

1. Answer True (T) if the statement is always true, otherwise answer False (F). [10 marks]
- Every continuous random variables is normally distributed.
 - If A and B are independent events, then $P(A \text{ and } B) = 0$.
 - If the random variable z is the standard normal score, $z(0.50) = 0$.
 - A **statistic** is a numerical value summarizing all the data of a sample.
 - In a Poisson distribution, the random variable $x = 0, 1, 2, \dots n$.
 - In a Binomial distribution, $\mu = 0$ and $\sigma = 1$.
 - In any probability distribution, $\sum P(x) = 1$.
 - If A and B are mutually exclusive events, then $P(A \text{ OR } B) = P(A) + P(B)$.
 - The five-number summary includes: \bar{x} , s , Q_1 , Q_2 and Q_3 .
 - If the random variable z is the standard normal score, $z(0.40) = P_{60}$.

2. A statistics student obtains sample data and finds that the mean weight of cars in the sample is 3126 lb. [6 marks]
- Identify the variable.
 - Is the variable quantitative or qualitative?
 - Identify the variable as discrete, continuous, nominal or ordinal.

3. Twelve Canadians were randomly selected and were asked to give the number of hours they watched television last week. These are their responses:

| | | | | | | | | | | | |
|----|----|----|---|----|----|---|----|----|----|----|----|
| 14 | 10 | 18 | 6 | 11 | 15 | 9 | 14 | 21 | 16 | 17 | 13 |
|----|----|----|---|----|----|---|----|----|----|----|----|

- Rank the data and find: the mean, the median, the mode, the range, the standard deviation. [6 marks]
 - Give the five-number summary and draw a Box-and-Whisker plot to summarize the data. [7 marks]
4. The grouped frequency distribution below gives the times (in minutes) between eruptions of Old Faithful in Yellowstone Park.

| Time | Frequency |
|---------|-----------|
| 40-50 | 8 |
| 50-60 | 44 |
| 60-70 | 23 |
| 70-80 | 6 |
| 80-90 | 107 |
| 90-100 | 11 |
| 100-110 | 1 |

- Find the mean time between eruptions of the geyser. [3 marks]
 - Construct a histogram for these data. [6 marks]
5. If $P(A) = 0.4$ and $P(B) = 0.2$ and A and B are mutually exclusive events, find $P(A \text{ OR } B)$. [3 marks]
6. If $P(A) = 0.3$ and $P(B) = 0.5$ and A and B are independent events, find $P(A \text{ AND } B)$. [3 marks]
7. Refer to the table below to answer the questions that follow. [9 marks]

PREGNANCY TEST RESULTS

| | Positive (Pregnancy is indicated) | Negative (Pregnancy is not indicated) |
|-------------------------|--------------------------------------|--|
| Subject is pregnant | 80 | 5 |
| Subject is not pregnant | 3 | 12 |

Assume that one of the subjects referred to in the table is randomly selected.

- Find the probability that she is not pregnant.
- Find the probability that the subject is pregnant or has positive test results.
- Find the probability of a negative test result given that he subject is not pregnant.

8. Given the function $f(x) = \frac{x-1}{5}$, $x = 0,1,2,3,4$. Is it a probability distribution function? Justify. [4 marks]
9. A recent study showed that directory assistance providers give out the wrong number 15% of the time. Assume that this survey is accurate and that you are testing such a provider by making 10 requests. [4 marks]
- a) Find the probability of getting no wrong numbers.
- b) Find the probability of getting at least one wrong number.
10. Currently, 11 babies are born in the village of Weeville each year. [6 marks]
- a) Find the mean number of births per day. (Use two decimal places.)
- b) Find the probability that on a given day, there are no births.
- c) Find the probability that on a given day, there is at least one birth.
11. The sitting height (from seat to top of head) of drivers must be considered in the design of a new car model. Men have sitting heights that are normally distributed with a mean of 36.0 inches and a standard deviation of 1.4 inches. [8 marks]
- a) Engineers have provided plans that can accommodate men with sitting heights up to 38.8 inches. If a man is randomly selected, find the probability that he has a sitting height less than 38.8 inches.
- b) If the engineers are asked to adjust their plans so that only the tallest 1% of men cannot fit into the new car model, what will they make the new sitting height?
12. Evaluate the following: [6 marks]
- a) $P(1.22 < z < 2.11)$
- b) $P(z < -2.57)$
- c) $z(0.9898)$
13. In order to help identify baby growth patterns that are unusual, we need to construct a confidence interval estimate of the mean head circumference of all babies that are two months old. A random sample of 100 babies is obtained, and the mean head circumference is found to be 40.6 cm. Assuming that the population standard deviation is known to be 1.6 cm, find a 99% confidence interval estimate of the mean head circumference of all babies. [5 marks]
14. A research firm wants to estimate the mean amount of time (in minutes) that full-time college students spend watching television each weekday. Find the sample size necessary to estimate that mean with a fifteen minute margin of error. Assume that a 96% confidence level is desired. Also assume that a pilot study showed that the standard deviation is estimated to be 112.2 minutes. [5 marks]
15. The tobacco industry closely monitors all surveys that involve smoking. One survey showed that among 785 randomly selected subjects who completed four years of university, 18.3% smoke. Construct a 98% confidence interval for the true percentage of smokers among all people who completed four years of university. [5 marks]
16. In designing a computer, if a byte is defined to be a sequence of 8 bits and each bit must be a 0 or a 1, how many different bytes are possible? [2 marks]
17. When testing for electrical current in a cable with five colour-coded wires, a man used a meter to test two wires at a time. How many tests are required for every possible pairing of two wires? [2 marks]

ANSWERS:

- 1) a) F b) F c) T d) T e) F f) F g) T h) T i) F j) T
- 2) a) Weight of car b) Quantitative c) Continuous
- 3) a) 13.7, 14, 14, 15, 4.2 b) $6 - 10.5 - 14 - 16.5 - 21$
- 4) a) 74.85
- 5) 0.6
- 6) 0.15
- 7) a) 0.14 b) 0.88 c) 0.80
- 8) No, since $f(0) < 0$.
- 9) a) 0.197 b) 0.803
- 10) a) 0.03 b) 0.970 c) 0.030
- 11) a) 0.9772 b) 39.262 inches
- 12) a) 0.0938 b) 0.0051 c) -2.32
- 13) 40.6 ± 0.412
- 14) 236
- 15) 0.183 ± 0.0322
- 16) 256
- 17) 10