1) Maximize $z = 14x + 22y$ subject to

$2x + 2y \geq 20$
$8x + 5y \leq 40$
$x \geq 0, y \geq 0$

This linear programming problem has

a. a unique solution

b. multiple solutions

c. unbounded solution

d. no feasible solution

2) When the constraint $6x_1 + 17x_2 \leq 28$ is converted to an equation, the equation is

a. $6x_1 + 17x_2 = 28$

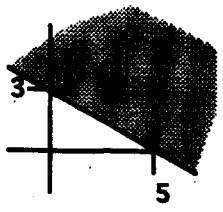
b. $6x_1 + 17x_2 - 28 = 0$

c. $6x_1 + 17x_2 + s_1 = 28$

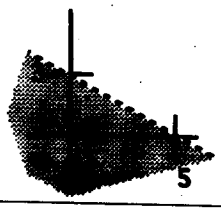
d. $6x_1 + 17x_2 - s_1 = 28$

3) Graph the inequality $3x + 5y < 15$

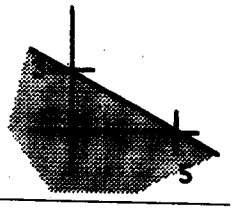
a.



b.



c.



4) Select the point which is in the feasible region of the system of inequalities

$2x + 3y \leq 8$
$5x + 2y \leq 7$
$x \geq 0, y \geq 0$

a. (1, 2)

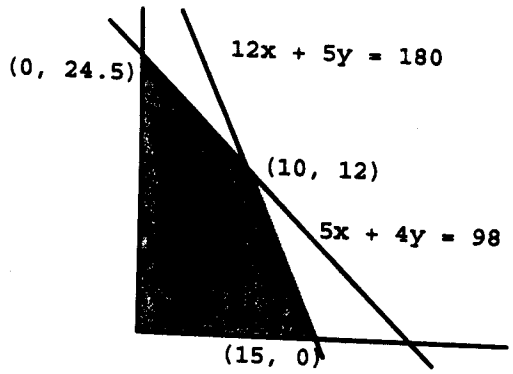
b. (1, 1)

c. (0, 3)

d. (3, 2)

5) The feasible region of a maximization problem shown is determined by:

$12x + 5y \leq 180$
$5x + 4y \leq 98$
$x \geq 0, y \geq 0$



Which of the following objective functions has its maximum value at (15, 0)?

a. $z = 25x + 25y$

b. $z = 9x + 6y$

c. $z = 20x + 10y$

d. $z = 45x + 15y$

6) An artist is painting a supply of small paintings to sell at an arts festival. He can paint three landscapes per hour and two seascapes. He can frame five paintings per hour. He has 50 hours available for painting and 25 hours for framing. How many of each type of painting should he paint and frame in order to maximize the total value of the paintings. He receives $25 each for the landscapes and $30 each for the seascapes.

a. Maximum value = $4,375 for 75 landscapes and 50 seascapes

b. Maximum value = $3,375 for 75 landscapes and 50 seascapes

c. Maximum value = $4,375 for 50 landscapes and 75 seascapes

d. Maximum value = $3,375 for 50 landscapes and 75 seascapes

7) The minimum value of $z = 4x + 10y$ subject to

$3x + y \leq 24$
$6x + 4y \leq 66$
$x \geq 0, y \geq 0$ is

a. 165

b. 110

c. 44

d. 32

8) Find the pivot column of the tableau.

$$\left[\begin{array}{cccccccc} 0 & 3 & -1/2 & 1 & -1 & 0 & 0 & 5 \\ 1 & 1 & 1/2 & 0 & 2 & 0 & 0 & 16 \\ 0 & 4 & 3/2 & 0 & -4 & 1 & 0 & 22 \\ \hline 0 & -2 & -8 & 0 & 9 & 0 & 1 & 49 \end{array}\right]$$

a. Column 1

b. Column 2

c. Column 3

d. Column 5

9) Find the pivot row of the tableau.

$$\left[\begin{array}{cccccccc} 3 & 2 & 6 & 1 & 0 & 0 & 0 & 18 \\ 5 & 1 & 4 & 0 & 1 & 0 & 0 & 20 \\ 4 & 8 & 10 & 0 & 0 & 1 & 0 & 40 \\ \hline -6 & -6 & -12 & 0 & 0 & 0 & 1 & 0 \end{array}\right]$$

a. Row 1

b. Row 2

c. Row 3

d. Row 4

10) The maximum value of $z = 5x + 4y$ subject to

$3x + y \leq 24$
$6x + 4y \leq 66$
$x \geq 0, y \geq 0$ is

a. 96

b. 66

c. 56

d. 40

11) The simplex tableau shown gives what information about the solution to a linear programming problem

$$\left[\begin{array}{cccccccc} -3 & 0 & 4 & 1 & -6 & 1 & 0 & 48 \\ 2 & 1 & 3 & 0 & 1 & 0 & 0 & -30 \\ 1 & 0 & 1 & 0 & 2 & 0 & 0 & 60 \\ \hline -4 & 0 & -5 & 0 & 8 & 0 & 1 & 148 \end{array}\right]$$

a. unique solution

b. multiple solutions

c. unbounded solution

d. no feasible solution

12) Which point is not a corner of the feasible region of the system of inequalities

$$x + 2y \leq 10$$
$$3x + y \leq 10$$
$$x \geq 0, y \geq 0$$

a. (10/3, 0)

b. (2, 4)

c. (0, 5)

d. (10, 0)

13) Find the pivot element of the tableau

$$\left[\begin{array}{rrrrrrr|r} 6 & 3 & 1 & 1 & 0 & 0 & 0 & 24 \\ 5 & 2 & 6 & 0 & 1 & 0 & 0 & 24 \\ 1 & 3 & 4 & 0 & 0 & 1 & 0 & 24 \\ \hline -6 & -5 & -9 & 0 & 0 & 0 & 1 & 0 \end{array}\right]$$

a. 1 in row 1, column 3

b. 6 in row 2, column 3

c. 4 in row 3, column 3

d. -9 in row 4, column 3

14) Determine the optimal solution of a standard maximum problem from this tableau

$$\left[\begin{array}{rrrrrrr|r} 0 & 1 & 1 & -2 & 1 & -1 & 0 & 40 \\ 0 & -2 & 0 & 4 & -1 & 3 & 0 & 32 \\ 1 & 1 & 0 & -1 & 1 & 1 & 0 & 63 \\ \hline 0 & 5 & 0 & 6 & 2 & 3 & 1 & 1148 \end{array}\right]$$

a. Maximum z = 1148 at (63, 0, 40)

b. Maximum z = 1148 at (40, 32, 63)

c. Maximum z = 1148 at (6, 2, 3)

d. Maximum z = 1148 at (63, 16, 40)

15) The pivot row is row _____ of the following tableau?

$$\left[\begin{array}{rrrrrrr|r} 2 & 5 & 0 & 1 & 0 & -2 & 0 & 66 \\ 1 & 6 & 0 & 0 & 1 & -2 & 0 & 66 \\ -2 & -2 & 1 & 0 & 0 & 1 & 0 & 32 \\ \hline -1 & -8 & 0 & 0 & 0 & 3 & 1 & 396 \end{array}\right]$$

a. 1

b. 2

c. 3

d. 4

16) Write the initial simplex tableau of the following problem.
Maximize $z = 12x_1 + 25x_2$ subject to

$$5x_1 + 7x_2 \leq 65$$
$$3x_1 + 4x_2 \leq 50$$
$$x_1 + 3x_2 \leq 48$$
$$x_1 \geq 0,\ x_2 \geq 0$$

a.
$$\left[\begin{array}{cccccc|c} 12 & 25 & 1 & 0 & 0 & 0 & 0 \\ 5 & 7 & 0 & 1 & 0 & 0 & 65 \\ 3 & 4 & 0 & 0 & 1 & 0 & 50 \\ 1 & 3 & 0 & 0 & 0 & 1 & 48 \end{array}\right]$$

b.
$$\left[\begin{array}{cccccc|c} 5 & 7 & 1 & 0 & 0 & 0 & 65 \\ 3 & 4 & 0 & 1 & 0 & 0 & 50 \\ 1 & 3 & 0 & 0 & 1 & 0 & 48 \\ -12 & -25 & 0 & 0 & 0 & 1 & 0 \end{array}\right]$$

c.
$$\left[\begin{array}{cccccc|c} 5 & 7 & 1 & 0 & 0 & 0 & 65 \\ 3 & 4 & 0 & 1 & 0 & 0 & 50 \\ 1 & 3 & 0 & 0 & 1 & 0 & 48 \\ 12 & 25 & 0 & 0 & 0 & 1 & 0 \end{array}\right]$$

17) In the following tableau what are the basic variables?

$$\left[\begin{array}{cccccccc} x_1 & x_2 & x_3 & s_1 & s_2 & s_3 & z & \\ 1 & 1/2 & 1 & 1/2 & 0 & 0 & 0 & 50 \\ 0 & 3/2 & 1 & -1/2 & 1 & 0 & 0 & 50 \\ 0 & 1 & -1 & -1 & 0 & 1 & 0 & 100 \\ 0 & -9 & 4 & 11 & 0 & 0 & 1 & 1100 \end{array}\right]$$

a. x_1, x_2, and x_3

b. x_1, x_3, and s_2

c. x_1, s_2, and s_3

d. s_1, s_2, and s_3

18) What is the transpose of the following matrix?

$$\begin{bmatrix} 3 & 1 & 2 \\ 2 & 0 & 5 \\ 1 & -1 & 6 \end{bmatrix}$$

a.
$$\begin{bmatrix} 1 & -1 & 6 \\ 2 & 0 & 5 \\ 3 & 1 & 2 \end{bmatrix}$$

b.
$$\begin{bmatrix} 3 & 2 & 1 \\ 1 & 0 & -1 \\ 2 & 5 & 6 \end{bmatrix}$$

c.
$$\begin{bmatrix} 2 & 1 & 3 \\ 5 & 0 & 2 \\ 6 & -1 & 1 \end{bmatrix}$$

d.
$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 5 & 2 \\ -1 & 6 & 1 \end{bmatrix}$$

19) Pivot on the appropriate entry to find the next tableau

$$\left[\begin{array}{ccccccc|c} 2 & 1 & 2 & 1 & 0 & 0 & 0 & 330 \\ 1 & 2 & 2 & 0 & 1 & 0 & 0 & 330 \\ -2 & -2 & 1 & 0 & 0 & 1 & 0 & 132 \\ \hline -1 & -2 & -3 & 0 & 0 & 0 & 1 & 0 \end{array}\right]$$

a. $$\left[\begin{array}{ccccccc|c} 1 & 1/2 & 1 & 1/2 & 0 & 0 & 0 & 165 \\ -1 & 1 & 0 & -1 & 1 & 0 & 0 & 0 \\ -3 & -5/2 & 0 & -1/2 & 0 & 1 & 0 & -33 \\ \hline 2 & -1/2 & 0 & 3/2 & 0 & 0 & 1 & 495 \end{array}\right]$$

b. $$\left[\begin{array}{ccccccc|c} 1 & -1 & 0 & 1 & -1 & 0 & 0 & 0 \\ 1/2 & 1 & 1 & 0 & 1/2 & 0 & 0 & 165 \\ -5/2 & -3 & 0 & 0 & -1/2 & 1 & 0 & -33 \\ \hline 1/2 & 1 & 0 & 0 & 3/2 & 0 & 1 & 495 \end{array}\right]$$

c. $$\left[\begin{array}{ccccccc|c} 6 & 5 & 0 & 1 & 0 & -2 & 0 & 66 \\ 5 & 6 & 0 & 0 & 1 & -2 & 0 & 66 \\ -2 & -2 & 1 & 0 & 0 & 1 & 0 & 132 \\ \hline -7 & -8 & 0 & 0 & 0 & 3 & 1 & 396 \end{array}\right]$$

20) A linear programming feasible region is determined by

$$6x + 3y \leq 72$$
$$5x + 15y \leq 185$$
$$x \geq 0, y \geq 0$$

Which of the following objective functions has its maximum value at the intersection of

$$6x + 3y = 72 \text{ and}$$
$$5x + 15y = 185$$

a. $z = 10x + 10y$

b. $z = 5x + 2y$

c. $z = 2x + 8y$

d. $z = 21x + 7y$

21) The final tableau of the dual problem of a standard minimum problem is

$$\left[\begin{array}{ccccccc|c} y_1 & y_2 & y_3 & x_1 & x_2 & x_3 & w & \\ \hline 0 & 1 & 0 & 1.5 & 2.2 & -1.4 & 0 & 40.5 \\ 1 & 0 & 0 & 3.0 & -1.6 & 4.2 & 0 & 65.2 \\ 0 & 0 & 1 & -2.7 & 5.1 & 1.3 & 0 & 28.1 \\ \hline 0 & 0 & 0 & 3.5 & 4.0 & 2.4 & 1 & 898.4 \end{array}\right]$$

The solution to the original problem is

a. $z = 898.4$ at (65.2, 40.5, 28.1)

b. $z = 898.4$ at (40.5, 65.2, 28.1)

c. $z = 898.4$ at (3.5, 4.0, 2.4, 1)

d. $z = 898.4$ at (3.5, 4.0, 2.4)

22) The area under a normal curve between the scores for z = 2.20 and z = 0.85 is _____

a. 0.3023

b. 0.7884

c. 0.1838

d. 0.4861

23) For a set of scores the mean is 60 and σ = 6. The z-score for the score 51 is

a. 3.0

b. 1.5

c. -1.5

d. 9.0

24) A box contains 4 red and 5 green balls. Three balls are drawn. The probability 2 red and 1 green are drawn is

a. 1/3

b. 4/9

c. 5/14

d. 3/5

25) For the grouped data

Score	Frequency
90-100	8
80-89	12
70-79	26
60-69	14

An estimate of the mean is _____

a. 86.75

b. 76.9

c. 75.0

d. 15.0

26) For a sample of size n = 60, proportion p = 0.35, and at a 95% confidence level, the lower bound of the proportion is _____

a. 0.229

b. 0.121

c. 0.175

d. 0.414

27) In a probability assignment P(a) = 0.1, P(b) = 0.2, P(c) = 0.4, P(d) = 0.3. P({a, d}) = _____

a. 0.2

b. 0.3

c. 0.4

d. 0.5

28) Find the population standard deviation of the following frequency distribution.

Score	Frequency
1	9
2	15
3	6

a. $\sqrt{0.49}$

b. $\sqrt{1.9}$

c. $\sqrt{2.0}$

d. $\sqrt{2.2}$

29) Sample space = {A, B, C, D}

P(A) = 0.2, P(B) = 0.2, P(C) = 0.15, P(D) = 0.45

P(B, C, D) = _____

a. 1.0

b. 0.95

c. 0.80

d. 0.75