LESSON MAKER PRO

Normal Curve Estimates

Use the mean and standard deviation to estimate percentages.

HIGH SCHOOL · MA.912.DP.2.2

MA.912.DP.2.2 "Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate."

NAME _____ DATE _____

USING THE EMPIRICAL RULE

When a data set is roughly symmetric, has one peak, and has no strong outliers, you can model it with a normal distribution. About 68% of values lie within 1 standard deviation of the mean, about 95% lie within 2, and about 99.7% lie within 3.

WORKED EXAMPLE

A normal distribution has a mean of 81 and a standard deviation of 6. Estimate the percentage of values from 75 to 87.

1. The interval endpoints are 81 - 6 = 75 and 81 + 6 = 87.
2. The interval is 1 standard deviation below to 1 standard deviation above the mean.
3. About 68% of values are within 1 standard deviation of the mean.

Answer: About 68%

PRACTICE 6 problems

1 A normal distribution has a mean of 52 and a standard deviation of 4. Estimate the percentage of values from 44 to 60.

ANSWER _____

2 A normal distribution has a mean of 70 and a standard deviation of 5. Estimate the percentage of values that are at least 80.

ANSWER _____

3 A normal distribution has a mean of 40 and a standard deviation of 3. Estimate the percentage of values from 31 to 49.

ANSWER _____

4 A normal distribution has a mean of 16 and a standard deviation of 2. Estimate the percentage of values below 14.

ANSWER _____

5 A normal distribution has a mean of 90 and a standard deviation of 10. Estimate the percentage of values from 90 to 100.

ANSWER _____

6 A data set has two separate peaks, with one group of values clustered low and another group clustered high. Is a normal model appropriate? Explain briefly.

ANSWER _____

APPLY IT Show your work

1 A gaming club finds that players' reaction times are normally distributed with a mean of 250 milliseconds and a standard deviation of 20 milliseconds. Estimate the percentage of players with reaction times from 210 to 290 milliseconds.

WORK SPACE

ANSWER _____

2 Episode lengths for a student-run music channel are normally distributed with a mean of 45 minutes and a standard deviation of 5 minutes. Estimate the percentage of episodes that last more than 55 minutes.

WORK SPACE

ANSWER _____

CHALLENGE One step up

The number of songs in students' playlists is normally distributed with a mean of 120 and a standard deviation of 15. In a group of 800 students, estimate how many students have from 105 to 135 songs, and how many have fewer than 90 songs.

WORK SPACE AND ANSWER

ANSWER KEY

Normal Curve Estimates

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A normal distribution has a mean of 52 and a standard deviation of 4. Estimate the percentage of values from 44 to 60.	**About 95%**
2	A normal distribution has a mean of 70 and a standard deviation of 5. Estimate the percentage of values that are at least 80.	**About 2.5%**
3	A normal distribution has a mean of 40 and a standard deviation of 3. Estimate the percentage of values from 31 to 49.	**About 99.7%**
4	A normal distribution has a mean of 16 and a standard deviation of 2. Estimate the percentage of values below 14.	**About 16%**
5	A normal distribution has a mean of 90 and a standard deviation of 10. Estimate the percentage of values from 90 to 100.	**About 34%**
6	A data set has two separate peaks, with one group of values clustered low and another group clustered high. Is a normal model appropriate? Explain briefly.	**No. A normal distribution should have one peak, but this data set has two peaks.**

PART 2 · APPLY IT

1. **About 95%** 210 is 2 standard deviations below the mean, and 290 is 2 standard deviations above the mean. About 95% of values lie within 2 standard deviations of the mean.
2. **About 2.5%** 55 is 2 standard deviations above the mean. About 5% of values are outside 2 standard deviations, so about 2.5% are above the upper end.

CHALLENGE

About 544 students have from 105 to 135 songs, and about 20 students have fewer than 90 songs.

Accept equivalent wording such as approximately or about. For percentage estimates, accept 16% for one lower tail, 2.5% for one tail beyond 2 standard deviations, and calculations based on those estimates.