: Reflective Thinking  
Blooms: Understand  
Learning Objective: 09-02

Refer to the following graph. The price of capital \( (r) \) is \$20.
What combination of labor ($L$) and capital ($K$) can produce 5,000 units of output at lowest cost?

a. $90K, 60L$

b. $110K, 10L$

c. $42K, 52L$

d. $60K, 20L$

e. $10K, 110L$

Answer: d

Difficulty: 01 Easy

Topic: Isocost Curves

AACSB: Reflective Thinking

Blooms: Understand

Learning Objective: 09-02

9-26 Refer to the following graph. The price of capital ($r$) is $20.

What is the lowest possible cost of producing 5,000 units of output?
Refer to the following graph. The price of capital \( (r) \) is $20.

Why wouldn't the firm choose to produce 5,000 units of output with the combination at A?

a. At A, \( MRTS < 3/2 \).

b. At A, \( MP_K / r > MP_L / w \).

c. At A, \( MP_L > MP_K \).

d. both \( a \) and \( b \).

e. none of the above

Answer: e

Difficulty: 03 Hard

Topic: Finding the Optimal Combination of Inputs

AACSB: Analytic

Blooms: Apply

Learning Objective: 09-03
Why wouldn't the firm choose to produce 5,000 units of output with the combination at \( B \)?

a. At \( B \), \( \text{MRTS} < \frac{3}{2} \).

b. At \( B \), \( \text{MP}_K / r > \text{MP}_L / w \).

c. At \( B \), \( \text{MP}_L < \text{MP}_K \).

d. both a and b

e. none of the above

Answer: d

Difficulty: 02 Medium

Topic: Finding the Optimal Combination of Inputs

AACSB: Analytic

Blooms: Apply

Learning Objective: 09-03

9-29 Refer to the following graph. The price of capital (\( r \)) is $20.

What is the lowest possible cost at which 14,000 units of output can be produced?

a. $8,600

b. $2,400

c. $3,600
Refer to the following graph. The price of capital \((r)\) is $20.

9-30  Refer to the following graph. The price of capital \((r)\) is $20.

What combination of \(K\) and \(L\) should the firm choose to produce 14,000 units of output at the lowest cost?

a.  \(180K, 120L\)

b.  \(180K, 0L\)

c.  \(60K, 120L\)

d.  \(90K, 60L\)

e.  none of the above

Answer: d

Difficulty: 01 Easy

Topic: Finding the Optimal Combination of Inputs

AACSB: Reflective Thinking

Blooms: Understand

Learning Objective: 09-03

9-31  Refer to the following graph. The price of capital \((r)\) is $20.
At the optimal combination of inputs for producing 14,000 units of output, what is the marginal rate of technical substitution?

a. 2.5
b. 0.67
c. 1.5
d. 0.80
e. impossible to tell from the graph

Answer: c
Difficulty: 02 Medium
Topic: Finding the Optimal Combination of Inputs
AACSB: Analytic
Blooms: Apply
Learning Objective: 09-03

Refer to the following graph. The price of capital \((r)\) is $20.
If, at the optimal combination of inputs for producing 14,000 units of output, the marginal product of capital is 40, what is the marginal product of labor?

a. 60  
b. 40  
c. 27.7  
d. 80  
e. impossible to tell from the graph

Answer: a

Difficulty: 02 Medium

Topic: Finding the Optimal Combination of Inputs

AACSB: Analytic

Blooms: Apply

Learning Objective: 09-03

9-33 In the following graph, the price of labor is $15 per unit. The minimum cost of producing 1,000 units of output is:

a. $150
b. $450  
c. $600  
d. $1,800  
e. none of the above  

Answer: e  
Difficulty: 01 Easy  
Topic: Isocost Curves  
AACSB: Analytic  
Blooms: Apply  
Learning Objective: 09-02

9-34 In the following graph, the price of labor is $15 per unit. How many units of labor should a firm use to produce 2,000 units of output at the least cost?

a. 40  
b. 50  
c. 80  
d. 100  
e. none of the above  

Answer: b  
Difficulty: 02 Medium  
Topic: Isocost Curves  
AACSB: Analytic  
Blooms: Apply  
Learning Objective: 09-02

9-35 In the following graph, the price of labor is $15 per unit. Which of the following combinations of capital and labor lies on the expansion path?
A firm is using 500 units of labor and 100 units of capital to produce 100 units of output. Labor costs $5 per unit and capital $20 per unit. At these input levels, another unit of labor adds 5 units of output, while another unit of capital adds 40 units of output. If the firm uses 496 units of labor and 101 units of capital instead, what will happen?

a. Cost will be unchanged, and output will increase by 20 units.

b. Cost will be unchanged, and output will increase by 35 units.

c. Output will be unchanged, and cost will decrease by $20.

d. Output will be unchanged, and cost will decrease by $40.

Answer: a

Difficulty: 03 Hard
Topic: Finding the Optimal Combination of Inputs
AACSB: Analytic
Blooms: Apply
Learning Objective: 09-03

A publishing house is using 400 printers and 200 printing presses to produce books. The printers' wage rate is $20 and the price of a printing press is $100. The last printer added 20 books to total output, while the last printing press added 50 books to total output. The publishing house

a. is using the cost–minimizing combination of printers and printing presses.

b. should use more printers because they are cheaper than printing presses.

c. should use more printing presses because they are more productive than printers.

d. could produce the same number of books at a lower cost by using more printing presses and fewer printers.

Chapter 9: PRODUCTION AND COST IN THE LONG RUN
e. could produce the same number of books at a lower cost by using more printers and fewer printing presses.

Answer: e

Difficulty: 03 Hard

Topic: Finding the Optimal Combination of Inputs

AACSB: Analytic

Blooms: Apply

Learning Objective: 09-03

9-38 In the long run
a. all inputs are fixed.
b. a firm is making the optimal input choice when the marginal rate of technical substitution is equal to the input price ratio.
c. the expansion path shows how the input marginal products change as the firm's output level changes.
d. both a and b
e. none of the above

Answer: b

Difficulty: 01 Easy

Topic: Finding the Optimal Combination of Inputs

AACSB: Reflective Thinking

Blooms: Understand

Learning Objective: 09-03

9-39 Which of the following are characteristics of a typical isoquant?
a. All input combinations on the isoquant will produce the same level of output.
b. The marginal rate of technical substitution decreases as more labor is substituted for less capital.
c. A change in input prices shifts the isoquant map.
d. both a and b
e. none of the above

Answer: d

Difficulty: 01 Easy

Topic: Production Isoquants

AACSB: Reflective Thinking

Blooms: Remember

Learning Objective: 09-01

9-40 A sofa manufacturer currently is using 50 workers and 30 machines to produce 5,000 sofas a day. The wage rate is $200 and the rental rate for a machine is $1,000. At these input levels, another worker adds 200 sofas, while another machine adds 500 sofas. If the firm uses 45 workers and 31 machines instead, then its
a. cost will be unchanged, and its output will decrease by 500 units.
b. cost will be unchanged, and its output will increase by 300 units.
c. cost will be unchanged, and its output will increase by 500 units.
d. output will be unchanged, and its cost will decrease by $800.
e. none of the above

Answer: a

Difficulty: 02 Medium

Topic: Finding the Optimal Combination of Inputs

AACSB: Analytic

Blooms: Apply
Learning Objective: 09-03

9-41 In the following graph, the price of capital is $100 per unit. How many units of capital should a firm use in order to produce 500 units of output at the least cost?

![Graph showing isocost lines and isoquant](image)

a. 10 units of capital
b. 12 units of capital
c. 14 units of capital
d. 20 units of capital
e. none of the above

Answer: b

Difficulty: 02 Medium
Topic: Isocost Curves
AACSB: Analytic
Blooms: Apply
Learning Objective: 09-02

9-42 In the following graph, the price of capital is $100 per unit. What is the marginal rate of technical substitution at point C?

![Graph showing isocost lines and isoquant](image)
In the following graph, the price of capital is $100 per unit. If a firm decides that total cost must not exceed $3,500, what is the maximum amount of output it can produce?
9-44 In the following graph, the price of capital is $100 per unit. Which of the following combinations of capital and labor lies on the expansion path?

![Graph showing isoquant curves with points labeled A, B, and C.]

- a. 20K, 60L
- b. 35K, 140L
- c. 50K, 200L
- d. all of the above
- e. none of the above

Answer: a
Difficulty: 02 Medium
Topic: Optimization and Cost
AACSB: Analytic
Blooms: Apply
Learning Objective: 09-04
9-46 If the price of labor rises relative to the price of capital, the cost-minimizing ratio of capital usage to labor usage (i.e., the ratio $K/L$) will
a. increase.
b. be unchanged.
c. decrease.
d. cannot determine without more information
Answer: a
Difficulty: 01 Easy
Topic: Finding the Optimal Combination of Inputs
AACSB: Reflective Thinking
Blooms: Understand
Learning Objective: 09-03

9-47 Which of the following statements is true?
   a. In the short run all inputs are fixed.
   b. In the long run a firm is making the optimal input choice when the marginal rate of technical substitution is equal to the input price ratio.
   c. Diminishing returns to labor means that adding one more worker will decrease output.
   d. all of the above
   e. none of the above
Answer: b
Difficulty: 01 Easy
Topic: Finding the Optimal Combination of Inputs
AACSB: Reflective Thinking
Blooms: Understand
Learning Objective: 09-03

9-48
Given the above graph, what is the marginal rate of technical substitution at point A?

a. 0.3  
b. 1  
c. 1.125  
d. 1.67  
e. none of the above

Answer: e

Difficulty: 02 Medium

Topic: Finding the Optimal Combination of Inputs

AACSB: Analytic

Blooms: Apply

Learning Objective: 09-03

Chapter 9: PRODUCTION AND COST IN THE LONG RUN

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Given the above graph, as you move from point A to point B,

a. output is unchanged.
b. cost is unchanged.
c. the rate at which the firm can substitute labor for capital while holding output constant decreases.
d. both a and b

e. both a and c

Answer: e

Difficulty: 02 Medium

Topic: Isocost Curves

AACSB: Analytic

Blooms: Apply

Learning Objective: 09-02
9.50 Given the above graph, if the firm continues to produce 45 units of output and moves from point A to point B, it must be true that
a. the price of labor decreased relative to the price of capital.
b. the price of capital decreased relative to the price of labor.
c. the cost of producing 45 units decreased.
d. both b and c

e. none of these are true
Answer: a
Difficulty: 01 Easy
Topic: Isocost Curves
AACSB: Reflective Thinking
Blooms: Understand
Learning Objective: 09-02

9.51 If the price of labor is $5 and the price of capital is $10, what is the marginal rate of technical substitution at the optimal input choice?

a. 0.5
b. 2

c. decreasing
d. increasing
e. none of the above

Answer: a
Difficulty: 01 Easy
Topic: Finding the Optimal Combination of Inputs
AACSB: Reflective Thinking
Blooms: Remember
Learning Objective: 09-03
Which of the following is (are) characteristics of an isocost curve?

a. The slope shows the rate at which the firm can substitute labor for capital while holding total cost constant.
b. The slope shows the rate at which the firm can substitute labor for capital in the market.
c. If the price of capital is unchanged and the price of labor increases, the intercept of the isocost curve on the horizontal axis will decrease.
d. both a and c
e. all of the above

Answer: e

Difficulty: 02 Medium
Topic: Isocost Curves
AACSB: Reflective Thinking
Blooms: Understand
Learning Objective: 09-02

A dry cleaner currently has 10 workers and 4 machines. The workers' wage rate is $300 per worker and the rental rate for a machine is $500. The last worker added 600 units to total output and the last machine also added 600 units to total output, and the last machine also added 600 units to total output. If the dry cleaner uses 11 workers and 3 machines instead, then

a. cost will be unchanged and output will increase by 300 units.
b. cost will be unchanged and output will decrease by 200 units.
c. output will be unchanged and cost will decrease by $500.
d. output will be unchanged and cost will decrease by $200.
e. none of the above

Answer: d

Difficulty: 03 Hard
Topic: Finding the Optimal Combination of Inputs
AACSB: Analytic
Blooms: Apply
Learning Objective: 09-03

The expansion path

a. shows how the cost–minimizing input choices change as the firm's output level changes.
b. shifts if the input price ratio changes.
c. is the collection of all input combinations at which the marginal rate of technical substitution equals the input price ratio.
d. both a and c
e. all of the above

Answer: e

Difficulty: 02 Medium
Topic: Optimization and Cost
AACSB: Reflective Thinking
Blooms: Remember
Learning Objective: 09-04
Given the above graph, as you move from input combination A to input combination C,

a. output is unchanged.
b. cost is unchanged.
c. the marginal rate of technical substitution increases.
d. both a and b

e. all of the above

Answer: d

Difficulty: 02 Medium
Topic: Production Isoquants
AACSB: Reflective Thinking
Blooms: Understand
Learning Objective: 09-01
Given the above graph, the marginal rate of technical substitution at point A is
a. less than 0.25.
b. less than 4.0.
c. greater than 0.25.
d. greater than 4.0.
Answer: c
Difficulty: 02 Medium
Topic: Finding the Optimal Combination of Inputs
AACSB: Reflective Thinking
Blooms: Understand
Learning Objective: 09-03

The marginal rate of technical substitution is
a. the market rate of exchange between labor and capital.
b. the rate at which the firm can substitute labor for capital while holding total cost constant.
c. the rate at which the firm can substitute labor for capital while holding output constant.
d. both a and b
e. both a and c
Answer: c
Difficulty: 01 Easy
Topic: Finding the Optimal Combination of Inputs
AACSB: Reflective Thinking
Blooms: Remember
Learning Objective: 09-03
9.58 In the following graph, the price of capital is $12 per unit. If the price of labor is $30 per unit, the lowest possible cost of producing 200 units of output is

![Graph showing isocost lines and production of 200 units.]

- a. $1,200.
- b. $2,400.
- c. $3,000.
- d. $4,000.
- e. none of the above

Answer: a

Difficulty: 01 Easy
Topic: Isocost Curves
AACSB: Analytic
Blooms: Apply
Learning Objective: 09-02

9.59 In the following graph, the price of capital is $12 per unit. How many units of labor should the firm use in order to produce 200 units of output at the least cost?

![Graph showing isocost lines and production of 200 units.]

- a. 12 units of labor
- b. 18 units of labor

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c. 30 units of labor  
d. 40 units of labor  
e. 22 units of labor  

Answer: e  
Difficulty: 02 Medium  
Topic: Isocost Curves  
AACSB: Analytic  
Blooms: Apply  
Learning Objective: 09-02  

9-60  
In the following graph, the price of capital is $12 per unit. If the price of labor increases to $40 per unit and total cost is unchanged, what is the maximum amount of output the firm can produce?  
a. 100 units of output  
b. 200 units of output  
c. 300 units of output  
d. 400 units of output  
e. none of the above  

Answer: a  
Difficulty: 02 Medium  
Topic: Isocost Curves  
AACSB: Analytic  
Blooms: Apply  
Learning Objective: 09-02  

9-61  
A firm is using 50 units of labor and 100 units of capital to produce 2,000 units of output. The price of labor is $200 per unit and the price of capital is $100 per unit. At these input levels, another unit of labor adds 400 units to output and another unit of capital adds 600 units to output. The firm  
a. is minimizing the cost of producing 2,000 units of output.  
b. could produce 6 more units of output at the same cost by switching $1 from labor to capital.  
c. could produce 4 more units of output at the same cost by switching $1 from labor to capital.  
d. could keep output constant and reduce cost by using more capital and less labor.  
e. both c and d  

Chapter 9: PRODUCTION AND COST IN THE LONG RUN  
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9-62 If the marginal rate of technical substitution of labor for capital is 6, the price of labor is $18, and the price of capital is $9, then the firm
a. can substitute one unit of capital for six units of labor and keep output unchanged.
b. should use more labor and less capital.
c. should use more capital and less labor.
d. both a and b
e. both a and c
Answer: b

9-63 A firm is using 500 units of labor and 100 units of capital to produce 100 units of output. The price of labor is $5 per unit and the price of capital is $20 per unit. At these input levels, another unit of labor adds 50 units of output, while another unit of capital adds 400 units of output. The firm could increase output by
a. 10 units by spending $1 more on capital and $1 less on labor.
b. 10 units by spending $1 more on labor and $1 less on capital.
c. 350 units by spending $1 more on capital and $1 less on labor.
d. 350 units by spending $1 more on labor and $1 less on capital.
e. none of the above
Answer: a
9-64 In the graph below, the price of capital is $500 per unit. How many units of labor should a firm use in order to produce 30,000 units of output at the lowest possible cost?

In the graph below, the price of capital is $500 per unit. How many units of labor should a firm use in order to produce 30,000 units of output at the lowest possible cost?

![Graph showing the production function with capital and labor on the axes.]

- a. 300 units of labor
- b. 320 units of labor
- c. 500 units of labor
- d. 800 units of labor
- e. none of the above

Answer: a

Difficulty: 02 Medium

Topic: Finding the Optimal Combination of Inputs

AACSB: Analytic

Blooms: Apply

Learning Objective: 09-03

9-65 In the graph below, the price of capital is $500 per unit. Given a total cost of $50,000, the maximum amount of output possible is

![Graph showing the production function with capital and labor on the axes.]
a. 500 units of output.
b. 1,100 units of output.
c. 10,000 units of output.
d. 50,000 units of output.
e. none of the above

Answer: c

Difficulty: 01 Easy
Topic: Production Isoquants
AACSB: Reflective Thinking
Blooms: Understand
Learning Objective: 09-01

In the graph below, the price of capital is $500 per unit. Which of the following combinations of capital and labor lies on the expansion path?

9-66

\[ 9-66 \]

- a. \(500L, 100K\)
- b. \(800L, 160K\)
- c. \(1100L, 220K\)
- d. both \(a\) and \(b\)
- e. none of the above

Answer: e

Difficulty: 01 Easy
Topic: Optimization and Cost
AACSB: Reflective Thinking
Blooms: Understand
Learning Objective: 09-04
In the graph below, the price of capital is $500 per unit. At point A, the firm can exchange

- 1 unit of capital for 5 units of labor and keep output unchanged.
- 5 units of capital for 1 unit of labor and keep output unchanged.
- 5 units of capital for 1 unit of labor and keep cost unchanged.
- both b and c
- none of the above

Answer: a

Difficulty: 02 Medium
Topic: Finding the Optimal Combination of Inputs
AACSB: Analytic
Blooms: Apply
Learning Objective: 09-03

In the graph below, the price of capital is $500 per unit. When output is 10,000 units, what is long-run average cost?

- $0.20
- $5
- $20

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9-69 In the graph below, the price of capital is $500 per unit. Between 30,000 and 50,000 units of output, how much does each additional unit of output add to long-run total cost?

- a. $1.50
- b. $2.45
- c. $300
- d. $30,000
- e. none of the above

Answer: a
Difficulty: 03 Hard
Topic: Long-Run Costs
AACSB: Analytic
Blooms: Apply
Learning Objective: 09-05
In the above graph, what is the marginal rate of technical substitution at point $D$?

a. less than 1.5
b. less than 2.5
c. greater than 1.5
d. greater than 2.5

Answer: a

Difficulty: 01 Easy
Topic: Finding the Optimal Combination of Inputs
AACSB: Analytic
Blooms: Apply
Learning Objective: 09-03

In the above graph, the shift from $I$ to $II$ was due to

a. an increase in total cost.
b. an increase in the price of labor.
c. a decrease in the price of labor.
d. an increase in the price of capital.
e. a decrease in the price of capital.
In the above graph, as you move from point B to point C,

a. output is unchanged.
b. cost is unchanged.
c. the amount of capital increases and the amount of labor decreases.
d. both b and c

e. all of the above

Answer: b

A cow will produce 8500 lbs. of milk if fed either 5000 lbs. of hay and 6200 lbs. of grain or 5600 lbs. of hay and 5400 lbs. of grain. Over this range, the marginal rate of technical substitution between hay and grain is

a. 0.17.
b. 0.75.
c. 0.98.
d. 1.02.
e. 6.00.

Answer: b
Learning Objective: 09-03

9-74 You overhear a businessman say: "We want to be big because there are economies associated with bigness." What he means is that
a. total cost decreases as more is produced.
b. long-run average cost decreases as more is produced.
c. marginal cost decreases as more is produced.
d. total fixed cost decreases as more is produced.
Answer: b
Difficulty: 01 Easy
Topic: Forces Affecting Long-Run Costs
AACSB: Reflective Thinking
Blooms: Remember
Learning Objective: 09-06

9-75 Diseconomies of scale
a. exist when fixed cost increases as output increases.
b. exist when long–run average cost increases as output increases.
c. result eventually as the firm uses more and more labor with a fixed capital stock.
d. both a and b
e. all of the above
Answer: b
Difficulty: 01 Easy
Topic: Forces Affecting Long-Run Costs
AACSB: Reflective Thinking
Blooms: Remember
Learning Objective: 09-06

9-76 If a firm is producing the level of output at which long–run average cost equals long–run marginal cost, then
a. long–run marginal cost is at its minimum point.
b. long–run average cost is at its minimum point.
c. long–run total cost is at its minimum point.
d. both a and b
e. all of the above
Answer: b
Difficulty: 02 Medium
Topic: Forces Affecting Long-Run Costs
AACSB: Reflective Thinking
Blooms: Understand
Learning Objective: 09-06

9-77 Long–run total cost
a. represents the lowest possible cost of producing a given level of output.
b. is always equal to or greater than short–run total cost.
c. is tangent to short–run total cost when short–run total cost is at its minimum point.
d. both a and b
e. all of the above
Answer: a
Difficulty: 02 Medium
Topic: Long-Run Costs
AACSB: Reflective Thinking

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9-78 If a firm is producing the level of output at which short-run average cost equals long-run average cost, then
a. the firm has chosen the cost–minimizing combination of inputs to produce this level of output.
b. with a fixed amount of capital, short-run average cost is greater than long-run average cost at any other level of output.
c. the firm has chosen the profit-maximizing level of output.
d. both \( a \) and \( b \)
e. all of the above
Answer: d
Difficulty: 03 Hard
Topic: Long-Run Costs
AACSB: Reflective Thinking
Blooms: Understand
Learning Objective: 09-05

9-79 Following is a firm's expansion path. The price of capital is $5 per unit; the price of labor is $2 per unit.

<table>
<thead>
<tr>
<th>Units of Output</th>
<th>Optimal Input Choice</th>
<th>Units of Capital</th>
<th>Units of Labor</th>
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<td>30</td>
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<td>13</td>
<td>20</td>
</tr>
</tbody>
</table>

When output is 30 units, what is long-run total cost?

a. $60
b. $105
c. $150
d. $260
e. none of the above
Answer: b
Difficulty: 01 Easy
Topic: Long-Run Costs
AACSB: Analytic
Blooms: Apply
Learning Objective: 09-05

9-80 Following is a firm's expansion path. The price of capital is $5 per unit; the price of labor is $2 per unit.

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</tbody>
</table>

When output is 20 units, what is long-run average cost?

a. $2
b. $3.50
c. $4
d. $4.50
e. none of the above
Answer: c
Difficulty: 02 Medium
Topic: Long-Run Costs
AACSB: Analytic
Blooms: Apply
Learning Objective: 09-05

9-81 Following is a firm's expansion path. The price of capital is $5 per unit; the price of labor is $2 per unit.

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How much does the 10th unit of output add to long-run total cost?

a. zero
b. $3
c. $4
d. $40
e. none of the above

Answer: c
Difficulty: 02 Medium
Topic: Long-Run Costs
AACSB: Analytic
Blooms: Apply
Learning Objective: 09-05

9-82 You read a story in the newspaper about the "economies of mass production." This means that

a. total cost is less at larger levels of production.
b. long-run average cost is less at larger levels of production.
c. marginal cost is less at larger levels of production.
d. fixed cost is less at larger levels of production.

Answer: b
Difficulty: 01 Easy
Topic: Forces Affecting Long-Run Costs
AACSB: Reflective Thinking
Blooms: Understand
Learning Objective: 09-06

9-83 Economies of scale exist when

a. total cost decreases as output increases.
b. long-run average cost decreases as output increases.
c. marginal cost decreases as output increases.
d. fixed cost decreases as output increases.

Answer: b
Difficulty: 01 Easy
Topic: Forces Affecting Long-Run Costs
AACSB: Reflective Thinking
Blooms: Understand
Learning Objective: 09-06
In the following graph, the price of capital is $100 per unit; the price of labor is $25 per unit. When output is 30 units, what is TOTAL cost?

9-84

- a. $1,000
- b. $2,000
- c. $10,000
- d. $20,000
- e. none of the above

Answer: c

Difficulty: 01 Easy
Topic: Isocost Curves
AACSB: Analytic
Blooms: Apply
Learning Objective: 09-02

In the following graph, the price of capital is $100 per unit; the price of labor is $25 per unit. When output is 20 units, what is AVERAGE cost?

9-85

- a. $350
- b. $700

Chapter 9: PRODUCTION AND COST IN THE LONG RUN
c. $3,500
d. $7,000
e. none of the above
Answer: a
Difficulty: 01 Easy
Topic: Isocost Curves
AACSB: Analytic
Blooms: Apply
Learning Objective: 09-02

9-86 In the following graph, the price of capital is $100 per unit; the price of labor is $25 per unit. How much does the seventh unit of output add to total cost?

![Graph showing isocost curves and output levels.]

a. nothing
b. $400
c. $800
d. $4,000
e. $8,000
Answer: b
Difficulty: 03 Hard
Topic: Finding the Optimal Combination of Inputs
AACSB: Analytic
Blooms: Apply
Learning Objective: 09-03

9-87 Economies of scale exist when
a. fixed cost decreases as output increases.
b. long-run average cost decreases as output increases.
c. long-run marginal cost is less than long-run average cost.
d. both a and b
e. both b and c
Answer: e
Difficulty: 02 Medium
Topic: Forces Affecting Long-Run Costs
AACSB: Reflective Thinking
Blooms: Understand

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Learning Objective: 09-06

9-88 Economies of scope in the production of goods G and W exist if
a. \( \text{LTC}(G, W) > \text{LTC}(G, 0) - \text{LTC}(0, W) \)
b. \( \text{LTC}(G, W) < \text{LTC}(G, 0) + \text{LTC}(0, W) \)
c. \( \text{LTC}(G, W) < \text{LTC}(G, 0) < \text{LTC}(0, W) \)
d. both a and c
e. both b and c
Answer: e
Difficulty: 03 Hard
Forces Affecting Long-Run Costs
AACSB: Analytic
Blooms: Apply
Learning Objective: 09-06

9-89 If there are no fixed costs in the long run, how can it be said that economies of scale arise from spreading fixed costs over more units of output?
a. Economies of scale is a short run phenomenon, and so diminishing returns is the root cause of scale economies.
b. Costs of quasi-fixed inputs get spread over more units of output which drives down average cost in the long run.
c. Average fixed costs decline continuously as output rises.
d. Long-run average cost falls because all fixed costs are sunk.
Answer: b
Difficulty: 02 Medium
Topic: Forces Affecting Long-Run Costs
AACSB: Reflective thinking
Blooms: Understand
Learning Objective: 09-06

9-90 Learning economies differ from economies of scale because
a. the former involves rising average costs and the latter involves falling average costs as a result of higher output levels.
b. the former involves output in a single period of production and the latter involves cumulative output.
c. the former involves \textit{cumulative} production and the latter involves \textit{rate} of production per period.
d. the first is a short-run phenomenon and the second is a long-run phenomenon.
Answer: c
Difficulty: 03 Hard
Topic: Forces Affecting Long-Run Costs
AACSB: Reflective thinking
Blooms: Understand
Learning Objective: 09-06