

AP Statistics Chapter 7 Practice FR Test: Sampling Distributions

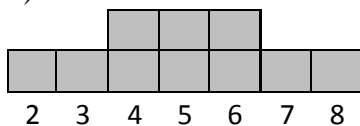
Show all work for the following on the answer sheet. Answer completely and clearly.

1. Consider the following set of numbers as a population: $\{1, 3, 5, 7, 9\}$
 - a) Show all possible samples of size 2 from this population (there are 10).
 - b) Construct a dot plot of the means of the samples found in part a.
 - c) What is the mean of the distribution in part b? Why would you expect that number?
 - d) How would the spread of the dot plot in part b change if we had taken samples of size 3 in part a? Explain.
2. An opinion poll asks a sample of 500 adults (an SRS) whether they favor giving parents of school-age children vouchers that can be exchanged for education at any public or private school of their choice. Each school would be paid by the government on the basis of how many vouchers it collected. Suppose that in fact 45% of the population favor this idea..
 - a) What are the mean and standard deviation of the sampling distribution of \hat{p} , the proportion of adults in samples of 500 who favor giving parents of school-age children these vouchers?.
 - b) Justify the use of a normal approximation for the sampling distribution of \hat{p} in this setting.
 - c) What is the probability that more than half of the sample are in favor? Show all work.
3. A study of college freshmen's study habits found that the time (in hours) that college freshmen use to study each week follows a skewed right distribution with a mean of 7.2 hours and a standard deviation of 5.3 hours.
 - a) What are the mean and standard deviation for the average number of hours \bar{x} spent studying by an SRS of 55 freshmen?
 - b) Find the probability that the average number of hours spent studying by an SRS of 55 students is greater than 9 hours. Show your work.
 - c) Explain why you can use a normal distribution to answer question b even though the distribution of study times is skewed right.

AP Statistics Chapter 7 Practice FR Test: SOLUTIONS

1. a) (1,3), (1,5), (1,7), (1,9), (3,5), (3,7), (3,9), (5,7), (5,9), (7,9)

b)



c) 5 – because the mean of all sample means will always equal the mean of the population. Here the mean of the population is also 5.

d) It would be smaller since increasing the sample size decreases the spread of the sampling distribution

2. a) mean = $p = .45$ SD = $\sqrt{p(1-p)/n} = \sqrt{.45(.55)/500} = .0222$

b) **10% Condition:** 500 is clearly less than 10% of the number all adults in the U.S.
Large Counts Condition: $np = 500(.45) = 225$ and $n(1-p) = 500(.55) = 275$. Both of these numbers are greater than 10.

c) Need to find $P(\hat{p} > 0.5)$

$$z = \frac{.50 - .45}{.0222} = 2.25 \quad \text{and} \quad \text{normalcdf}(.50, E99, .45, .0222) = .0122$$

3. a) mean = $\mu = 7.2$ SD = $\sigma/\sqrt{n} = 5.3/\sqrt{55} = 0.7147$

b) Need to find $P(\bar{x} > 9)$

$$z = \frac{9 - 7.2}{.7147} = 2.52 \quad \text{and} \quad \text{normalcdf}(9, E99, 7.2, .7147) = .0059$$

c) **Central Limit Theorem:** The CLT says that if the sample size is greater than 30, the sampling distribution of sample means will be approximately normal. Here, $55 > 30$.