University of California, Los Angeles
Department of Statistics

Statistics 13 **Instructor: Nicolas Christou**

Homework 6

EXERCISE 1
Suppose that 60% of Los Angeles residents support the idea of constructing a subway system that runs from Downtown Los Angeles to Santa Monica through Wiilshire Boulevard. What is the probability that in a random sample of 400 Los Angeles residents the sample proportion will be less than 53%?

EXERCISE 2
Information on a packet of seeds claims that the germination rate is 92%. What is the probability that more than 95% of the 160 seeds in a packet will germinate? Is there any problem with assumptions here?

EXERCISE 3
About 60% of restaurant customers demand a smoke-free environment and so they ask to be seated in a nonsmoking section. A new restaurant with 120 seats will starts its business very soon. How many seats should be in the nonsmoking area in order to be very sure that there is enough space for the nonsmokers. First comment on what "very sure" means.

EXERCISE 4
The carbon monoxide (CO) emissions for a certain kind of car follows a distribution with mean $\mu = 2.9gm/mi$ and standard deviation $\sigma = 0.4gm/mi$. Suppose that a company has in its fleet 80 of these cars.

a. What is the distribution of the sample mean ($\bar{X}$) of these 80 cars?

b. What is the probability that the sample mean is between 3.0 and 3.1 mg/mi?

c. Find the $5th$ percentile of the distribution of the sample mean.

EXERCISE 5
Suppose the weight of a potato chips bag of a certain brand follows the normal distribution with mean $\mu = 10.2$ ounces, and standard deviation $\sigma = 0.12$ ounces. A bag is underweight if it weighs less than 10 ounces.

a. What is the probability that a bag is underweight?

b. A box contains 3 of these bags. What is the probability that none of the 3 bags is underweight?

c. What is the probability that the sample mean of these 3 bags is below 10 ounces?

d. What is the probability that the sample mean weight of a box that contains 24 of these bags is underweight?

e. Draw the results of parts (a), (c), and (d) in three normal curves (one below each other) and write a brief comment.

EXERCISE 6
The amount of mineral water consumed by a person per day on the job is normally distributed with mean 19 ounces and standard deviation 5 ounces. A company supplies its employees with 2000 ounces of mineral water daily. The company has 100 employees.

a. Find the probability that the mineral water supplied by the company will not satisfy the water demanded by its employees.

b. Find the probability that in the next 4 days the company will not satisfy the water demanded by its employees on at least 1 of these 4 days. Assume that the amount of mineral water consumed by the employees of the company is independent from day to day.

c. Find the probability that during the next year (365 days) the company will not satisfy the water demanded by its employees on more than 15 days.

EXERCISE 7
An insurance company wants to audit health insurance claims in its very large database of transactions. In a quick attempt to assess the level of overstatement of this database, the insurance company selects at random 400 items from the database (each item represents a dollar amount). Suppose that the population mean overstatement of the entire database is $8, with population standard deviation $20.

a. Find the probability that the sample mean of the 400 would be less than $6.50.

b. The population from where the sample of 400 was selected does not follow the normal distribution. Why?

c. Why can we use the normal distribution in obtaining an answer to part (a)?

d. For what value of ω can we say that $P(\mu - \omega < \bar{X} < \mu + \omega)$ is equal to 80%?

e. Let T be the total overstatement for the 400 randomly selected items. Find the number b so that $P(T > b) = 0.975$.

EXERCISE 8
You are going to play roulette at a casino. As a reminder a roulette has 38 numbers (1-36 plus 0 and 00). Let's say that you want to bet on number 13. If you win it pays $35:1$ which means that you get your $1 back plus $35.

a. In 10000 plays, what is the probability that the casino will make more than $400?

b. What would the probability be if you play 90000 games?

Hint: The number of times you play the game can be viewed as a sample from a population that has mean μ and standard deviation σ. First find this population and then compute μ and σ.