

Z scores and Normal Distributions

Calculation Z scores when you know the mean and standard deviation. Ben and Jerry were graduate students in psychology. As part of their graduate training, they had to take a psychological test for pathology. Ben scored 65 on the Massachusetts Test of Deviance (population mean = 50, population SD = 10), and Jerry scored 95 on the Alabama Test of Deviance (population mean = 80, population SD = 20).

Write a sentence that interprets Ben's z-score.

Write a sentence that interprets Jerry's z-score.

Calculating Z scores from the original scores by Hand.

- The mean of the exam scores is 77.
- The standard deviation of the exam scores is 17.26268.
- Use the mean and the standard deviation to convert each score to a Z score.

Stat Exam Scores
75
50
65
92
85
95

Using SPSS to Obtain Z scores

Untitled - SPSS Data Editor

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6:

	statexam	var
1	75.00	
2	50.00	
3	65.00	
4	92.00	
5	85.00	
6	95.00	
7		

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16:

	statexam	var
1	75.00	
2	50.00	
3	65.00	
4	92.00	

Analyze menu path: Analyze > Descriptive Statistics > Descriptives...

Descriptives

Variable(s): statexam

Save standardized values as variables

Buttons: OK, Paste, Reset, Cancel, Help, Options...

Descriptives

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
statexam	6	50.00	95.00	77.0000	17.26268
Valid N (listwise)	6				

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9:

	statexam	Zstatexam
1	75.00	-.11586
2	50.00	-1.56407
3	65.00	-.69514
4	92.00	.86893
5	85.00	.46343
6	95.00	1.04271
7		

Normal Distributions

Within the United States,

- ❑ Income is known to have a positively skewed distribution with a population mean of \$28,500 and standard deviation of \$5,000.
- ❑ Number of arrests is known to have a positively skewed distribution with a population mean of 5 arrests and standard deviation of 1 arrest.
- ❑ ACT scores are known to have a normal distribution with a population mean of 20 and a standard deviation of 3.
- ❑ WISC-III scores are known to have a normal distribution with a population mean of 100 and a population standard deviation of 15.

- ❑ What percentage of the population earns less than **\$15,000** per year?
- ❑ What percentage of the population has **never** been arrested?
- ❑ What percentage of the population would score lower than **16** on the **ACT**?

- ❑ What percentage of the population would score higher than **118** on the **WISC-III**?

Scenario 1. SAT scores are known to be normally distributed with a national mean of 1000 and a standard deviation of 100. An instructor wanted to know if the average SAT score of the incoming freshman class was significantly higher than the national average. The SAT scores of 144 incoming freshmen were obtained; the average SAT score was 1075. Use an alpha of .05 to test the null hypothesis.

Scenario 2. Female weight is known to be normally distributed with a national average of 150 and a standard deviation of 20 pounds. A physician at a private university wants to determine whether the average weight of females attending the university is significantly different from the national average. Twenty-five females were weighted and found to have an average of 120 pounds. Use an alpha of .05 to test the null hypothesis.

Scenario 3. A child psychologist wanted to know whether children lie more frequently than adults. Previous research with adults indicate they tell an average of five lies per day with a standard deviation of two. Thirty children were observed by the psychologist for one day, and the number of lies the children told was measured. The children told an average of 3.5 lies per day. Use an alpha of .01 to test the null hypothesis.

Scenario 4. A researcher wanted to estimate the actual IQs of persons receiving academic scholarships. Sixty-four persons receiving academic scholarships were randomly selected and given an IQ test. The sample average was 115. Within the United States, IQ is known to have an average of 100 with a standard deviation of 15. Do persons on academic scholarships have significantly different IQs than persons in the general population? Use an alpha of .05 to test the null hypothesis.

Scenario 5. A researcher believes that pet owners have lower stress in their lives than non-pet owners. To investigate her idea, the researcher randomly sampled 50 pet owners and administered the Stress Inventory to them. The 50 pet owners had an average of 80 on the Stress Inventory. Previous research has shown that non-pet owners have a mean of 90 and a standard deviation of 30 on the Stress Inventory. Use an alpha of .01 to test the null hypothesis.

<i>Confidence Intervals</i>

- ❑ Calculate 95% confidence intervals for Scenario 2.
- ❑ Interpret the 95% confidence intervals for Scenario 2.

- ❑ Calculate 95% confidence intervals for Scenario 4.
- ❑ Interpret the 95% confidence intervals for Scenario 4.