PID:	
Last Name, First Name:	
Section:	
Approximate time spent to complete this assignment:	hour(s)

Homework 5 Math 11, UCSD, Winter 2018 Due on Tuesday, 20th February

Readings: Sections 5.3-5.5, Chapter 11, Section 16.4, and Chapter 17.

Exercise 1

Based on the Normal model N(100,16) describing IQ scores, find (using tables) what percent of people's IQs would you expect to be

1. over 80?

2. under 90?

3. between 112 and 132?

In the Normal model N(100, 16) from Exercise 1, what cutoff value bounds

1. the highest 5% of all IQs?

$2. \ {\rm the \ lowest} \ 30$

3. the middle 80% of the IQs?

For car speed data (collected where the speed limit read 20 mph), here is the histogram, boxplot, and Normal probability plot (qq-plot) of the 100 readings. Do you think it is appropriate to apply a Normal model here? Explain.





Exercise 4

A tire manufacturer believes that the treadlife of its snow tires can be described by a Normal model with a mean of 32,000 miles and standard deviation of 2500 miles.

1. If you buy one of these tires, would it be reasonable for you to hope it will last 40,000 miles? Explain.

2. Approximately what fraction of these tires can be expected to last less than 30,000 miles?

3. Approximately what fraction of these tires can be expected to last between 30,000 and 35,000 miles?

4. Estimate the IQR of the treadlives.

5. In planning a marketing strategy, a local tire dealer wants to offer a refund to any customer whose tires fail to last a certain number of miles. However, the dealer does not want to take too big a risk. If the dealer is willing to give refunds to no more than 1 of every 25 customers, for what mileage can be guarantee these tires to last?

A company hoping to assess employee satisfaction surveys employees by assigning computergenerated random numbers to each employee on a list of all employees and then contacting all those whose assigned random number is divisible by 7. Is this a simple random sample?

Exercise 6

For their class project, a group of Statistics students decide to survey the student body to assess opinions about the proposed new student center. Their sample of 200 contained 50 first-year students, 50 sophomores, 50 juniors, and 50 seniors.

1. Do you think the group was using an SRS? Why?

2. What sampling design do you think they used?

A local TV station conducted a "Pulse-Poll" about the upcoming mayoral election. Evening news viewers were invited to text in their votes, with the results to be announced on the late-night news. Based on the texts, the station predicted that Amabo would win the election with 52% of the vote. They were wrong: Amabo lost, getting only 46% of the vote. Do you think the station's faulty prediction is more likely to be a result of bias or sampling error? Explain.

Exercise 8

In a large city school system with 20 elementary schools, the school board is considering the adoption of a new policy that would require elementary students to pass a test in order to be promoted to the next grade. The PTA wants to find out whether parents agree with this plan. Listed below are some of the ideas proposed for gathering data. For each, indicate what kind of sampling strategy is involved and what (if any) biases might result.

1. Put a big ad in the newspaper asking people to log their opinions on the PTA website.

2. Randomly select one of the elementary schools and contact every parent by phone.

6

3. Send a survey home with every student, and ask parents to fill it out and return it the next day.

4. Randomly select 20 parents from each elementary school. Send them a survey, and follow up with a phone call if they do not return the survey within a week.

Exercise 9

For your political science class, you'd like to take a survey from a sample of all the Catholic Church members in your city. A list of churches shows 17 Catholic churches within the city limits. Rather than try to obtain a list of all members of all these churches, you decide to pick 3 churches at random. For those churches, you'll ask to get a list of all current members and contact 100 members at random. What kind of design have you used? What could go wrong with your design?

The American Veterinary Association claims that the annual cost of medical care for dogs averages \$100, with a standard deviation of \$30, and for cats averages \$120, with a standard deviation of \$35.

1. What's the expected difference in the cost of medical care for dogs and cats?

2. What's the standard deviation of that difference?

3. If the costs can be described by Normal models, what's the probability that medical expenses are higher for someone's dog than for her cat?

Assume that 30% of students at a university wear contact lenses.

1. We randomly pick 100 students. Let \hat{p} represent the proportion of students in this sample who wear contacts. What's the appropriate model for the distribution of \hat{p} ? Specify the name of the distribution, the mean, and the standard deviation. Be sure to verify that the conditions are met.

2. What's the approximate probability that more than one third of this sample wear contacts?

Information on a packet of seeds claims that the germination rate is 92%. What's the probability that more than 95% of the 160 seeds in the packet will germinate? Be sure to discuss your assumptions and check the conditions that support your model.

It's believed that 4% of children have a gene that may be linked to juvenile diabetes. Researchers hoping to track 20 of these children for several years test 732 newborns for the presence of this gene. What's the probability that they find enough subjects for their study?

A sample is chosen randomly from a population that was strongly skewed to the left.

1. Describe the sampling distribution model for the sample mean if the sample size is small.

2. If we make the sample larger, what happens to the sampling distribution model's shape, center, and spread?

3. As we make the sample larger, what happens to the expected distribution of the data in the sample?

Statistics from Cornell's Northeast Regional Climate Center indicate that Ithaca (NY), gets an average of 35.4" of rain each year, with a standard deviation of 4.2". Assume that a Normal model applies.

1. During what percentage of years does Ithaca get more than 40" of rain?

2. Less than how much rain falls in the driest 20% of all years?

3. A Cornell University student is in Ithaca for 4 years. Let y represent the mean amount of rain for those 4 years. Describe the sampling distribution model of this sample mean, y.

4. What's the probability that those 4 years average less than 30" of rain?

Exercise 16

Some business analysts estimate that the length of time people work at a job has a mean of 6.2 years and a standard deviation of 4.5 years.

1. Explain why you suspect this distribution may be skewed to the right.

2. Explain why you could estimate the probability that 100 people selected at random had worked for their employers an average of 10 years or more, but you could not estimate the probability that an individual had done so.

Member Category	Amount of Donation (\$)	Percent of Members
Individual	50	41
Family	100	37
Sponsor	250	14
Patron	500	7
Benefactor	1000	1

A museum offers several levels of membership, as shown in the table.

1. Find the mean and standard deviation of the donations.

2. During their annual membership drive, they hope to sign up 50 new members each day. Would you expect the distribution of the donations for a day to follow a Normal model? Explain.

3. Consider the mean donation of the 50 new members each day. Describe the sampling model for these means (shape, center, and spread).

4. A phone volunteer for the museum sets a personal goal of getting an average donation of at least \$100 from the new members she enrolls during the membership drive. If she gets 80 new members and they can be considered a random sample of all the museum's members, what is the probability that she can achieve her goal?