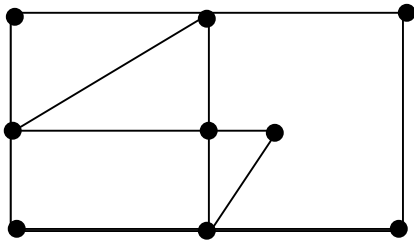


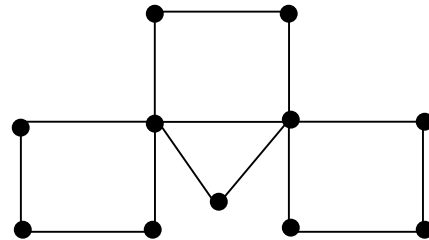
The following 18 multiple choice questions are worth 5 points each.

1. Which of the following graphs below have Euler Circuits?

I



II



- a. I only
- b. II only

- c. I and II both
- d. Neither I nor II

2. Which of the following statements is/are true?

- I. A tree is a connected graph that does not contain a circuit.
- II. An Euler circuit must visit each vertex once and only once.
- III. The minimum completion time for an order requirement digraph is the length of the shortest path.

- a. I, II, and III are all true.
- b. I only is true.

- c. I and III only are true.
- d. II only is true.
- e. II and III only are true.

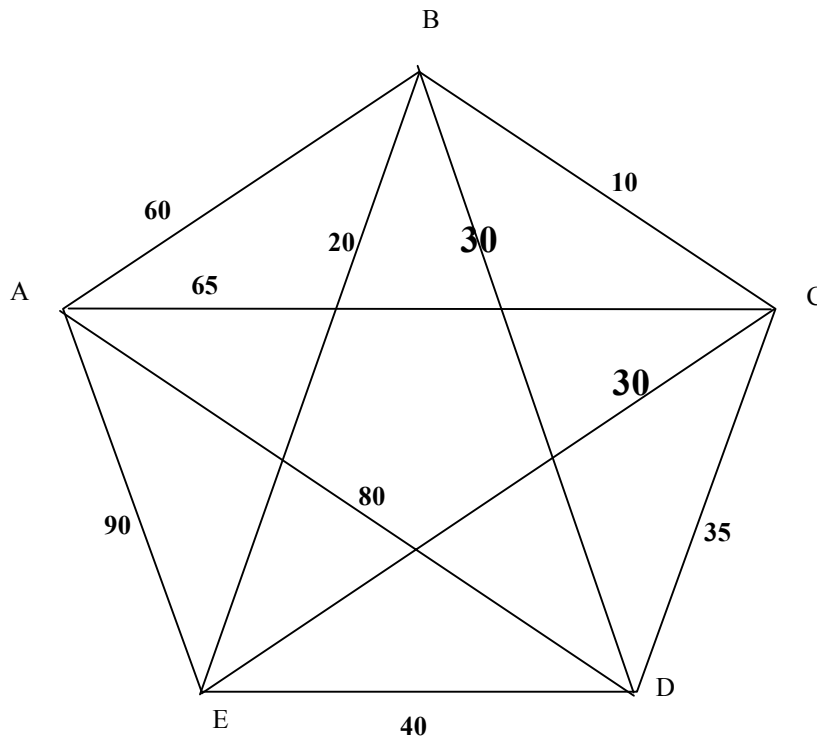
3. Which of the following statements is/are true?

- I. The chromatic number of a graph is the minimum number of colors required to produce a vertex coloring of the graph.
- II. Eulerization of a graph is the process of finding an Euler circuit for that graph.
- III. Kruskal's algorithm is used for finding a minimum cost spanning tree.

- a. I, II, and III are all true.
- b. I only is true.

- c. I and III only are true.
- d. II only is true.
- e. II and III only are true.

4. For the graph show below, use the nearest neighbor algorithm to find a Hamiltonian circuit. Use B as the starting point.



- a. BCDAEB
- b. BCEDAB
- c. BECADB
- d. BEDBCA

5. A photocopy shop must schedule independent batches of documents to be copied. The times for the different sets of documents are (in minutes): 12, 23, 32, 13, 24, 45, 23, 23, 14, 21, 34, 53. Construct a schedule using the list-processing algorithm on three machines. Find the completion time.

- a. 123 minutes
- b. 106 minutes
- c. 109 minutes
- d. 144 minutes
- e. 112 minutes

6. The following data is based on a report from a food industry research group. Let  $x$  = the guessed calories in each of several common foods. Let  $y$  = correct calories in the same foods.

Food	Guessed Calories	Correct Calories
8 oz. milk	196	159
5 oz. macaroni	350	269
Wheat bread	117	61
White bread	136	76
2 oz. candy bar	364	260
Saltine cracker	74	12
Apple	107	80
Potato	160	88

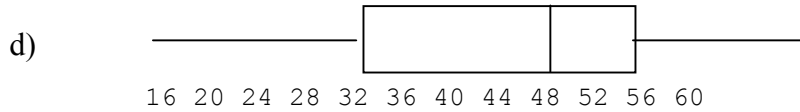
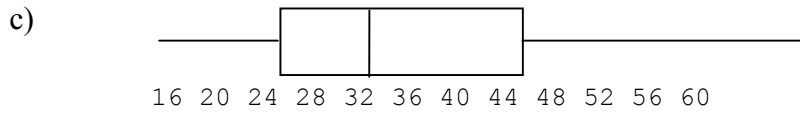
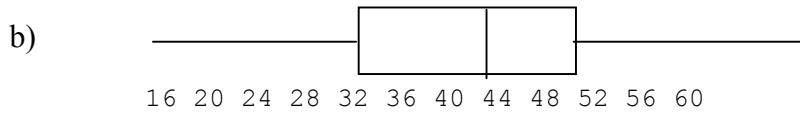
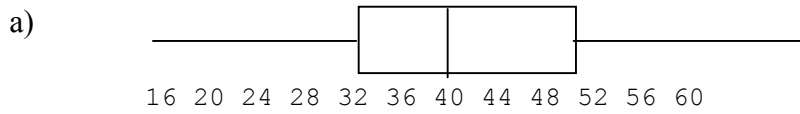
Determine the equation of the “line of best fit” for this data set. (Correct to 2 decimal places).

- $y = -33x + .84$
  - $y = .84x - 32.96$
  - $y = 1.15x + 43.88$
  - $y = 43.88x + 1.15$
  - none of the preceding
7. In a study relating two variables,  $Y$  and  $X$ , the regression equation is  $y = 3.4x + 2.1$ , and the correlation coefficient  $r = 0.2$ . Which of the following is most likely?
- There is a cause and effect relationship between  $Y$  and  $X$ .
  - $Y$  and  $X$  are both related to a third variable,  $Z$ .
  - The regression equation will not be a very good predictor of  $Y$ .
  - None of the above.

8.

1	67
2	229
3	0046
4	046778
5	111223399
6	03569

Which boxplot best corresponds to the stemplot above?



9. In a recent survey, 100 college students were asked their average monthly earnings during the school year. The results are given in the frequency distribution below:

Earnings	<u>Number of Students</u>
0-99	15
100-199	8
200-299	9
300-399	16
400-499	22
500-599	12
600-699	18

Calculate the mean and standard deviation for this data.

- a.  $\bar{x} = 350, s = 216.0$
- b.  $\bar{x} = 380, s = 200.8$
- c.  $\bar{x} = 380, s = 199.7$
- d.  $\bar{x} = 379.5, s = 200.8$
- e. None of the preceding
10. A member of congress is interested in whether her constituents favor a proposed education bill. Her staff reports that letters on the bill have been received from 450 constituents and that 270 of those favor the bill. Which of the following statements is/are true?
- I. The size of the population is 450.
- II. The size of the sample is 450.
- III. The proportion of the sample who favor the bill is 60%
- a. I, II are true.
- b. II, III are true
- c. I, III are true
- d. All are true.
11. A game has the following probability model:

Outcome	Probability
win \$1	0.25
win \$2	0.10
lose \$1	0.65

What is the mean of this probability model? What is the standard deviation of this model?

- a.  $-0.2, 1.12$
- b.  $0.67, 1.24$
- c.  $-0.2, 1.33$
- d.  $0.2, 1.24$

12. A psychologist surveyed 150 children and asked them to keep track of the number of hours of television they watched each week. The average number of hours watched per week was found to be 26.35. From past experience, it is known that the population standard deviation is  $\sigma = 7.2$  hours. Construct a 95% confidence interval for the mean amount of television watched by all children.
- a. 25.76 hr to 26.94 hr.
  - b. 25.17 hr to 27.53 hr.
  - c. 11.95 hr to 40.75 hr.
  - d. 19.15 hr to 33.55 hr.
  - e. 26.30 hr to 26.40 hr.

13. Which of the following statements is (are) true?

- I. The Borda count method of voting satisfies the independence of irrelevant alternatives criterion.
  - II. For a given set of voters' preference lists, different agendas for sequential pairwise voting may produce different winners.
  - III. There is no voting system (for 3 or more candidates) that satisfies both the Condorcet winner criterion and the independence of irrelevant alternatives.
- a. I and II
  - b. II and III
  - c. I and III
  - d. All are true
  - e. None are true

14. The Hare winner of the following election is:

- a. A
- b. B
- c. C
- d. D

Number of voters				
3	5	2	6	1
A	B	D	C	A
B	A	A	B	D
C	C	B	A	C
D	D	C	D	B

15. Forty-five members of Springfield High School’s Alumni Association vote on eight nominees to the school’s Sports Hall of Fame by approval voting as indicated in the following table. An X indicates an approval vote.

Nominees	Number of Voters							
	7	8	9	9	6	3	1	2
A	X		X	X	X		X	X
B		X		X		X	X	
C			X		X	X	X	
D		X		X	X			
E	X	X	X	X			X	X
F	X	X				X		
G		X	X	X	X			X
H	X		X	X		X		X

Which candidate(s) is (are) elected if 75% approval is necessary?

- a. Only candidate E
- b. Candidates A and E
- c. Candidates A, E, G, and H.
- d. Candidates A, E, and G
- e. No candidates are elected.

**Use the following information for question 16.**

A large university with a total enrollment of about 50,000 students has offered Pepsi-Cola an exclusivity agreement that would give Pepsi exclusive rights to sell its products at all university facilities. Under this agreement Pepsi predicts it will sell an average of 88,000 cans per week with a standard deviation of 12,500 cans.

16. Construct a 95% confidence interval for the mean number of cans sold per week.
- a. 75,500 to 100,500
  - b. 50,500 to 125,500
  - c. 76,125 to 99,875
  - d. 63,000 to 113,000
  - e. none of the above

17. Which of the following is/are true?
- I. The distribution of sample means of a non-normal population will tend to be increasingly normal as the sample size increases.
  - II. The standard deviation of a distribution of sample means from a given population increases as the sample size increases.
  - III. The mean of a distribution of sample means is equal to the mean of the original population.
- a. I only
  - b. II only
  - c. III only
  - d. I and III only
  - e. I, II, and III

Use the following information for question 18.

A video store sells three different brands of VCR's each of which comes with either two heads or four heads. The accompanying table gives the number of recent purchasers buying each type of VCR.

Brand	Number of Heads	
	2	4
M	57	95
P	24	82
Q	43	107

18. Given that brand M was purchased, determine the standard deviation of the sample proportion of purchasers of 2-head VCR's.
- a. 49.6%
  - b. 37.5%
  - c. 3.9%
  - d. 24.7%
  - e. 15.4%

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

Section: \_\_\_\_\_

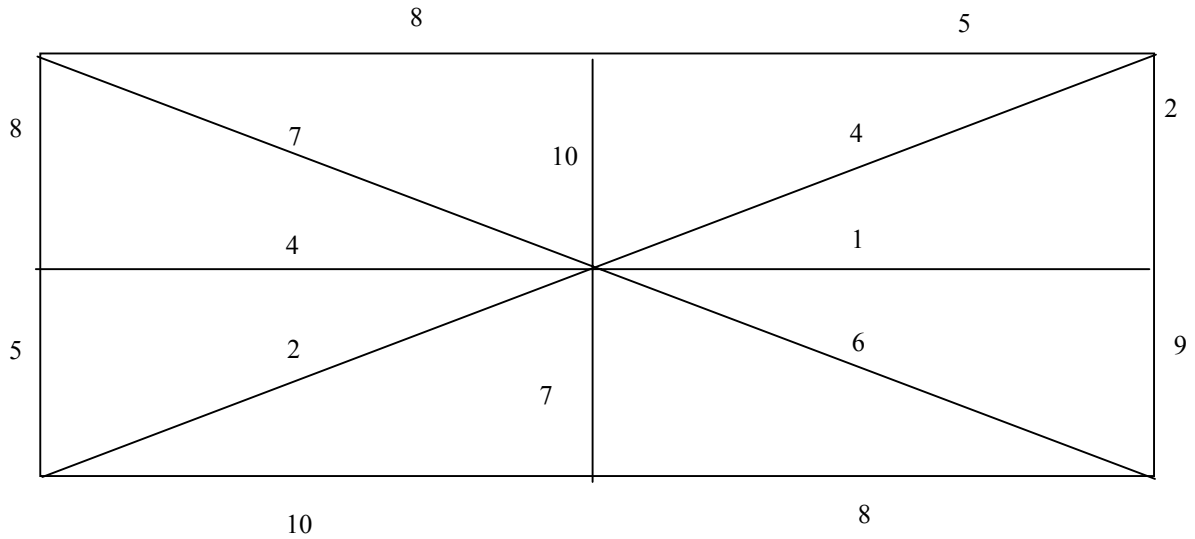
Instructor: \_\_\_\_\_

**The following questions are free response. Please show all work in order to receive credit.**

19. Complete each of the following definitions with the correct term. (18 pts)
- The number of edges meeting at a vertex is known as the \_\_\_\_\_ of that vertex.
  - The longest path in an order-requirement-digraph is called the \_\_\_\_\_.
  - A \_\_\_\_\_ is an ordering of the collection of tasks to be scheduled.
  - Two variables are \_\_\_\_\_ when their effects on the outcome of a study cannot be distinguished from one another.
  - An \_\_\_\_\_ is a data point that falls clearly outside the overall pattern of a set of data.
  - A number computed from a sample is called a \_\_\_\_\_.
  - A \_\_\_\_\_ monitors a production process over time.
  - A \_\_\_\_\_ is a ballot that provides a rank ordering of candidates, from best to worst, in the eyes of the voter.

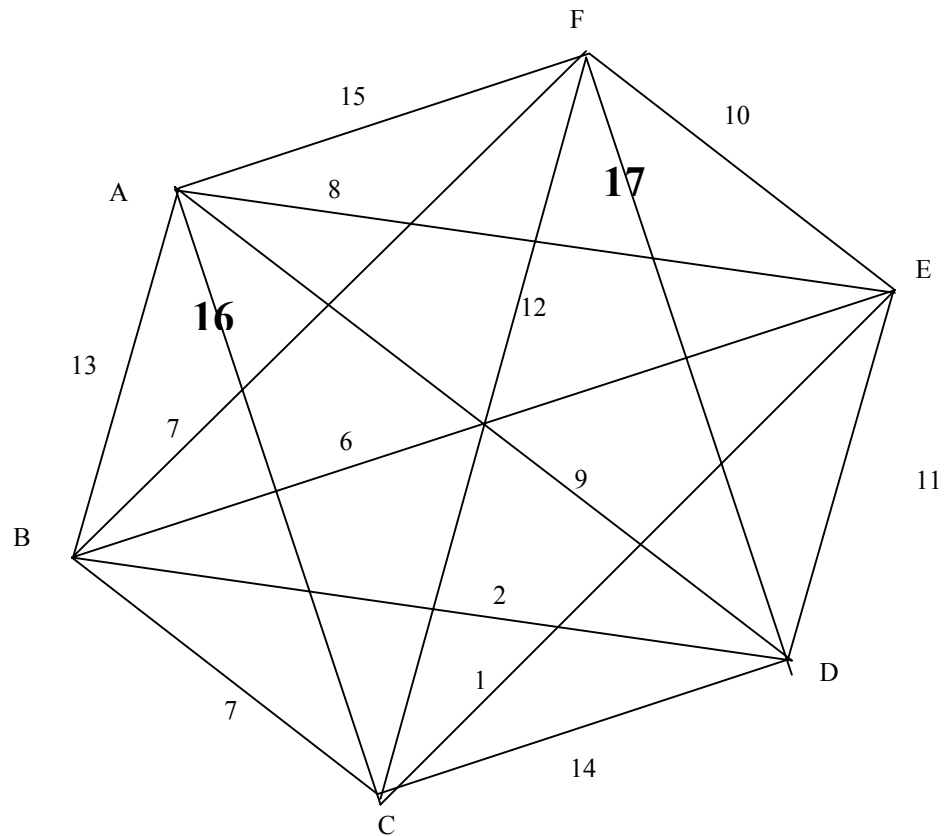
20. Use Kruskal's Algorithm to find a minimum-cost spanning tree for the following. Show the spanning tree on the graph below? (6 pts)

What is the cost of the spanning tree? \_\_\_\_\_

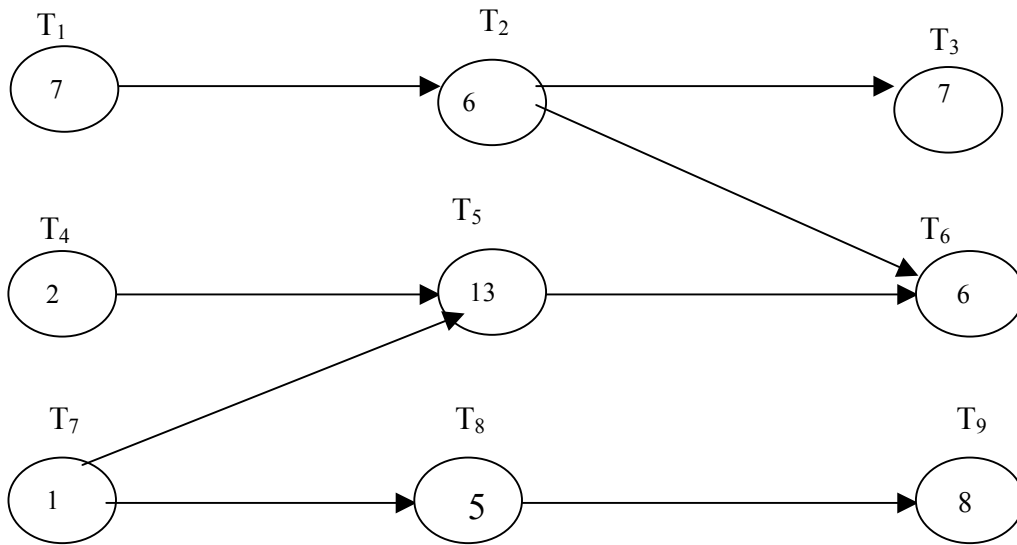


21. Use the Sorted Edges algorithm to find a Hamiltonian circuit for the graph below. (6 pts)

Write the circuit \_\_\_\_\_.



22. Given the priority list,  $T_5T_9T_1T_3T_2T_6T_8T_4T_7$ , and the order-requirement digraph shown below, schedule the tasks using the list processing algorithm, with three processors. (10 pts)



$M_1$	
$M_2$	
$M_3$	

23. The NAEP test was given to a random sample of 100 women, aged 21 to 25. The mean quantitative score was 275. It is known that the standard deviation of all individual scores is  $\sigma = 75$ . (10 pts)
- a. Find the standard deviation of the sampling distribution of this statistic.
- b. Construct a 95% confidence interval for the mean score  $\mu$  of the population of all young women aged 21 to 25.
- c. Suppose that a sample of 400 women also produced the sample mean  $\bar{x} = 275$  with standard deviation  $\sigma = 75$ . Construct a 95% confidence interval for  $\mu$ .
- d. What are the margins of error for samples of size 100 and 400?
- | <u>Sample Size</u> | <u>Margin of Error</u> |
|--------------------|------------------------|
| $n = 100$          |                        |
| $n = 400$          |                        |
- e. How does increasing sample size affect the margin of error of a confidence interval?

24. One hundred voters are to elect one of the four candidates A, B, C, or D. Their preference lists are shown below. (10 pts)

	Number of Votes			
	40	32	17	11
First choice	A	B	D	C
Second choice	C	C	C	D
Third choice	B	A	B	A
Fourth choice	D	D	A	B

Which candidate wins using:

- plurality?
- the Borda count?
- sequential pairwise voting with the agenda D, B, C, A?
- the Hare system?