LESSON MAKER PRO

Inside the Band

Check how many sample means fall near the population mean.

HIGH SCHOOL · A2S.DSP.I.32.b

A2S.DSP.I.32.b "Verify that 95% of sample means are within two standard deviations of the sampling distribution from the population mean."

NAME _____ DATE _____

THE 95% CHECK

When the sampling distribution is approximately normal, about 95% of sample means fall within two standard deviations of the population mean. Find the band by subtracting and adding twice the standard deviation of the sample means. Then divide the number of sample means inside the band by the total number sampled.

WORKED EXAMPLE

Use the table to find the two-standard-deviation band and the percent of sample means inside it.

SAMPLING RESULTS

Measure	Value
Population mean	72
SD of sample means	3
Sample means inside the band	19 of 20

1. Lower end: 72 - 2(3) = 66.
2. Upper end: 72 + 2(3) = 78.
3. Percent inside: 19/20 = 95%.

Answer: 66 to 78; 95%

PRACTICE 4 problems

1 Population mean: 50. SD of sample means: 4. Of 40 sample means, 38 are inside the two-SD band. Find the band and percent inside.

ANSWER _____

2 Population mean: 100. SD of sample means: 5. Find the two-SD band.

ANSWER _____

3 Population mean: 30. SD of sample means: 2. Of 30 sample means, 27 are inside the two-SD band. Find the band and percent inside.

ANSWER _____

4 Population mean: 80. SD of sample means: 6. Of 80 sample means, 76 are inside the two-SD band. Find the band and percent inside.

ANSWER _____

APPLY IT Show your work

1 Students record the mean wait time for many samples of cafeteria orders. Use the table to find the two-SD band and the percent of sample means inside it.

CAFETERIA WAIT TIMES, IN MINUTES

Measure	Value
Population mean	45
SD of sample means	7
Sample means inside the band	95 of 100

ANSWER _____

2 A music app samples playlists to study mean song length. The population mean is 210 seconds, and the SD of sample means is 5 seconds. If 45 of 50 sample means are inside the two-SD band, find the band and percent inside.

WORK SPACE

ANSWER _____

CHALLENGE One step up

A population mean is 60. The endpoints 52 and 68 are each exactly two standard deviations of the sample means from the mean. Find that standard deviation. If 190 of 200 sample means fall from 52 to 68, does the observed percent match 95%?

WORK SPACE AND ANSWER

ANSWER KEY

Inside the Band

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Population mean: 50. SD of sample means: 4. Of 40 sample means, 38 are inside the two-SD band. Find the band and percent inside.	**42 to 58; 95%**
2	Population mean: 100. SD of sample means: 5. Find the two-SD band.	**90 to 110**
3	Population mean: 30. SD of sample means: 2. Of 30 sample means, 27 are inside the two-SD band. Find the band and percent inside.	**26 to 34; 90%**
4	Population mean: 80. SD of sample means: 6. Of 80 sample means, 76 are inside the two-SD band. Find the band and percent inside.	**68 to 92; 95%**

PART 2 · APPLY IT

1. **31 to 59 minutes; 95%** Compute 45 - 2(7) = 31 and 45 + 2(7) = 59. Then 95/100 = 95%.
2. **200 to 220 seconds; 90%** Compute 210 - 2(5) = 200 and 210 + 2(5) = 220. Then 45/50 = 90%.

CHALLENGE

The SD of sample means is 4 because (68 - 60)/2 = 4. Yes, 190/200 = 95%.

Accept endpoints in either order if clearly identified. The 95% rule is approximate for an approximately normal sampling distribution, so an observed percentage need not equal 95%.