

1) In a large Metropolitan area, 20% of the families have an adjusted gross income of \$80,000 or more reported on their local income tax return. A random audit chooses 100 of these returns for careful study. Let X be the number of local income tax returns audited that show an adjusted gross income of under \$80,000.

a) Find the mean of X . (Answer 80)

b) What is the probability that at least 30 of the returns audited show an adjusted gross income of more than \$80,000? (Answer 0.0062)

2) People with type O-negative blood are universal donors whose blood can safely be given to anyone. Only 7.2% of the population has O-negative blood. A mobile blood center is visited by 20 donors in the afternoon. Let X denote the number of universal donors among them.

a) Find the mean of X . (Answer 1.44)

b) Find the standard deviation of X . (Answer 1.15)

c) Find the probability that X is at least 2. (Answer 0.427)

d) Now you do a larger study with 1000 donors. What is the probability that X is at least 200.

3) Scores on a University exam are normally distributed with a mean of 68 and a standard deviation of 9. Using the 68-95-99.7 rule, what percentage of students score above 77? (Answer 16%)

4) The time to complete a standardized exam is approximately normal with a mean of 70 minutes and a standard deviation of 10 minutes. Using the 68-95-99.7 rule, if students are given 90 minutes to complete the exam, what percentage of students will not finish? (Answer 2.5%)

5) Birthweights at a local hospital have a normal distribution with a mean of 110 oz. and a standard deviation of 15 oz.

- a) What is the proportion of infants with birthweights above 125 oz.? (Answer 0.159)
- b) What is the proportion of infants with birthweights between 125 oz. and 140 oz.? (Answer 0.136)
- 6) The average age of cars owned by residents of a small city is 6 years with a standard deviation of 2.2 years. A simple random sample of 400 cars is to be selected, and the sample mean age of these cars is to be computed.
- a) We know the random variable has approximately a normal distribution because of(Answer Central limit theorem)
- b) What is the probability that the average age of the 400 cars is more than 6.1 years? (Answer 0.1814)
- 7) The distribution of actual weights of 8 oz. wedges of cheddar cheese produced by a certain company is normal with mean 8.1 ounces and standard deviation 0.1 ounces.
- a) If a sample of five of these cheese wedges is selected, what is the probability that their average weight is less than 8 oz.?(Answer 0.0125)
- b) There is only a 5% chance that the average weight of the sample of five of the cheese wedges will be below(Answer 8.03 oz)
- 8) A medical researcher treats 100 subjects with high cholesterol with a new drug. The average decrease in cholesterol level is $\bar{x} = 80$ after two months of taking the drug. Assume that the decrease in cholesterol after two months of taking the drug follows a normal distribution, with unknown mean μ and standard deviation $\sigma = 20$.
- a) Give a 90% confidence interval for μ . (Answer 80 ± 3.29)
- b) Which of the following would produce a confidence interval with a smaller margin of error than the 90% confidence interval you computed above?
- i) Give the drug to only 25 subjects rather than 100, since 25 people are easier to manage and control.
- ii) Give the drug to 500 subjects rather than 100.
- iii) Compute a 99% confidence interval rather than a 90% confidence interval. The increase in confidence indicates that we have a

better interval.

iv) None of the above

(Answer ii)

9) Suppose we want a 90% confidence interval for the average amount of time (in minutes) spent per week on homework by the students in a large introductory statistics course at a large university. The interval is to have a margin of error of 2 minutes, and the amount spent has a normal distribution with a standard deviation $\sigma = 30$ minutes. The number of observations required is closest to(Answer 609)

10) The Survey of Study Habits and Attitudes (SSHA) is a psychological test that measures the motivation, attitudes, and study habits of college students. Scores range from 0 to 200 and follow (approximately) a normal distribution with, mean 115 and standard deviation $\sigma = 25$. You suspect that incoming freshman have a mean μ , which is different from 115, since they are often excited yet anxious about entering college. To verify your suspicion, you test the hypotheses

$$H_0 : \mu = 115, H_a : \mu \neq 115.$$

You give the SSHA to 25 students who are incoming freshman and find their mean score is 116.2. Assuming that the scores of all incoming freshmen are approximately normal, with the same standard deviation as the scores of all college students, what is the P-value of your test? (Answer 0.8104)

11) Suppose the time that it takes a certain large bank to approve a home loan is normally distributed with mean (in days) μ and standard deviation $\sigma = 1$. The bank advertises that it approve loans in 5 days, on average, but measurements on a random sample of 400 loan applications to this bank gave a mean approval time of $\bar{x} = 5.2$ days. Is this evidence that the mean time to approval is actually more than advertised? To answer this, test the hypotheses

$$H_0 : \mu = 5, H_a : \mu > 5,$$

at significance level $\alpha = 0.01$. Conclude whether H_0 should be rejected or not. Explain each step in detail. (Answer: H_0 should be

rejected.)