

Part I: Multiple-Choice Questions. For each question, please circle only one of the proposed choices. Each multiple-choice question has 6 marks

1. The following two questions (1 and 2) are based on the following stem-and-leaf plot for 25 observations.

Leaf unit=1

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1 05
2 233
3 55778
4 44566777
5 678
6 01
7 23

2. The upper quartile, Q_3 , and the median are respectively:

a. 5.6 and 4.5 **b.** 56.5 and 45 **c.** 35 and 45 **d.** 30 and 47.

3. What are the shape and approximate standard deviation for the data in the above stem-and-leaf plot?

a. Symmetric, 18.25 **b.** right-skewed, 18.25
c. Left-skewed, 15.75 **d.** symmetric, 15.75

4. Suppose that for two events A and B we have $P(A) = 0.5$ and $P(B) = 0.3$. If A and B are mutually exclusive, then the values of $P(A \cap B)$ and $P(A \cup B)$ are, respectively,

a. 0 and 0.15, **b.** 0.15 and 0.8 **c.** 0.2 and 0.8, **d.** 0 and 0.8.

5. A sample of 100 durations has a mean of 38 seconds and a median of 42 seconds. Unfortunately, it has just been discovered that an observation which was incorrectly recorded as “35” actually had a value of “25”. If we correct this mistake in the data, which of the following things will happen?

(a) The median remains the same, but the mean is increased
(b) The mean and median both remain the same.
(c) The median remains the same, but the mean is decreased.

- (d) We do not know how the mean and median are effected without knowing all the data measurements, but we know that the variance is increased.
6. Let X be a random variable with mean μ and standard deviation σ . Based on the empirical rule, the probability that X will fall in the interval $\mu \pm \sigma$ is at least
a. 0.5 b. 0.25 c. 0.95 d. 0.68
7. Consider the following set of data 4 5 2 8 4 3 8 9. The mean and the variance for this set are
a. 5.37 and 34.87 b. 43 and 34.87 c. 5.37 and 6.84 d. 5.37 and 5.98
8. The probability that a customer will buy a product given that he or she has seen an advertisement for the product is 0.15. The probability that a consumer will see an ad for this particular product is 0.20. What is the probability that a consumer will both see the ad and buy the product?
a. 0.75 b. 0.05 c. 0.35 d. 0.03
9. In order to determine the quality of a shipment of 20 parts, a sample of 3 items is randomly selected without replacement from the shipment. Four of the 20 items in the shipment are actually defective. Let Y be a random variable representing the total number of defective items in the sample. Then $P(Y = 1)$ is
a. 0.48 b. 0.60 c. 0.08 d. 0.42
10. A city planner claims that 20% of all apartment dwellers move from their apartments within a year from the time they first moved in. In a particular city, 7 apartment dwellers who had given notice of termination to their landlords are to be interviewed. What is the probability that at least 6 will have lived in their apartment for more than a year?
a. 0.00037 b. 0.36700 c. 0.57617 d. 0.4233

Part II: Long answer questions. Show all your steps when answering the questions below.

1. [20 marks] Medical case histories indicate that different illnesses may produce identical symptom. Suppose a particular set of symptoms, which we will denote as event H , occurs only when any one of these illnesses: A , B , or C occurs. (For the sake of simplicity, we assume that illnesses A , B , and C are mutually exclusive.) Studies show that the probabilities of getting these illnesses are as follows: $P(A) = .015$, $P(B) = .005$, and $P(C) = .025$. The probabilities of developing the symptoms H given a specific illness are respectively .85, .9, and .7.

- (a) What is the probability that an ill person will develop the symptoms H ?
- (b) Assuming an ill person shows the symptoms H , what is the probability he or she has the illness A ?

2. [10 marks] The number of cars owned by a household has the following distribution

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|------|----|----|----|---|----|
| x | 0 | 1 | 2 | 3 | 4 |
| p(x) | .2 | .1 | .3 | ? | .1 |

- (a) Find the probability that a family owns 3 cars.
 - (b) Compute average number of cars per family.
3. [10 marks] The average number per day of people who arrive at bicycle repair is 5.
- (a) What is the probability that 7 people will arrive in a given day. Use Poisson distribution formula.
 - (b) What is the probability that between 2 and 5 (inclusive) will arrive tomorrow at the bicycle repair? Use Poisson cumulative distribution table.