Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

**Solve the problem.**

1) An appliance store sells two types of refrigerators. Each Cool-It refrigerator sells for $ 640 and each Polar sells for $ 740. Up to 330 refrigerators can be stored in the warehouse and new refrigerators are delivered only once a month. It is known that customers will buy at least 80 Cool-Its and at least 100 Polars each month. How many of each brand should the store stock and sell each month to maximize revenues? 1) \_\_\_\_\_\_\_

A) 230 Cool-Its and 100 Polars B) 310 Cool-Its and 175 Polars

C) 80 Cool-Its and 250 Polars D) 95 Cool-Its and 235 Polars

**Provide an appropriate response.**

2) Give the dimensions of the following matrix.

| 1 3 -1 2 4|

| 3 5 1 0 6 | 2) \_\_\_\_\_\_\_

A) 5 x 2 B) 2 x 2 C) 2 x 5 D) 10 x 1

**Use the Gauss-Jordan method to solve the system of equations.**

3) 3x + 3y = -6

 2x + 8y = 14 3) \_\_\_\_\_\_\_

A) ( 3, -5) B) ( -5, 3) C) ( -5, -3) D) No solution

**Each day Larry needs at least 10 units of vitamin A, 12 units of vitamin B, and 20 units of vitamin C. Pill #1 contains 4 units of A and 3 of B. Pill #2 contains 1 unit of A, 2 of B, and 4 of C. Pill #3 contains 10 units of A, 1 of B, and 5 of C.**

4) Pill #1 costs 9 cents, pill #2 costs 8 cents, and pill #3 costs 10 cents. Larry wants to minimize cost. What are the coefficients of the objective function? 4) \_\_\_\_\_\_\_

A) 4, 1, 10 B) 9, 4, 3 C) 10, 12, 20 D) 9, 8, 10

**A manufacturing company wants to maximize profits on products A, B, and C. The profit margin is $3 for A, $6 for B, and $15 for C. The production requirements and departmental capacities are as follows:**

|  |  |  |
| --- | --- | --- |
| Department | Production requirementby product (hours) | Departmental capacity(Total hours) |
|  |  A B C |  |
| Assembling |  2 3 2 | 30,000 |
| Painting |  1 2 2 | 38,000 |
| Finishing |  2 3 1 | 28,000 |

5) What are the coefficients of the objective function? 5) \_\_\_\_\_\_\_

A) 1, 2, 2 B) 2, 3, 2 C) 2, 3, 1 D) 3, 6, 15

**Solve using artificial variables.**

6) Maximize z = 3X1 + 2x2

subject to: X1 +x2= 5

 4X1 +2x2  ≥ 12

 5X1 + 2x2 ≤ 16

 X1≥0 + x2≥0  6) \_\_\_\_\_\_\_

A) Maximum is 14 for X1=4, X2=1

B) Maximum is 12 for X1=2, X2=3

C) Maximum is 13 for X1=3, X2=2

D) Maximum is 15 for X1=5, X2=0

**Use slack variables to convert the constraints into linear equations.**

7) Maximize z = 2X1 +8x2

subject to: X1 + 2x2 ≤ 15

 8X1 + 2x2 ≤ 25

with: X1≥0 + x2≥0  7) \_\_\_\_\_\_\_

A) X1 + 2x2 + s1 = 15

 8 X1 + 2x2 + s2 = 25

B) X1 + 2x2 = s1 + 15

 8X1 + 2x2 = s2 + 25

C) X1 + 2x2 + s1 = 15

 8X1 + 2x2 + s1 = 25

D) X1 + 2x2 + s1 ≤ 15

 8X1 + 2x2 + s2 ≤ 25

**A manufacturing company wants to maximize profits on products A, B, and C. The profit margin is $3 for A, $6 for B, and $15 for C. The production requirements and departmental capacities are as follows:**

|  |  |  |
| --- | --- | --- |
| Department | Production requirementby product (hours) | Departmental capacity(Total hours) |
|  |  A B C |  |
| Assembling |  2 3 2 | 30,000 |
| Painting |  1 2 2 | 38,000 |
| Finishing |  2 3 1 | 28,000 |

8) What are the constants in the model? 8) \_\_\_\_\_\_\_

A) 3, 6, 15 B) 1, 2, 2

C) 2, 3, 3 D) 30,000, 38,000, 28,000

**Rewrite the objective function into a maximization function.**

9) Minimize w = 2y1 + 4y2 + 3y3

subject to: y1 + y2 ≥ 10

 2y1 + 3y2 + y3 ≥ 27

 y1 + 2 y2 + y3 ≥ 15

 y1 ≥ 0, y2≥0, y3≥0 9) \_\_\_\_\_\_\_

A) Maximize z = -2x1 – 4x2 – 3x3

B) Maximize z = 2x1 + 4x2 – 3x3

C) Maximize z = -x1 – x2 ≤ 10

D) Maximize z = -2x1 –3 x2 – x3 ≤ 27

**Solve the problem.**

10) A company makes three chocolate candies: cherry, almond, and raisin. Matrix A gives the amount of ingredients in one batch. Matrix B gives the costs of ingredients from suppliers X and Y. Multiply the matrices.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Sugar | Choc | Milk |  |
|  | 4 | 6 | 1 | Cherry |
| A= | 5 | 3 | 1 | Almond |
|  | 3 | 3 | 1 | raisin |

|  |  |  |  |
| --- | --- | --- | --- |
|  | X | Y |  |
|  | 3 | 2 | Sugar |
| B= | 3 | 4 | Choc |
|  | 2 | 2 | milk |

 10) \_\_\_\_\_\_

A)

|  |  |  |
| --- | --- | --- |
| X | Y |  |
| 32 | 34 | Sugar |
| 26 | 24 | Choc |
| 20 | 20 | milk |

B)

|  |  |  |
| --- | --- | --- |
| X | Y |  |
| 33 | 22 | Cherry |
| 27 | 36 | Almond |
| 14 | 14 | Raisin |

C)

|  |  |  |
| --- | --- | --- |
| X | Y |  |
| 22 | 33 | Cherry |
| 36 | 27 | Almond |
| 14 | 14 | Raisin |

D)

|  |  |  |
| --- | --- | --- |
| X | Y |  |
| 32 | 34 | Cherry |
| 26 | 24 | Almond |
| 20 | 20 | Raisin |

**The initial tableau of a linear programming problem is given. Use the simplex method to solve the problem.**

11)

 11) \_\_\_\_\_\_

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | X1 | X2 | X3 | S1 | S2 | z |
| 3 | 2 | 4 | 1 | 0 | 0 | 18 |
| 2 | 1 | 5 | 0 | 1 | 0 | 8 |
| -1 | -4 | -2 | 0 | 0 | 1 | 0 |

A) Maximum at 32 for x2=8, s1=2

B) Maximum at 36 for x2=2, s1=8

C) Maximum at 18 for x2=8, x3=2

D) Maximum at 9 for x1=8, x2=2

**Write the solutions that can be read from the simplex tableau.**

12)

 12) \_\_\_\_\_\_

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | X1 | X2 | X3 | S1 | S2 | z |
| 3 | 4 | 0 | 3 | 1 | 0 | 12 |
| 1 | 5 | 1 | 7 | 0 | 0 | 23 |
| -3 | 4 | 0 | 1 | 0 | 1 | 19 |

A) x1,x2, s1=0, x1=23, s2=12,z=19

B) x1,x2, s1=0, x3=23, s2=12,z=19

C) x1,x2, s1=0, x5=23, s2=12,z=19

D) x1,x2, s1=0, x3=12, s2=23,z=19

**Perform the indicated operation where possible.**

13)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| -1 | 0 |  | -1 | 3 |
| 3 | 3 | - | 3 | 1 |

 13) \_\_\_\_\_\_

A)

|  |  |
| --- | --- |
| 0 |  3 |
| 0 | -2 |

B) | -1 |

C)

|  |  |
| --- | --- |
| -2 |  3 |
|  6 |  4 |

 D)

|  |  |
| --- | --- |
| 0 |  -3 |
| 0 |  2 |

**Solve the problem.**

14) Factories A and B sent rice to stores 1 and 2. A sent 14 loads and B sent 21. Store 1 received 20 loads and store 2 received 15. It cost $200 to ship from A to 1, $350 from A to 2, $300 from B to 1, and $250 from B to 2. $ 8350 was spent. How many loads went where? 14) \_\_\_\_\_\_

A) 14 from A to 1, 0 from A to 2, 6 from B to 1, 15 from B to 2

B) 13 from A to 1, 1 from A to 2, 7 from B to 1, 4 from B to 2

C) 12 from A to 1, 2 from A to 2, 8 from B to 1, 13 from B to 2

D) 0 from A to 1, 14 from A to 2, 15 from B to 1, 6 from B to 2

**Find the values of the variables in the matrix.**

15)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| -2 |  5 | x |  | m | 5 | 4 |
|  3 | y | -4 | = | n | -8 | p |

 15) \_\_\_\_\_\_

A) m = 3, x = 5, n = -2, y = -8, p = -4

B) m = -2, x = 4, n = 3, y = -8, p = -4

C) m = -2, x = 5, n = 3, y = -8, p = -4

D) m = -2, x = 4, n = 5, y = -8, p = -4

**Solve the problem.**

16)

|  |  |  |  |
| --- | --- | --- | --- |
| Let A = | -3 | 6 | Find 4A. |
|  | 0 | 2 |  |

1. \_\_\_\_\_\_

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 10 |  | -12 | 24 |  | -12 | 24 |  | -12 | 6 |
| A) | 4 |  6 | B) |  0 |  2 | C) |  0 |  8 | D) |  0 | 2 |

**Find the values of the variables in the matrix.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 17) | 7 | -8 |  | x | y |
|  | 8 | -1 | = | 8 | z |

17) \_\_\_\_\_\_

A) x = 7, y = -8, z = 8 B) x = -8, y = 7, z = -1

C) x = 7, y = -8, z = -1 D) x = 7, y = 8, z = -1

**Write a matrix to display the information.**

18) Factories A and B sent rice to stores 1 and 2. It cost $200 to ship from A to 1, $350 from A to 2, $300 from B to 1, and $250 from B to 2. Make a 2 × 2 matrix showing the shipping costs. Assign the factories to the rows and the stores to the columns. 18) \_\_\_\_\_\_

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 300 | 250 |  | 200 | 300 |  | 350 | 250 |  | 200 | 350 |
| A) | 350 | 200 | B) | 350  |  250 | C) | 200 | 300 | D) | 300 | 250 |

**Solve the problem.**

19) Barges from ports X and Y went to cities A and B. X sent 32 barges and Y sent 8. City A received 22 barges and B received 18. Shipping costs $220 from X to A, $300 from X to B, $400 from Y to A, and $180 from Y to B. $ 9280 was spent. How many barges went where? 19) \_\_\_\_\_\_

A) 22 from X to A, 10 from X to B, 0 from Y to A, 8 from Y to B

B) 20 from X to A, 12 from X to B, 2 from Y to A, 6 from Y to B

C) 16 from X to A, 16 from X to B, 6 from Y to A, 2 from Y to B

D) 18 from X to A, 18 from X to B, 4 from Y to A, 4 from Y to B

**Convert the inequality into a linear equation by adding a slack variable.**

20) x1 + 8x2 ≤ 19 20) \_\_\_\_\_\_

A) x1 + 8x2 + s1 ≤ 19

B) x1 + 8x2 + s1 + 19 =0

C) x1 + 8x2 + s1 < 19

D) x1 + 8x2 + s1 = 19