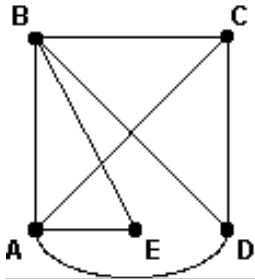


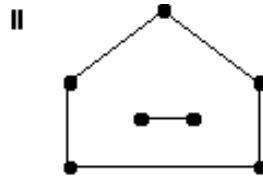
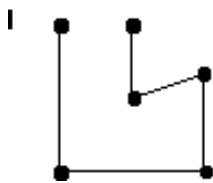
Choose the most appropriate answer among the choices A), B), C), and D).

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



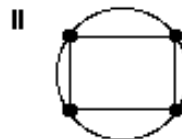
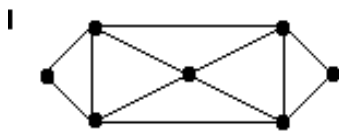
- A) 2
B) 3
C) 4
D) 5

2. Which of the graphs below are connected?



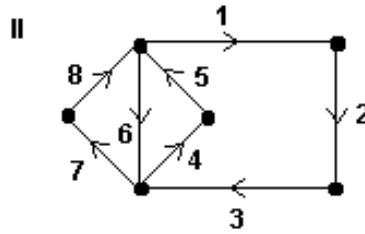
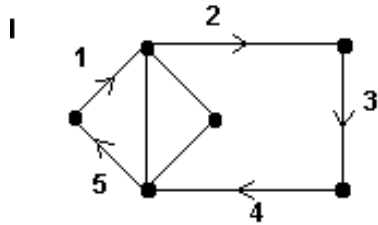
- A) I only
B) II only
C) Both I and II
D) Neither I nor II

3. Which of the graphs below have Euler circuits?

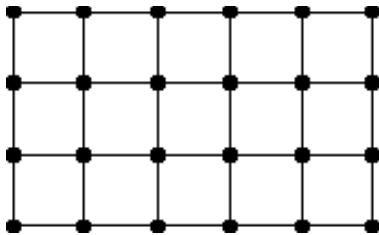


- A) I only
B) II only
C) Both I and II
D) Neither I nor II

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

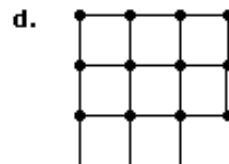
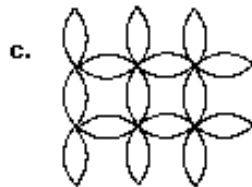
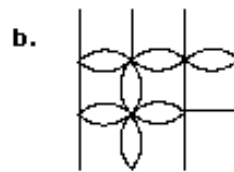
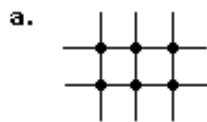
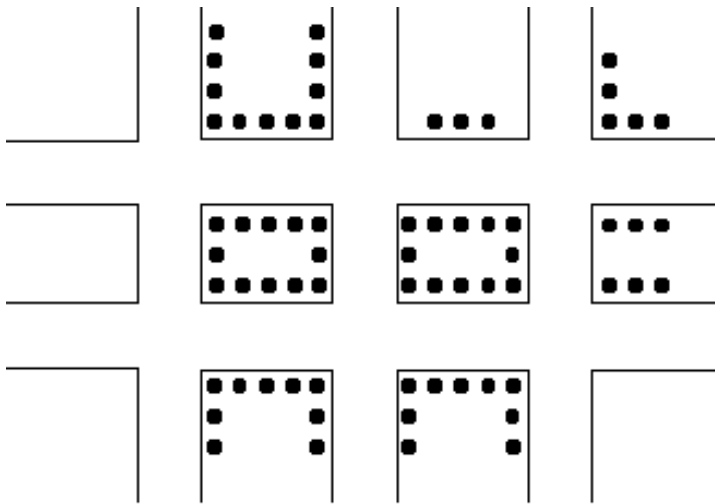


- A) I only
 B) II only
 C) Both I and II
 D) Neither I nor II
5. For which of the two situations below is it desirable to find an Euler circuit or an efficient eulerization of a graph?
- I. A pizza delivery person takes pizzas to ten houses in a neighborhood and then returns to pick up the next set to be delivered.
 II. A postal carrier picks up mail from six collection boxes around a city.
- A) I only
 B) II only
 C) Both I and II
 D) Neither I nor II
6. In order to eulerize the graph below, give the fewest number of edges that need to be duplicated?

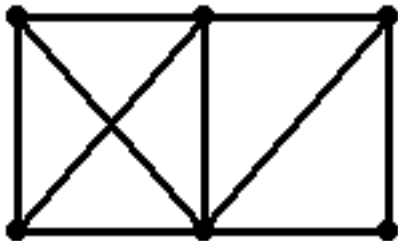


- A) 4
 B) 6
 C) 10
 D) 12

7. The map shown below illustrates part of a postal carrier's territory. The dots indicate mailboxes to which mail must be delivered. Which graph would be most useful for finding an efficient route for mail delivery?

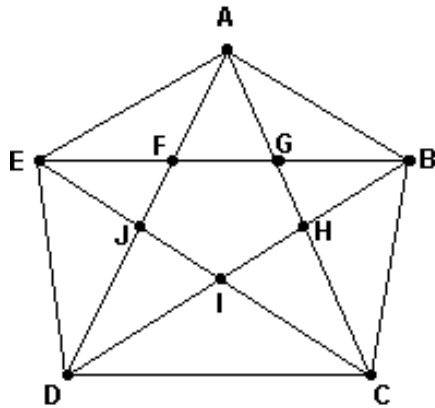


8. Find the chromatic number of the graph below:



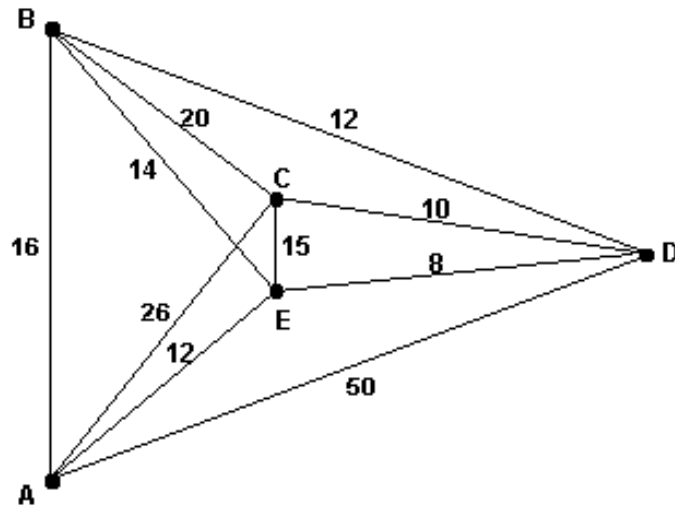
- A) 6
- B) 4
- C) 3
- D) 2

9. Which of the following describes a Hamiltonian circuit for the graph below?



- A) ABCDEFJIHG
- B) ABCDEAFJDIHGBGFEJICHGA
- C) ABCDEAGHIJFA
- D) AEDCBGHIJFA

10. For the graph below, what is the cost of the Hamiltonian circuit obtained by using the nearest-neighbor algorithm, starting at A?

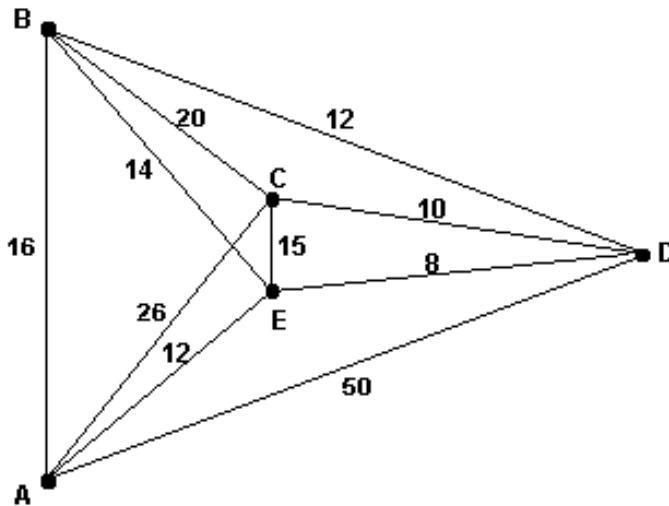


- A) 60
- B) 54
- C) 62
- D) 66

11. For the traveling salesman problem applied to seven cities, how many distinct tours are possible?

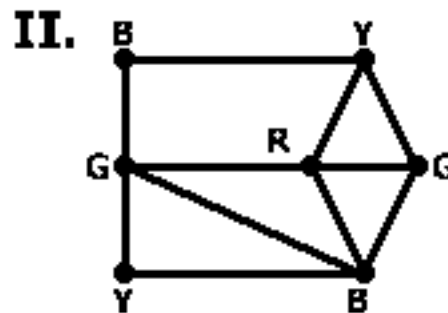
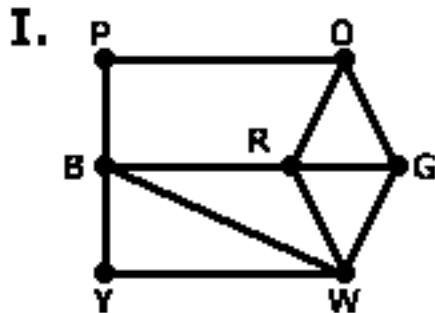
- A) 360
- B) 720
- C) 2520
- D) 5040

12. For the graph below, what is the cost of the Hamiltonian circuit obtained by using the sorted-edges algorithm?



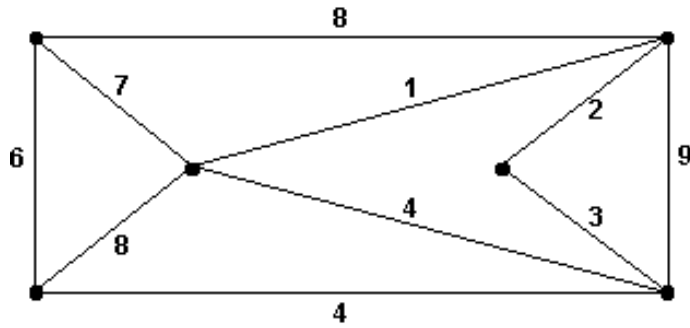
- A) 40
- B) 58
- C) 60
- D) 66

13. 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

14. Use Kruskal's algorithm for minimum-cost spanning trees on the graph below. The cost of the tree found is:



- A) 23
B) 20
C) 16
D) 5
15. Suppose an architect needs to design an intercom system for a large office building. The technique most likely to be useful in solving this problem is
- A) finding an Euler circuit on a graph.
B) applying the nearest-neighbor algorithm for the traveling salesman problem.
C) applying Kruskal's algorithm for finding a minimum-cost spanning tree for a graph.
D) None of these techniques is likely to apply.
16. A local cafeteria offers a choice of 5 meats, 6 vegetables, and 3 salads. A complete dinner includes 1 meat, 1 vegetable, and 1 salad. How many different dinners can be created?
- A) 14
B) 45
C) 90
D) 120

Answer Key

1. C
2. A
3. C
4. B
5. D
6. B
7. b
8. B
9. D
10. D
11. A
12. D
13. C
14. C
15. C
16. C