LESSON MAKER PRO

Normal or Not?

Check spreadsheet counts with the empirical rule.

HIGH SCHOOL · A2S.DSP.C.25.a

A2S.DSP.C.25.a "Use technology to determine if a given set of data is normal by applying the empirical rule."

NAME _____ DATE _____

THE BIG IDEA

For normal data, about 68% of values are within 1 standard deviation (SD) of the mean, 95% are within 2 SD, and 99.7% are within 3 SD. Compare the percentages from a spreadsheet with all three benchmarks. Close matches support normality, but do not prove it.

WORKED EXAMPLE

A spreadsheet summarizes 200 quiz scores with a mean of 73 and an SD of 6. Do the scores appear normal?

QUIZ SCORES

Distance from mean	Count within distance
1 SD	138
2 SD	189
3 SD	199

1. Within 1 SD: 138/200 = 69%.
2. Within 2 SD: 189/200 = 94.5%.
3. Within 3 SD: 199/200 = 99.5%.

Answer: Yes. The percentages are close to 68%, 95%, and 99.7%.

PRACTICE 4 problems

1 A spreadsheet counts 100 values. It finds 68 within 1 SD, 95 within 2 SD, and 100 within 3 SD. Do the data appear normal? Why?

ANSWER _____

2 Of 100 values, 42 are within 1 SD and 94 are within 2 SD. Do the data appear normal? Why?

ANSWER _____

3 Of 100 values, 68 are within 1 SD and 80 are within 2 SD. Do the data appear normal? Why?

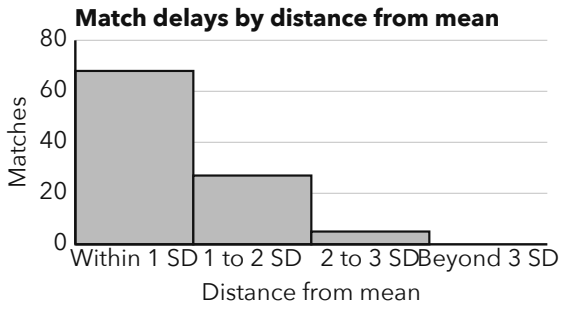
ANSWER _____

4 Of 100 values, 66 are within 1 SD, 96 within 2 SD, and 100 within 3 SD. Do the data appear normal? Why?

ANSWER _____

APPLY IT Show your work

1 A gaming club records the delay for 100 online matches. The mean is 150 milliseconds, and the SD is 20 milliseconds. The graph groups matches by distance from the mean. Do the delays appear normal?



ANSWER _____

2 A student checks the lengths of 100 songs on a playlist. The mean is 180 seconds, and the SD is 30 seconds. A spreadsheet finds 67 songs within 1 SD, 96 within 2 SD, and 100 within 3 SD. Do the song lengths appear normal?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Two sets of 100 scores have the same mean and SD. A spreadsheet gives the counts shown. Which set appears normal? Explain why checking only 1 SD is not enough.

COUNTS WITHIN EACH DISTANCE

Distance	Set A	Set B
1 SD	68	68
2 SD	95	78
3 SD	100	100

WORK SPACE AND ANSWER

Normal or Not?

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A spreadsheet counts 100 values. It finds 68 within 1 SD, 95 within 2 SD, and 100 within 3 SD. Do the data appear normal? Why?	**Yes. The percentages, 68%, 95%, and 100%, are close to the empirical-rule percentages.**
2	Of 100 values, 42 are within 1 SD and 94 are within 2 SD. Do the data appear normal? Why?	**No. Only 42% are within 1 SD, far below 68%.**
3	Of 100 values, 68 are within 1 SD and 80 are within 2 SD. Do the data appear normal? Why?	**No. The 80% within 2 SD is well below 95%, even though the 1 SD percentage matches.**
4	Of 100 values, 66 are within 1 SD, 96 within 2 SD, and 100 within 3 SD. Do the data appear normal? Why?	**Yes. The percentages, 66%, 96%, and 100%, are close to the empirical-rule percentages.**

PART 2 · APPLY IT

1. **Yes. The cumulative percentages are 68%, 95%, and 100%, which are close to the empirical-rule percentages.** Add the bar counts as distance increases: 68, then 68 + 27 = 95, then 95 + 5 = 100. There are 100 matches, so these counts are also percentages.
2. **Yes. The percentages, 67%, 96%, and 100%, are close to 68%, 95%, and 99.7%.** Because there are 100 songs, each count is also a percentage. Compare all three percentages with the empirical rule.

CHALLENGE

Set A appears normal: its percentages are 68%, 95%, and 100%. Both sets match at 1 SD, but Set B has only 78% within 2 SD, far below 95%.

Accept 'consistent with normal' instead of 'appears normal.' The empirical rule is an approximate check, not proof that data are normal.