

Sampling Variability

Suppose that you want to estimate the mean time per evening students at your school spend doing homework. You will do this using a random sample of 30 students.

1. Suppose that you have a list of all the students at your school. The students are numbered 1, 2, 3, One way to select the random sample of students is to use the random digit table from today's class, taking three digits at a time. If you start at the third digit of row 9, what is the number of the first student you would include in your sample?
2. Suppose that you have now selected your random sample and that you have asked the students how long they spend doing homework each evening. How will you use these results to estimate the mean time spent doing homework for *all* students?
3. Explain what is meant by *sampling variability* in this context.

1. Yousef intends to buy a car. He wishes to estimate the mean fuel efficiency (in miles per gallon) of all cars available at this time. Yousef selects a random sample of 10 cars and looks up their fuel efficiencies on the Internet. The results are shown below.

22 25 29 23 31 29 28 22 23 27

- a. Yousef will estimate the mean fuel efficiency of all cars by calculating the mean for his sample. Calculate the sample mean, and record your answer below. (Be sure to show your work.)
 - b. In practice, you only take one sample to estimate a population characteristic. However, if Yousef were to take another random sample of 10 cars from the same population, would he likely get the same value for the sample mean?
 - c. What if Yousef were to take *many* random samples of 10 cars? Would all of the sample means be the same?
 - d. Using this example, explain what sampling variability means.
2. Think about the mean number of siblings (brothers and sisters) for all students at your school.
- a. What do you think is the approximate value of the mean number of siblings for the population of all students at your school?
 - b. How could you find a better estimate of this population mean?
 - c. Suppose that you have now selected a random sample of students from your school. You have asked all of the students in your sample how many siblings they have. How will you calculate the sample mean?
 - d. If you had taken a different sample, would the sample mean have taken the same value?
 - e. There are many different samples of students that you could have selected. These samples produce many different possible sample means. What is the phrase used for this concept?
 - f. Does the phrase you gave in part (e) apply only to sample means?

Suppose that you want to estimate the mean time per evening students at your school spend doing homework. You will do this using a random sample of 30 students.

1. Suppose that you have a list of all the students at your school. The students are numbered 1, 2, 3, One way to select the random sample of students is to use the random digit table from today's class, taking three digits at a time. If you start at the third digit of row 9, what is the number of the first student you would include in your sample?

The first student in the sample would be student number 229.

2. Suppose that you have now selected your random sample and that you have asked the students how long they spend doing homework each evening. How will you use these results to estimate the mean time spent doing homework for *all* students?

I would calculate the mean time spent doing homework for the students in my sample.

3. Explain what is meant by *sampling variability* in this context.

Different samples of students would result in different values of the sample mean. This is sampling variability of the sample mean.

1. Yousef intends to buy a car. He wishes to estimate the mean fuel efficiency (in miles per gallon) of all cars available at this time. Yousef selects a random sample of 10 cars and looks up their fuel efficiencies on the Internet. The results are shown below.

22 25 29 23 31 29 28 22 23 27

- a. Yousef will estimate the mean fuel efficiency of all cars by calculating the mean for his sample. Calculate the sample mean, and record your answer below. (Be sure to show your work.)

$$\frac{22 + 25 + 29 + 23 + 31 + 29 + 28 + 22 + 23 + 27}{10} = 25.9$$

- b. In practice, you only take one sample to estimate a population characteristic. However, if Yousef were to take another random sample of 10 cars from the same population, would he likely get the same value for the sample mean?

No, it is not likely that Yousef would get the same value for the sample mean.

- c. What if Yousef were to take *many* random samples of 10 cars? Would all of the sample means be the same?

No, he could get many different values of the sample mean.

- d. Using this example, explain what sampling variability means.

The fact that the sample mean will vary from sample to sample is an example of sampling variability.

2. Think about the mean number of siblings (brothers and sisters) for all students at your school.

a. What do you think is the approximate value of the mean number of siblings for the population of all students at your school?

Answers will vary.

b. How could you find a better estimate of this population mean?

I could take a random sample of students, ask the students in my sample how many siblings they have, and find the mean for my sample.

c. Suppose that you have now selected a random sample of students from your school. You have asked all of the students in your sample how many siblings they have. How will you calculate the sample mean?

I will add up all of the values in the sample and divide by the number of students in the sample.

d. If you had taken a different sample, would the sample mean have taken the same value?

No. A different sample would generally produce a different value of the sample mean. It is possible, but unlikely, that the sample mean for a different sample would have the same mean.

e. There are many different samples of students that you could have selected. These samples produce many different possible sample means. What is the phrase used for this concept?

Sampling variability.

f. Does the phrase you gave in part (e) apply only to sample means?

No. The concept of sampling variability applies to any sample statistic.