1. A lumber company owns a forest that is of rectangular shape, 1 km by 2 km. If the company cuts a uniform strip of trees along the outer edges of this forest, how wide should the strip be if $\frac{3}{4}$ square km of forest is to remain?

   (a) $\frac{1}{4}$ _____(correct)

   (b) $\frac{1}{8}$

   (c) $\frac{1}{2}$

   (d) $\frac{1}{5}$

   (e) $\frac{1}{6}$

2. At present, a manufacturer has 3000 units of product in stock. The product is now selling at \$4 per unit. Next month the unit price will increase by \$1. The manufacturer wants the total revenue received from the sale of the 3000 units to be no less than \$12,500. What is the maximum number of units that can be sold this month?

   (a) 2500 _____(correct)

   (b) 2300

   (c) 2400

   (d) 2600

   (e) 2700

3. Consider the two lines

$$L_1 : x + 3y + 5 = 0$$
$$L_2 : y = 3x + 1$$

(a) L_1 and L_2 are perpendicular _____(correct)

(b) L_1 and L_2 are parallel

(c) L_1 and L_2 intersect at two points

(d) L_1 is horizontal and L_2 is vertical

(e) L_1 is vertical and L_2 is horizontal

4. Suppose consumers will demand 60 units of a product when the price is \$15 per unit, and 35 units when the price is \$20 per unit. Assuming the demand function is linear, the price per unit when 40 units are demanded is

(a) 19 _____(correct)

(b) 18

(c) 21

(d) 22

(e) 11

5. The demand function for a manufacturer's product is $p = 1000 - 2q$, where p is the price (in dollars) per unit when q units are demanded (per week) by consumers. The maximum total revenue is

   (a) 125,000 _____(correct)

   (b) 120,000

   (c) 130,000

   (d) 115,000

   (e) 135,000

6. The linear system

$$\begin{aligned} x - y + 2z &= 0 \\ 2x + y - z &= 0 \\ x + 2y - 3z &= 0 \end{aligned}$$

   (a) has infinite number of solutions with one parameter only _____(correct)

   (b) has infinite number of solutions with two parameters

   (c) has no solutions

   (d) has a unique solution

   (e) has exactly two solutions

7. The system

$$x = y + 1$$
$$y = 2\sqrt{x+2}$$

(a) has a unique solution _____(correct)

(b) has two solutions

(c) has three solutions

(d) has infinite number of solutions

(e) has no solutions

8. If $R = 0.1q^2 + 9q$ represents total revenue in dollars, and $C = 3q + 400$ represents total cost in dollars and q represents both the number of units produced and the number of units sold, then the break-even quantity is

(a) 40 _____(correct)

(b) 100

(c) 60

(d) 80

(e) 50

9. A company has taxable income of \$312,000. The federal tax is 25% of that portion that is left after the state tax has been paid. The state tax is 10% of that portion that is left after the federal tax has been paid. The total tax paid is

(a) \$96,000 _____ (correct)
(b) \$84,000
(c) \$100,000
(d) \$90,000
(e) \$80,000

10. The minimum value of $C = 5x + y$ subject to

$$\begin{gathered} 2x - y \geq -2 \\ 4x + 3y \leq 12 \\ x - y = -1 \\ x, y \geq 0 \end{gathered}$$

is

(a) 1 _____ (correct)
(b) 2
(c) 3
(d) 4
(e) 0

11. The maximum value of $Z = 2x + 4y$ subject to

$$\begin{gathered} x - 4y \leq -8 \\ x + 2y \leq 16 \\ x, y \geq 0 \end{gathered}$$

(a) occurs on the whole line segment joining (8,4) and (0,8) _____(correct)

(b) occurs only at $(8, 4)$

(c) occurs only at $(0, 8)$

(d) occurs only at $(0, 2)$

(e) does not exist

12. The minimum value of $Z = 2x_1 + 2x_2 + 5x_3$ subject to

$$\begin{gathered} x_1 - x_2 + 2x_3 \geq 2 \\ -x_1 + 2x_2 + x_3 \geq 3 \\ x_1, x_2, x_3 \geq 0 \end{gathered}$$

is

(a) $\frac{43}{5}$ _____(correct)

(b) $\frac{28}{5}$

(c) $\frac{22}{5}$

(d) $\frac{41}{5}$

(e) $\frac{33}{5}$

13. The slope of the line parallel to $x + 2y + 3 = 0$ is

(a) $-\frac{1}{2}$ (correct)

(b) -2

(c) 2

(d) $\frac{1}{2}$

(e) 1

14. A company manufactures three types of patio furniture: chairs, rockers and chaise lounges. Each requires wood, plastic, and aluminum as shown in the following table:

	Wood 2	Plastics	Aluminum
Chair	1 unit	1 unit	2 units
Rocker	1 unit	1 unit	3 units
Chaise lounge	1 unit	2 units	5 units

The company has available 400 units of wood, 500 units of plastic, and 1450 units of aluminum. Each chair sells for \$21, each rocker sells for \$24, and each chaise lounge sells \$36. Assuming that all furniture can be sold, the maximum revenue is

(a) \$10,800 (correct)

(b) \$12,000

(c) \$9,000

(d) \$14,000

(e) \$10,000

15. The dual problem of
Minimize $Z = x_1 + 8x_2 + 5x_3$ subject to

$$\begin{aligned} x_1 + x_2 + x_3 &\geq 8 \\ -x_1 + 2x_2 + x_3 &\geq 2 \\ x_1, x_2, x_3 &\geq 0 \end{aligned}$$

is

(a) Maximize $W = 8y_1 + 2y_2$ subject to

$$\begin{aligned} y_1 - y_2 &\leq 1 \\ y_1 + 2y_2 &\leq 8 \\ y_1 + y_2 &\leq 5 \\ y_1, y_2, y_3 &\geq 0 \end{aligned}$$

(correct)

(b) Maximize $W = 2y_1 + 8y_2$ subject to

$$\begin{aligned} y_1 - y_2 &\leq 1 \\ y_1 + 2y_2 &\leq 8 \\ y_1 + y_2 &\leq 5 \\ y_1, y_2, y_3 &\geq 0 \end{aligned}$$

(c) Maximize $W = 8y_1 + 2y_2$ subject to

$$\begin{aligned} y_1 - y_2 &\geq 1 \\ y_1 + 2y_2 &\leq 8 \\ y_1 + y_2 &\leq 5 \\ y_1, y_2, y_3 &\geq 0 \end{aligned}$$

(d) Maximize $W = 8y_1 + 2y_2$ subject to

$$\begin{aligned} y_1 - y_2 &\leq 1 \\ y_1 + 2y_2 &\geq 8 \\ y_1 + y_2 &\geq 5 \\ y_1, y_2, y_3 &\geq 0 \end{aligned}$$

(e) Minimize $W = 8y_1 + 2y_2$ subject to

$$\begin{aligned} y_1 - y_2 &\leq 1 \\ y_1 + 2y_2 &\leq 8 \\ y_1 + y_2 &\leq 5 \\ y_1, y_2, y_3 &\geq 0 \end{aligned}$$