

Chapter I

Sampling Distribution Exercises

Part I:

1.

A substitute teacher wants to know how students in the class did on their last test. He asks only the 10 students sitting in the front row to report how they did on their last test and he concludes from them that the class did extremely well.

1. What is population?
2. What is the sample?
3. Can you identify any problems with choosing the sample in the way that the teacher did?

2.

For a particular brand of TV picture tube, it is known that the mean operating life of the tubes is 9000 hr with a standard deviation of 500 hr.

1. Determine the expected value and standard error of the sampling distribution of the mean
given a sample size of 25 .
2. Interpret the meaning of the computed values.

3.

Assume that the heights of 3000 male students at a university are normally distributed with mean 68.0 inches and standard deviation 3.0 inches. If 80 samples consisting of 25 students each are obtained, what would be the mean and standard deviation of the resulting sample of means if sampling were done

1. with replacement,
2. without replacement?

4.

A company manufactures circuit boards. The average number of imperfection on a board is 5 with a standard deviation 2.34 when the production process is under control.

A random sample of 36 circuit boards will be taken for inspection and a mean of 6 defects per board will be found.

What is the probability of getting a value less than 6 if the process is under control?

5.

For a large population of normally distributed account balances, the mean balance is 150.00€ with standard deviation 35.00.

What is the probability that

1. *one* randomly sampled account has a balance that exceeds 160.00 €?
2. the mean for a random sample of 40 accounts will exceed 160.00 €?

6.

The GPAs of all students at a large university have an approximate normal distribution with a mean of 3.02 and a standard deviation of 0.39.

Find the probability that the mean GPA of a random sample of 20 students selected from this university is

1. 3.10 or higher
2. 2.90 or lower
3. 2.95 to 3.11.

7.

Suppose that students' commuting time at a certain university has a mean of 29 minutes and a standard deviation of 9 minutes. There are 6000 students at this university. We take a sample of 40 students.

1. Calculate the probability that the sample mean will be within 2 minutes of the population mean if sampling is
 - a) without replacement
 - b) with replacement.
2. Recalculate the probability using a sample size of 100.

8.

The five cities with the most African-American-owned businesses in the USA are given in the following table:

City	Number of African-American –owned Businesses, in thousands
A: New York	42
B: Washington, D.C.	39
C: Los Angeles	36
D: Chicago	33
E: Atlanta	30

1. List all samples of size 4 and find the mean of each sample.
 2. Construct the sampling distribution of the sample mean.
 3. Give the sampling error associated with each of the samples.
 4. Find the mean and variance of the sampling distribution of the sample mean.
- Verify the
corresponding formulas in the script.

9.

Suppose we take a random sample of 100 students from a large university where 40% of the students work at least part time.

1. What percentage of the students in the sample we can expect to have at least a part time job?
2. How much can we expect the sample proportion to vary from the population proportion?
3. Find the probability of observing a sample proportion that is greater than 0.5?

Part II: SPSS

1.

Data File: GSS2010 (Variable: age)

1. Investigate the validity of the following statement:
 - a) Calculating the average age is a correct application of a statistic.
 - b) The mean of the variable age is in all cases 47.97 years.
2. Calculate the mean for the sample.

2.

Data File: 2001WorldFactbook.sav (Variable: pop)

1. How many cases are available for the analysis?
2. Is the distribution of Populations nearly normal?
3. Re-express the values to see if the transformed distribution satisfies the nearly normal condition.

(*Hint: If the skewness of the distribution of the variable is positive, we test the log transformation. If the skewing is negative, we test the square transformation.*)

4. Verify whether or not percentages based on the distribution of the log transformed variable agree with the percentages specified in the empirical rule.

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