

Math 153 - Test 3

April 19, 2018

Name _____

Score _____

Show all work to receive full credit. Supply explanations where necessary. You may use your calculator for all statistical computations, but show how you use it.

1. (8 points) When in use, the batteries of a certain kind of electronic device have lives that are normally distributed with mean 17.9 hr and standard deviation 0.9 hr.

(a) If a battery is selected at random, what is the probability that its life will exceed 20 hr?

(b) In a sample of 250 batteries, about how many will have lifetimes between 17 hr and 19 hr?

2. (12 points) According to a recent poll by the Pew Research Center, 37% of Americans have “some” trust in the news they obtain from social media. A random sample of 50 Americans is obtained.

(a) What is the probability that exactly 20 have some trust in social media news?

(b) What is the probability that fewer than 15 have some trust in social media news?

(c) In the sample of 50, what would be an unusually large number of people who have some trust in social media news?

3. (9 points) The probability distribution for the random variable x is shown below.

x	1	2	3	4	5	6	7	8
$P(x)$	0.03	0.03	0.15	0.02	0.45	0.28	0.03	0.01

- (a) Determine all unusually small values of x . Show work or explain.
- (b) Determine all unusually large values of x . Show work or explain.
- (c) Is $x = 4$ unusual? Explain.
4. (12 points) A company is investigating the HVAC system in one of its out-buildings. On average, the building's furnace comes on 17 times per day.
- (a) In a given day, what is the probability that the building's furnace comes on more than 20 times?
- (b) In a given day, what is the probability that the building's furnace comes on exactly 17 times?
- (c) What is the standard deviation in the numbers of times the furnace comes on per day?

5. (14 points) A three-person employee committee is exploring tech options for a small company. The ages of the committee members, in years, are 26, 32, and 62. In this problem, we analyze whether sampling is a good way to find a population maximum value. We take samples of size 2.
- (a) List all possible samples of two ages, and state the maximum age in each sample.

 - (b) Find the probability distribution for the sample maximums. Write your distribution in the form of a table.

 - (c) Find the mean of the sampling distribution of the sample maximums.

 - (d) Look back at the original population of ages. Find the population maximum.

 - (e) Do sample maximums target the population maximum? Explain.

 - (f) Is sampling a good way to find a population maximum value? Explain.

6. (2 points) Suppose x is a random variable in a probability distribution. Which one of these must be true if $x = k$ is unusually small? (Circle one choice.)

- (a) $P(x = k) < 0.05$
- (b) $P(x \leq k) \geq 0.05$
- (c) $P(x \geq k) \leq 0.05$
- (d) $P(x = k) > 0.05$
- (e) $P(x \leq k) \leq 0.05$

7. (2 points) Suppose x is a random variable in a probability distribution. Which one of these must be true if $x = k$ is unusually large? (Circle one choice.)

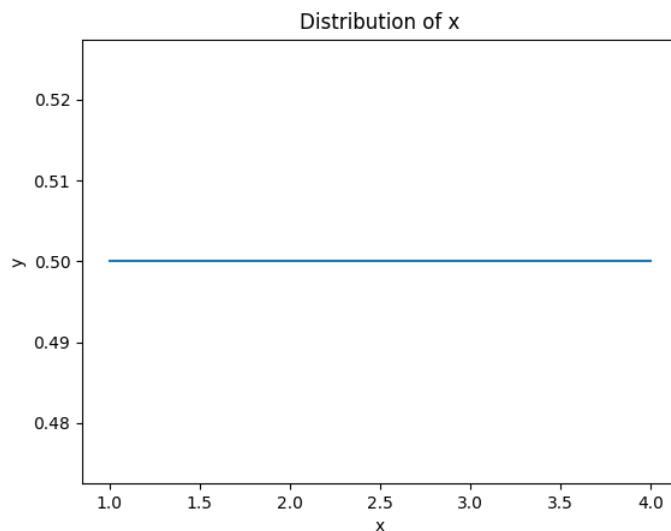
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8. (8 points) In a hospital emergency room, the processing times for arriving patients are normally distributed with mean 17 min and standard deviation 9 min. A random sample of 47 patients is obtained.

(a) What is the probability that the mean processing time is less than 16 min?

(b) Internal regulations require on-call employees to be called into work if the mean processing time reaches the 95th percentile. What mean processing time is at the 95th percentile?

9. (9 points) For each situation, decide whether the distribution of sample means is approximately normal. If so, find the mean and standard deviation of the sampling distribution.
- (a) Speeds on a highway are normally distributed with a mean of 71 mph and a standard deviation of 3 mph. 13 cars are picked at random and their speeds are measured.
 - (b) Adult male wombats in Narawntapu National Park have a mean weight of 35.6 kg with a standard deviation of 2.8 kg. Random samples of 20 male wombats are obtained.
 - (c) Eggs have a mean cholesterol content of 215 mg with a standard deviation of 15 mg. Samples of 500 eggs are randomly selected.
10. (5 points) Is the graph shown below a probability density curve. Explain.



11. (9 points) In a certain large group of adults, the weekly amounts of time spent watching television are uniformly distributed between 5 hours and 39 hours.
- (a) Sketch the density curve for the probability distribution.
 - (b) What is the probability that a random person from this group watches television more than 20 hours per week?
 - (c) What is the probability that a random person from this group watches television exactly 20 hours per week?
12. (5 points) On average, a certain school's cafeteria has 418 customers per day. It is probably NOT a good idea to think that people visiting a cafeteria is a Poisson process. Briefly explain why not.
13. (5 points) According to data collected by the Pew Research Center, 19% of U.S. adults have absolutely no confidence that elected officials act in the best interests of the public. A random sample of 200 U.S. adults is obtained. Use guess and check to find the number of adults at 80th percentile. That is, find the number k so that $P(x \leq k) = 0.80$.