

Measures of Central Tendency

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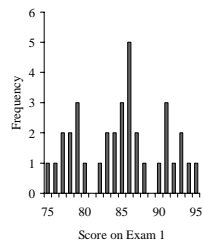
Measures of Central Tendency

- A *measure of central tendency* is a descriptive statistic that describes the average, or typical value of a set of scores
- There are three common measures of central tendency:
 - the mode
 - the median
 - the mean

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The Mode

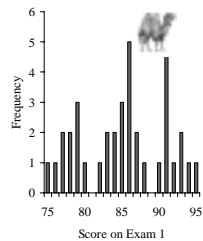
- The *mode* is the score that occurs most frequently in a set of data



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Bimodal Distributions

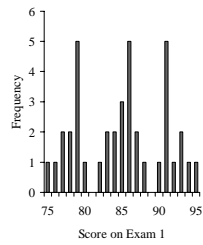
- When a distribution has two “modes,” it is called *bimodal*



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Multimodal Distributions

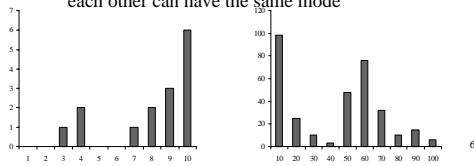
- ⊞ If a distribution has more than 2 “modes,” it is called *multimodal*



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When To Use the Mode

- ⊞ The mode is not a very useful measure of central tendency
 - ⊞ It is insensitive to large changes in the data set
 - ⊞ That is, two data sets that are very different from each other can have the same mode



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When To Use the Mode

- ⊞ The mode is primarily used with nominally scaled data
 - ⊞ It is the only measure of central tendency that is appropriate for nominally scaled data

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The Median

- ⊞ The *median* is simply another name for the 50th percentile
 - ⊞ It is the score in the middle; half of the scores are larger than the median and half of the scores are smaller than the median

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How To Calculate the Median

- ⊕ Conceptually, it is easy to calculate the median
 - ⊕ There are many minor problems that can occur; it is best to let a computer do it
- ⊕ Sort the data from highest to lowest
- ⊕ Find the score in the middle
 - ⊕ $\text{middle} = (N + 1) / 2$
 - ⊕ If N , the number of scores, is even the median is the average of the middle two scores

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Median Example

- ⊕ What is the median of the following scores:
10 8 14 15 7 3 3 8 12 10 9
- ⊕ Sort the scores:
15 14 12 10 10 9 8 8 7 3 3
- ⊕ Determine the middle score:
 $\text{middle} = (N + 1) / 2 = (11 + 1) / 2 = 6$
- ⊕ Middle score = median = 9

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Median Example

- ⊕ What is the median of the following scores:
24 18 19 42 16 12
- ⊕ Sort the scores:
42 24 19 18 16 12
- ⊕ Determine the middle score:
 $\text{middle} = (N + 1) / 2 = (6 + 1) / 2 = 3.5$
- ⊕ Median = average of 3rd and 4th scores:
 $(19 + 18) / 2 = 18.5$

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When To Use the Median

- ⊕ The median is often used when the distribution of scores is either positively or negatively skewed
 - ⊕ The few really large scores (positively skewed) or really small scores (negatively skewed) will not overly influence the median

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The Mean

- ⊕ The *mean* is:
 - ⊕ the arithmetic average of all the scores
 $(\Sigma X)/N$
 - ⊕ the number, m , that makes $\Sigma(X - m)$ equal to 0
 - ⊕ the number, m , that makes $\Sigma(X - m)^2$ a minimum
- ⊕ The mean of a population is represented by the Greek letter μ ; the mean of a sample is represented by \bar{X}

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Calculating the Mean

- ⊕ Calculate the mean of the following data:
1 5 4 3 2
- ⊕ Sum the scores (ΣX):
 $1 + 5 + 4 + 3 + 2 = 15$
- ⊕ Divide the sum ($\Sigma X = 15$) by the number of scores ($N = 5$):
 $15 / 5 = 3$
- ⊕ Mean = $\bar{X} = 3$

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When To Use the Mean

- ⊕ You should use the mean when
 - ⊕ the data are interval or ratio scaled
 - ⊕ Many people will use the mean with ordinal data too
 - ⊕ and the data are not skewed
- ⊕ The mean is preferred because it is sensitive to every score
 - ⊕ If you change one score in the data set, the mean will change

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Relations Between the Measures of Central Tendency

- ⊕ In symmetrical distributions, the median and mean are equal
 - ⊕ For normal distributions, mean = median = mode
- ⊕ In positively skewed distributions, the mean is greater than the median
- ⊕ In negatively skewed distributions, the mean is smaller than the median



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