LESSON MAKER PRO

Mean in the Middle

Build and interpret 95% confidence intervals.

HIGH SCHOOL · A2S.DSP.I.32.c

A2S.DSP.I.32.c "Create and interpret a 95% confidence interval based on an observed mean from a sampling distribution."

NAME _____ **DATE** _____

THE 95% RULE

For a random sample whose sample mean has an approximately normal sampling distribution, a 95% confidence interval is sample mean ± 1.96 × standard error (SE). In repeated random sampling, about 95% of intervals made this way will contain the true population mean.

WORKED EXAMPLE

A random sample of cafeteria pasta portions has a mean weight of 180 grams. The SE is 5 grams. Find a 95% confidence interval for the mean weight of all pasta portions.

1. Find the margin of error: 1.96 × 5 = 9.8 grams.
2. Find the lower endpoint: 180 − 9.8 = 170.2 grams.
3. Find the upper endpoint: 180 + 9.8 = 189.8 grams.

Answer: 170.2 to 189.8 grams

PRACTICE 6 problems

1 A sample mean is 60 and the SE is 10. Find the 95% confidence interval.

ANSWER _____

2 A sample mean is 250 and the SE is 25. Find the 95% confidence interval.

ANSWER _____

3 A sample mean is 32 and the SE is 2.5. Find the 95% confidence interval.

ANSWER _____

4 A sample mean is 14 and the SE is 1. Find the 95% confidence interval.

ANSWER _____

5 A random sample of students has a mean monthly playlist size of 85 songs. The SE is 2 songs. Find the 95% confidence interval, then state what it estimates.

ANSWER _____

6 A 95% confidence interval was made using sample mean ± 1.96 × SE. Its endpoints are 125.5 and 174.5. Find the sample mean and SE.

ANSWER _____

APPLY IT Show your work

1 A random sample of students has a mean phone battery level of 73% at dismissal. The SE is 2.5 percentage points. Find a 95% confidence interval for the mean battery level of all students at dismissal.

WORK SPACE

ANSWER _____

2 A school club samples event entry times and finds a mean wait of 18 minutes, with an SE of 2 minutes. An organizer claims the mean wait for all attendees is 24 minutes. Find a 95% confidence interval and say whether it includes the claimed mean.

WORK SPACE

ANSWER _____

CHALLENGE One step up

A random sample of students has a mean of 48 minutes of gaming per day, with an SE of 7.5 minutes. Find a 95% confidence interval for the mean gaming time of all students. A classmate says, "This means 95% of individual students game for a time inside the interval." Explain why that statement is incorrect.

WORK SPACE AND ANSWER

Mean in the Middle

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A sample mean is 60 and the SE is 10. Find the 95% confidence interval.	**40.4 to 79.6**
2	A sample mean is 250 and the SE is 25. Find the 95% confidence interval.	**201 to 299**
3	A sample mean is 32 and the SE is 2.5. Find the 95% confidence interval.	**27.1 to 36.9**
4	A sample mean is 14 and the SE is 1. Find the 95% confidence interval.	**12.04 to 15.96**
5	A random sample of students has a mean monthly playlist size of 85 songs. The SE is 2 songs. Find the 95% confidence interval, then state what it estimates.	**81.08 to 88.92 songs. We are 95% confident that the mean monthly playlist size for all students is within this interval.**
6	A 95% confidence interval was made using sample mean ± 1.96 × SE. Its endpoints are 125.5 and 174.5. Find the sample mean and SE.	**Sample mean = 150; SE = 12.5**

PART 2 · APPLY IT

1. **68.1% to 77.9%** The margin of error is 1.96 × 2.5 = 4.9 percentage points. Subtract and add 4.9 to 73.
2. **14.08 to 21.92 minutes; it does not include 24 minutes.** The margin of error is 1.96 × 2 = 3.92 minutes. The claimed mean of 24 minutes is above the interval's upper endpoint.

CHALLENGE

The margin of error is 1.96 × 7.5 = 14.7 minutes, so the interval is 33.3 to 62.7 minutes. It estimates the mean for all students, not the gaming times of individual students. The 95% describes how often intervals made by this method contain the population mean in repeated sampling.

Accept equivalent interval notation and interpretations that clearly refer to the population mean. Confidence does not mean that 95% of individual values fall in the interval.