DISCRETE MIDTERM REVIEW

1. An outlier is an individual value that:
   A)    extends the pattern.
   B)    deviates from the pattern.
   C)    determines the strength of the relationship.
   D)    outlines the general form of the data.

2. If a regression line for two variables has a small positive slope, then:
   A)    the variables are positively associated.
   B)    the variables are negatively associated.
   C)    the association of the variables cannot be determined.
   D)    the variables have no association with each other.

3. If the regression line is $x = 5y - 2$, then the variables:
   A)    have a positive association.
   B)    have a negative association.
   C)    have an association that is sometimes positive and sometimes negative.

4. If the least-squares regression line is $y = 5x - 3$, then for $x = 3$, the predicted value for y is:
   A)    2.
   B)    0.
   C)    1 1/5.
   D)    12.

5. Suppose the points of a scatterplot lie close to the line $3x + 2y = 6$.  The slope of this line is:
   A)    3.
   B)    2/3.
   C)    3/2.
   D)    −3/2.

6. For professional golfers, one would expect a positive correlation between:
   A)    average score and number of endorsements.
   B)    age and number of endorsements.
   C)    average score and number of years as a pro.
   D)    none of these.

Use the following scatterplot to answer questions 7-9.



7. What can you say about the correlation of the data?

A)      The correlation is nearly 1.
B)      The correlation is nearly −1.
C)      The correlation is nearly 0.
D)      The data has no correlation.

8. What can you say about the association of the variables?

A)      The variables are positively correlated.
B)      The variables are negatively correlated.
C)      The variables are not correlated.
D)      The variables are not linearly correlated.

9. What can you say about outliers in the data set?

A)      There are no apparent outliers.
B)      There is only one outlier.
C)      There are only two outliers.
D)      There are many outliers.

Use the following histogram of waiting times for patients at a health clinic to answer questions 10-12.
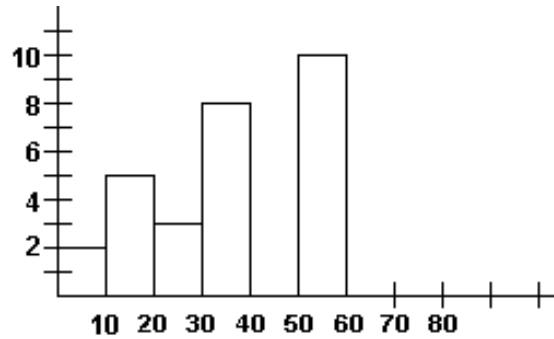


10. How many patients waited between 20 and 29 minutes?

    A)    2
    B)    3
    C)    6
    D)    8

11. Based on the histogram, which statement must be true?

    A)    There are no gaps in the histogram.
    B)    Eight patients waited exactly 35 minutes.
    C)    Two patients were seen immediately on arrival at the clinic.
    D)    More patients waited longer than one half-hour than waited less than one half-hour.

12. Based on the histogram, which statement is true?

    A)    The histogram is roughly symmetric.
    B)    The class from 50 to 59 minutes represents 10 outliers.
    C)    There is a gap in the histogram.
    D)    The histogram is skewed to the right.

13. The graph of the feasible region for a mixture problem is shown below. Find the point that maximizes the profit function $P = 3x + y$.
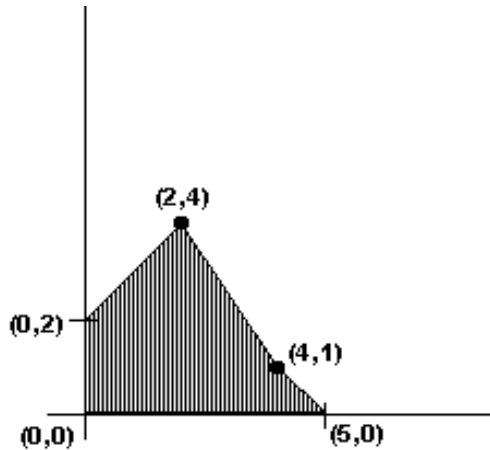


A)   (0, 2)
B)   (2, 4)
C)   (4, 1)
D)   (5, 0)



14. Suppose the feasible region has five corners, at these points: (1, 1), (1, 7), (5, 7), (5, 5), and (4, 3). If the profit formula is $5x − $2y, which point maximizes the profit?
A)   (1, 7)
B)   (5, 7)
C)   (5, 5)
D)   (4, 3)



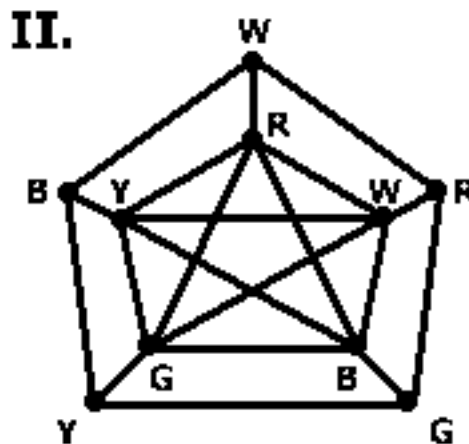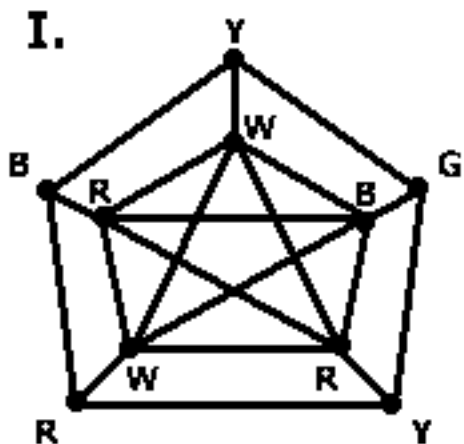15. Consider the feasible region identified by the inequalities below.

$x \geq 0;\ y \geq 0;\ x + y \leq 4;\ x + 3y \leq 6$

Which point is *not* a corner of the region?
A)   (0, 2)
B)   (0, 4)
C)   (3, 1)
D)   (4, 0)

16. Skip


17. Which of the following is a correct vertex coloring of the given graph?  (Capital letters indicate which color the vertex is colored.)
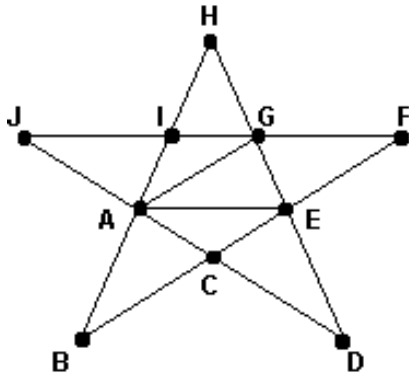


A)     I only
B)     II only
C)     Both I and II
D)     Neither I nor II


18. The table below shows chemical compounds which cannot be mixed without causing dangerous reactions.  If a graph were used to facilitate scheduling of disposal containers for the compounds, how many edges would it have?

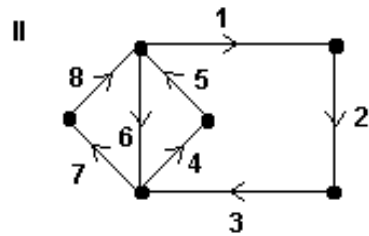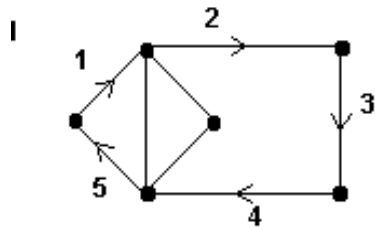|   | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| A |   | X |   | X | X |   |
| B | X |   | X |   | X | X |
| C |   | X |   | X |   |   |
| D | X |   | X |   |   | X |
| E | X | X |   |   |   |   |
| F |   | X |   | X |   |   |

A)     7
B)     8
C)     16
D)     20

19. What is the valence of vertex A in the graph below?



A)          3
B)          4
C)          5
D)          6

20. Consider the paths represented by the numbered sequence of edges on the graphs below. Which path represents an Euler circuit?



A)     I only
B)     II only
C)     Both I and II
D)     Neither I nor II

21. The graph below shows the cost (in hundreds of dollars) of installing telephone wires between the work spaces in an office complex. Use Kruskal's algorithm for minimum-cost spanning trees to find the cost for establishing this phone network.
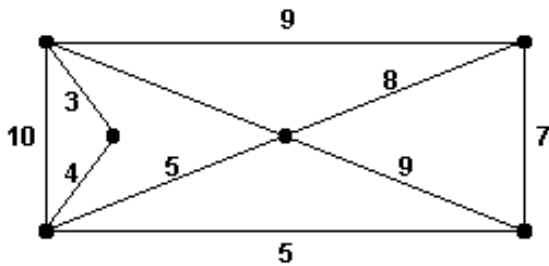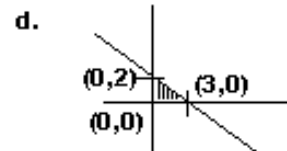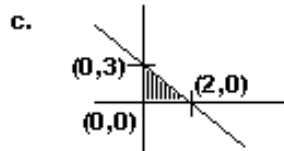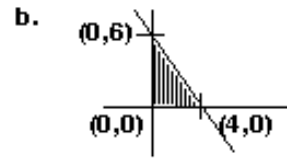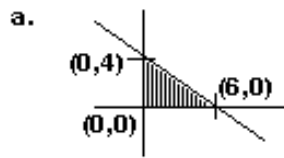


A)     $2100
B)     $2400
C)     $2900
D)     $6200

22.  Graph the constraint inequalities for a linear programming problem shown below.  Which feasible region shown is correct?

$$2x + 3y \leq 12$$
$$x \geq 0, \, y \geq 0$$

a.
(0,4)
(6,0)
(0,0)

b.
(0,6)
(0,0)    (4,0)

c.
(0,3)
(2,0)
(0,0)

d.
(0,2)    (3,0)
(0,0)

23.  Write a resource constraint for this situation:  a lawn service company has 40 hours of worker time available.  Mowing a lawn (*x*) takes 3 hours and trimming (*y*) takes 2 hours.  The profit from mowing is $15 and the profit from trimming is $10.

A)  $3x + 2y \leq 40$
B)  $(40/3)x + 10y \leq 40$
C)  $15x + 10y \leq 40$
D)  $5x + 5y \leq 40$

24.  Below are listed the numbers of children in the classrooms of a small elementary school. Choose the correct stemplot of the data.
12, 14, 20, 21, 21, 25, 27, 30, 30, 30

a.  1 | 12,14
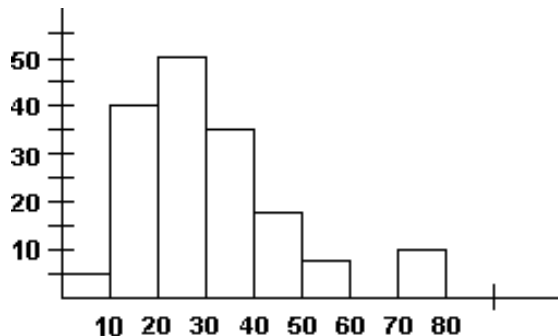    2 | 20,21,27
    3 | 30

b.  1 | 2
    2 | 5
    3 | 3

c.  1 | 24
    2 | 01157
    3 | 000

d.  1 | 24
    2 | 0157
    3 | 0

25.  Below is a histogram of the ages of people attending a concert.  Which statement is true?



A)  The histogram is roughly symmetric.
B)  There is a gap in the histogram.
C)  The histogram is skewed to the left.
D)  The center of the distribution is at about age 50.

26.    How does an outlier effect the correlation?
   A)    A single outlier has no effect.
   B)    A single outlier has minimal effect.
   C)    A single outlier can change the value of the correlation, but not its sign.
   D)    A single outlier can change the value and the sign of the correlation.

27.    For professional baseball players, one would expect a negative correlation between:
   A)    batting average and salary.
   B)    years of play and salary.
   C)    number of home runs and salary.
   D)    number of errors and salary.

28.  Consider the paths represented by the numbered sequence of edges on the graphs below.  Which path represents an Euler circuit?
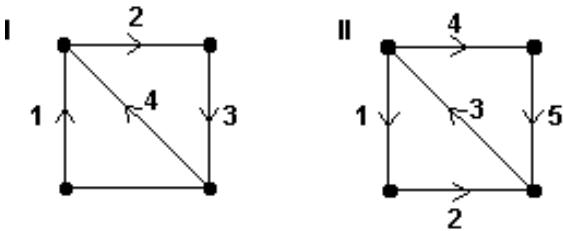


   A)    I only
   B)    II only
   C)    Both I and II
   D)    Neither I nor II

29.  Consider the path represented by the sequence of numbered edges on the graph below.  Why does the path *not* represent an Euler circuit?
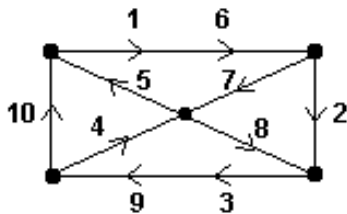


   A)    The path does not start and stop at the same vertex.
   B)    The path does not cover every edge of the graph.
   C)    The path uses some edges more than one time.
   D)    The path does not touch each vertex of the graph.

30. Consider the path represented by the numbered sequence of edges of the graph below. Which statement is true?
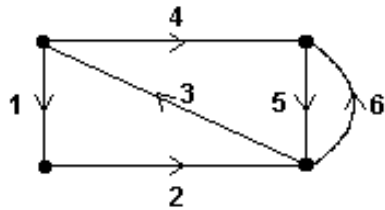


A)    The path is not a circuit.
B)    The path is an Euler circuit.
C)    The path is a circuit, but not an Euler circuit.
D)    None of the above

31. Consider the path represented by the numbered sequence of edges on the graph below. Which statement is true?
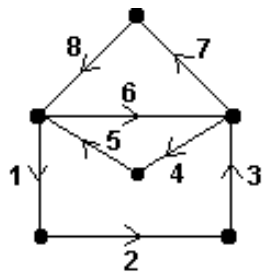


A)    The path is not a circuit.
B)    The path is an Euler circuit.
C)    The path is a circuit, but not an Euler circuit.
D)    None of the above

32. Which path listed forms a Hamiltonian circuit on the graph below?
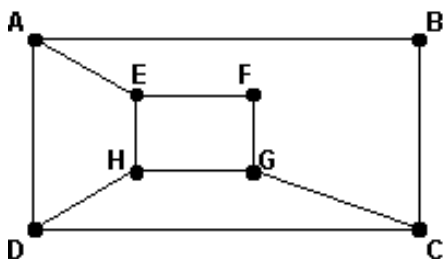


A)    ADCBFGHEA
B)    ABCDHGFE
C)    ABCDHGFEA
D)    ABCDHGFEHDA

33. Given the order-requirement digraph below (with time given in minutes) and the priority list $T_1, T_2, T_3, T_4, T_5, T_6, T_7$, apply the list-processing algorithm to construct a schedule using two processors. How much time does the resulting schedule require?

$T_3$ (3)

$T_1$ (5) ⟶ $T_4$ (5) ⟶ $T_5$ (3)

$T_2$ (9) ⟶ $T_7$ (5)     $T_6$ (2)
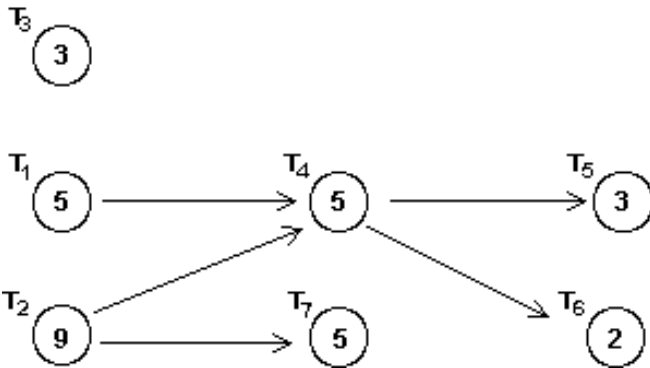
A)    16 minutes
B)    17 minutes
C)    18 minutes
D)    21 minutes

34. If the regression line is 2x + 4y = 10, then the variables:
    A)    have a positive association.
    B)    have a negative association.
    C)    have an association that is sometimes positive and sometimes negative.

35. If the correlation between two variables is 1, then the points of their scatterplot:
    A)    all lay within 1 unit of the regression line.
    B)    all lay within ½ unit of the regression line.
    C)    all lay on the regression line.
    D)    lay so that exactly half of the points are on each side of the regression line.

36.
Skip

37. skip

38. skip

39. Suppose you are taking a survey of young children.  If you measure their height and their weight, what do you expect to determine about this data?
    A)    There is no correlation between the data.
    B)    There is a positive correlation between the data.
    C)    There is a negative correlation between the data.

40. A typing service keeps data on the number of pages in a manuscript and the length of time (in hours) it takes to complete the typing.  The least squares regression line for the data is given by $y = 20 + 0.273x$.  Use this to predict the length of time needed to type a 40-page manuscript.
    A)    810.92
    B)    60.273
    C)    30.92
    D)    16.38

41. Given the stemplot below, which description is true?

```
2 | 9
3 | 267
4 | 12
5 | 0259
6 | 258
7 | 05
```
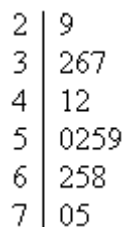
    A)    There are no outliers on the stemplot.
    B)    The number 29 is the only outlier on the stemplot.
    C)    The numbers 29 and 75 are the only outliers on the stemplot.
    D)    The number 75 is the only outlier on the stemplot.

42. To determine the effectiveness of group study sessions, a college instructor gathers data on hours of attendance and exam scores for students in the class. Which variable, hours of attendance or exam scores, would represent the independent variable for the situation?
    A)  Hours of attendance
    B)  Exam scores

43. Given the histogram below, which statement is true?
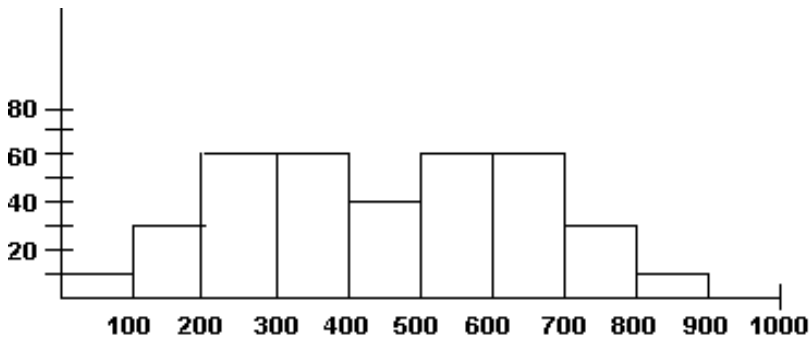


    A)  The histogram has an outlier between 400 and 500.
    B)  The histogram is skewed to the right.
    C)  The histogram is symmetric.
    D)  The histogram has a gap between 400 and 500.

44. Find the point of intersection of the lines whose equations are $2x + 3y = 12$ and $1x + 5y = 13$.
    A)  (2, 3)
    B)  (3, 2)
    C)  (6, 0)
    D)  (−2, 3)

45. Write a resource constraint for this situation: producing a plastic ruler ($x$) requires 10 grams of plastic while producing a pencil box ($y$) requires 30 grams of plastic. There are 2000 grams of plastic available.
    A)  $200x + (2000/30)y \le 2000$
    B)  $30x + 10y \le 2000$
    C)  $10x + 30y \le 2000$
    D)  $x + y \le 2000$

46. Write the resource constraints for this situation: a small stereo manufacturer makes a receiver and a CD player. Each receiver takes eight hours to assemble and one hour to test and ship. Each CD player takes 15 hours to assemble and two hours to test and ship. The profit on each receiver is $30 and the profit on each CD player is $50. There are 160 hours available in the assembly department and 22 hours available in the testing and shipping department.

A)    $8x + 1y \leq 30$, $15\ x + 2y \leq 50$, $x \geq 0$, $y \geq 0$
B)    $8x + 1y \leq 160$, $15\ x + 2y \leq 22$, $x \geq 0$, $y \geq 0$
C)    $8x + 15y \leq 30$, $1\ x + 2y \leq 50$, $x \geq 0$, $y \geq 0$
D)    $8x + 15y \leq 160$, $1\ x + 2y \leq 22$, $x \geq 0$, $y \geq 0$

47. Given below is the sketch of the feasible region in a linear programming problem. Which point is *not* in the feasible region?
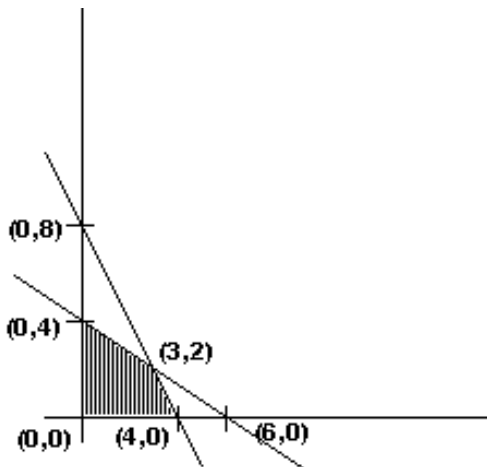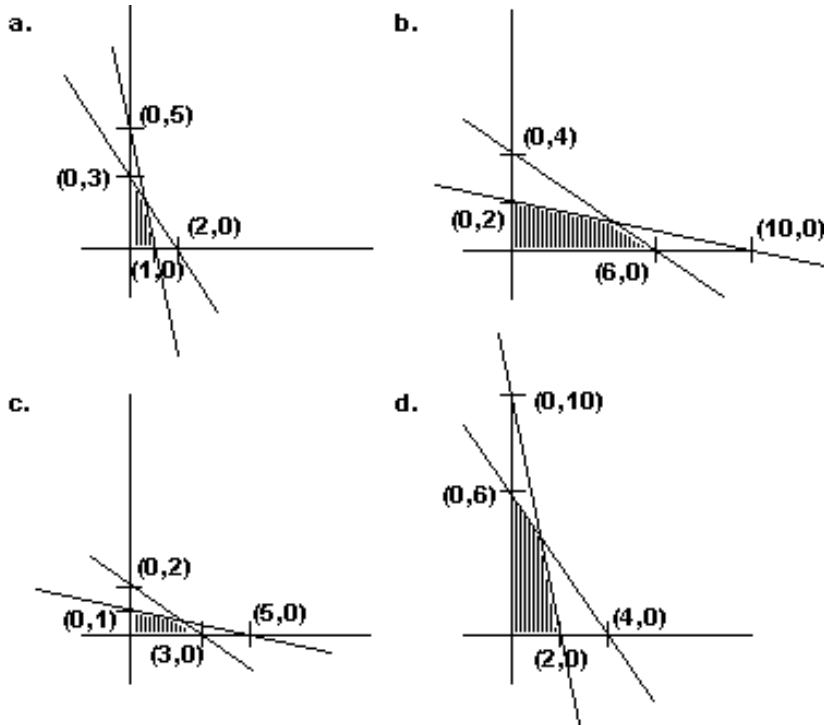


A)    (0, 4)
B)    (4, 0)
C)    (6, 0)
D)    (1, 2)

48. Graph the feasible region identified by the inequalities:
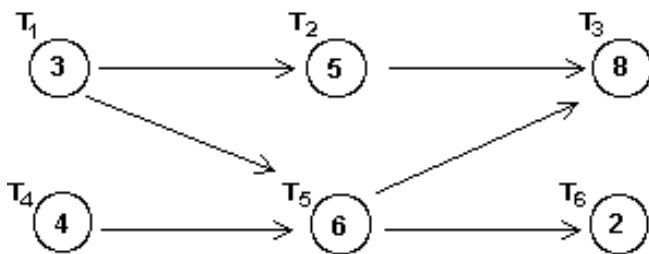
$$2x + 3y \leq 12$$
$$1x + 5y \leq 10$$
$$x \geq 0, y \geq 0$$

a.



(0,5)
(0,3)
(2,0)
(1,0)

b.



(0,4)
(0,2)
(10,0)
(6,0)

c.



(0,2)
(0,1)
(5,0)
(3,0)

d.



(0,10)
(0,6)
(4,0)
(2,0)

49. Given the order-requirement digraph below (with time given in minutes) and the priority list $T_1$, $T_2$, $T_3$, $T_4$, $T_5$, $T_6$, apply the critical-path scheduling algorithm to construct a schedule using two processors.  How much time does the resulting schedule require?



A)   14 minutes
B)   15 minutes
C)   16 minutes
D)   18 minutes

50. Choose the packing that results from the use of the first-fit decreasing (FFD) bin-packing algorithm to pack the following weights into bins that can hold no more than 9 lbs.

4 lbs, 5 lbs, 3 lbs, 2 lbs, 7 lbs, 6 lbs, 4 lbs, 2 lbs

a.

| 7 | 6 | 4 / 5 | 2 / 3 / 4 | 2 |

b.

| 2 / 7 | 2 / 6 | 4 / 5 | 3 / 4 |

c.

| 2 / 7 | 3 / 6 | 4 / 5 | 2 / 4 |
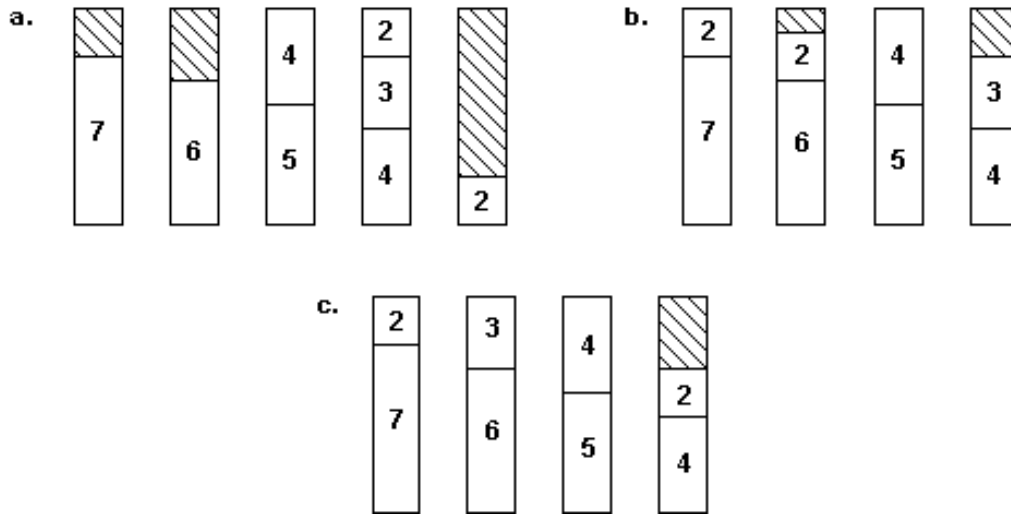
d. Another packing

51. Phyllis has her office in Middleton and must visit four clients, each in a different city. The graph below shows each city and the distances between each pairs of cities. How many miles would Phyllis travel if she chooses the Hamiltonian circuit for her trip by using the sorted-edges algorithm?

Newport
65    20
Palm Coast
75
Middleton
30    110
90
45
100
40
50
Russell          Quiet Corner
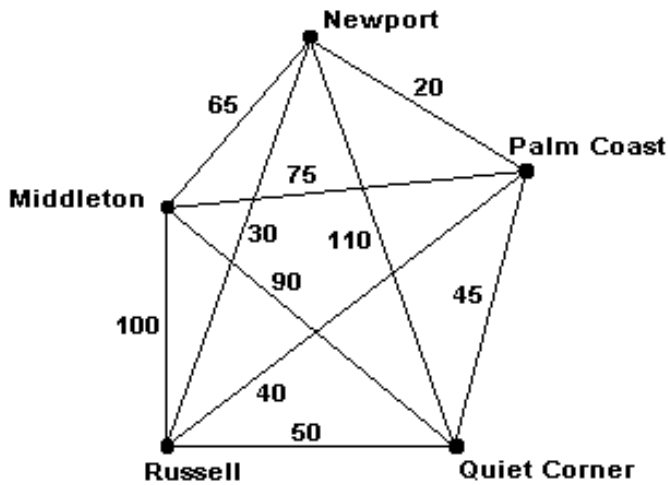
A)      265 miles
B)      300 miles
C)      285 miles
D)      345 miles