

Exam 1 Practice

Stat 515 Name: _____

Instructor: Ho, Yen-Yi

Note: Show all of your work to receive full credit. A formula sheet and standard normal table accompany this exam. Calculators are permitted. Good luck!

1. (15 pts) County health survey components.

A county health department wants to estimate the proportion of all adult residents (age 18 and older) who received a flu vaccine in the past year. It randomly selects landline telephone numbers from the county directory and completes 740 interviews.

a) (10 pts) Identify each of the following for this study:

Target population: _____

Sampled population: _____

Sampling unit: _____

Observation unit: _____

Response: _____

b) (5 pts) Explain why the target population and the sampled population may differ in this study.

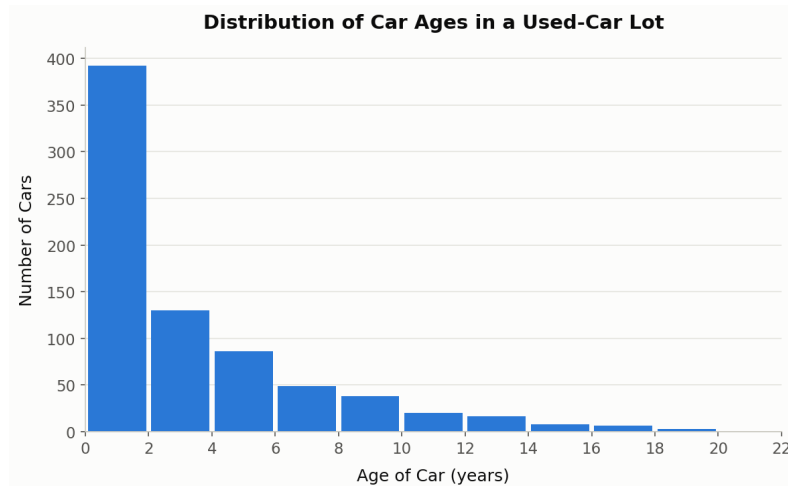
2. (12 pts) Short Questions.

a) (3 pts) Suppose Population A has a variance of 15 and Population B has a variance of 45. Which population shows more variability? Briefly explain.

b) (3 pts) (Circle the correct answer.) A histogram of exam scores is roughly bell-shaped and symmetric. We would expect its mean to be

larger than / equal to / smaller than its median.

c) (6 pts) (Circle the correct answers.) Suppose data are collected on the age (in years) of cars in a used-car lot.



The distribution of car ages is most likely: skewed left / symmetric / skewed right
 We would expect that its mean would be: larger than / equal to / smaller than its median.

3. (6 pts) Suppose Z is a standard normal random variable.

a) Find z_0 such that $P(Z < z_0) = 0.025$.

b) Find $P(-1.5 < Z < 2.0)$.

4. (6 pts) Selecting a committee. A department has 8 faculty members. A committee of 3 is to be chosen at random.

a) In how many ways can the committee be formed?

b) If every possible committee is equally likely, what is the probability that a specific group of 3 faculty members is chosen?

5. (8 pts) Newborn birth weights. Birth weights of full-term newborns are approximately normally distributed with a mean of 7.5 lbs and a standard deviation of 1.1 lbs.

a) Find the probability that a randomly selected newborn weighs more than 9 lbs.

b) Find the probability that a randomly selected newborn weighs between 6 and 8 lbs.

6. (15 pts) Consider the discrete probability distribution of X given below:

x	5	10	15	25
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$p(x)$	0.10	0.40	0.35	0.15
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a) Find $E(X)$.

b) Find $\text{Var}(X)$.

c) Find $P(X \geq 15)$.

7. (25 pts) College student transportation survey. A survey of 400 college students asked about their primary mode of transportation to campus and whether they were satisfied with their commute. Suppose one student is selected at random.

Transportation	Satisfied	Not Satisfied	Total
Car	120	80	200
Public Transit	90	60	150
Walking/Biking	42	8	50
Total	252	148	400

a) Find the probability that the selected student is satisfied with their commute.

b) Find the probability that the selected student uses public transit or is not satisfied with their commute.

c) Find the probability that the selected student uses a car and is satisfied.

d) Given that a student walks or bikes, find the probability that they are satisfied with their commute.

e) Are the events "uses public transit" and "satisfied" independent? Justify your answer clearly.

8. (12 pts) Defective items. A quality control inspector knows that 15% of items coming off an assembly line are defective. A random sample of 10 items is selected. Let X be the number of defective items. Assume X follows a binomial distribution.

a) Find the expected number of defective items in the sample.

b) Find the standard deviation of the number of defective items.

c) Find the probability that exactly 3 items are defective.

9. (16 pts) Emergency room arrivals. The number of patients arriving at a hospital emergency room follows a Poisson distribution with an average of 4 patients per hour.

- a) What is the probability that no patients arrive in a given hour?
- b) What is the expected number of patients in a 3-hour period?
- c) What is the probability that at least 2 patients arrive in a 3-hour period?

10. (10 pts)

A new blood test for a certain disease has the following characteristics: if a person has the disease, the test is positive with probability 0.95. If a person does not have the disease, the test is positive with probability 0.04. It is known that 2% of the population has the disease.

- a) Draw a tree diagram showing all relevant probabilities.
- b) Find the probability that a randomly selected person tests positive.
- c) Given that a person tests positive, find the probability that they actually have the disease.