LESSON MAKER PRO

Curve Clues

Estimate chances with the empirical rule.

HIGH SCHOOL · MT.PLUS.DATA.NORM.3

MT.PLUS.DATA.NORM.3 "Estimate areas under a normal curve to solve problems in context, using calculators, spreadsheets, and tables as appropriate."

NAME _____ DATE _____

AREAS AS PERCENTAGES

For a normal distribution, use the table to estimate the percent within 1, 2, or 3 standard deviations of the mean. The curve is symmetric, so half of the percent outside an interval lies in each tail.

WORKED EXAMPLE

Scores are normally distributed with a mean of 500 and a standard deviation of 40. Estimate the percent above 540.

EMPIRICAL RULE

Distance from mean	Percent within	Percent outside
1 standard deviation	68%	32%
2 standard deviations	95%	5%
3 standard deviations	99.7%	0.3%

1. 540 is 1 standard deviation above 500.
2. The percent outside that interval is about 32%.
3. Half is above 540: 32% / 2 = 16%.

Answer: About 16%

PRACTICE 4 problems

1 A normal distribution has mean 70 and standard deviation 5. Estimate the percent between 65 and 75.

ANSWER _____

2 A normal distribution has mean 120 and standard deviation 10. Estimate the percent below 90.

ANSWER _____

3 A normal distribution has mean 30 and standard deviation 4. Estimate the percent above 26.

ANSWER _____

4 A normal distribution has mean 200 and standard deviation 20. Estimate the percent between 200 and 240.

ANSWER _____

APPLY IT Show your work

1 Concert entry times are normally distributed with a mean of 18 minutes and a standard deviation of 3 minutes. Of 1,000 fans, about how many take between 18 and 24 minutes to enter?

WORK SPACE

ANSWER _____

2 Video clip lengths are normally distributed with a mean of 50 seconds and a standard deviation of 8 seconds. Of 200 clips, about how many last longer than 58 seconds?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Quiz times are normally distributed with a mean of 62 seconds and a standard deviation of 7 seconds. About 13.5% of times fall between 69 seconds and x seconds, where $x > 69$. Find x and explain.

WORK SPACE AND ANSWER

ANSWER KEY

Curve Clues

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A normal distribution has mean 70 and standard deviation 5. Estimate the percent between 65 and 75.	**About 68%**
2	A normal distribution has mean 120 and standard deviation 10. Estimate the percent below 90.	**About 0.15%**
3	A normal distribution has mean 30 and standard deviation 4. Estimate the percent above 26.	**About 84%**
4	A normal distribution has mean 200 and standard deviation 20. Estimate the percent between 200 and 240.	**About 47.5%**

PART 2 · APPLY IT

1. **About 475 fans** 24 is 2 standard deviations above the mean. Half of 95% is 47.5%, and 47.5% of 1,000 is 475.
2. **About 32 clips** 58 is 1 standard deviation above the mean. The upper tail is about 16%, and 16% of 200 is 32.

CHALLENGE

x = 76 seconds. The area between 1 and 2 standard deviations above the mean is (95% - 68%) / 2 = 13.5%, and 62 + 2(7) = 76.

Accept estimates labeled as approximate. Answers use the empirical rule, not exact normal-curve probabilities.