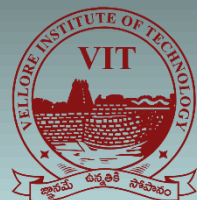


Applied Statistics

Course Code: MAT1011

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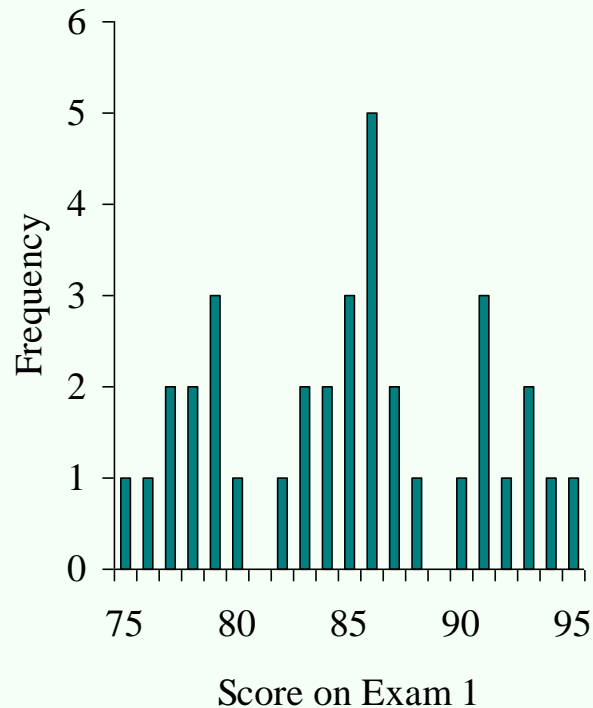
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Measures of Central Tendency

- ✧ *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

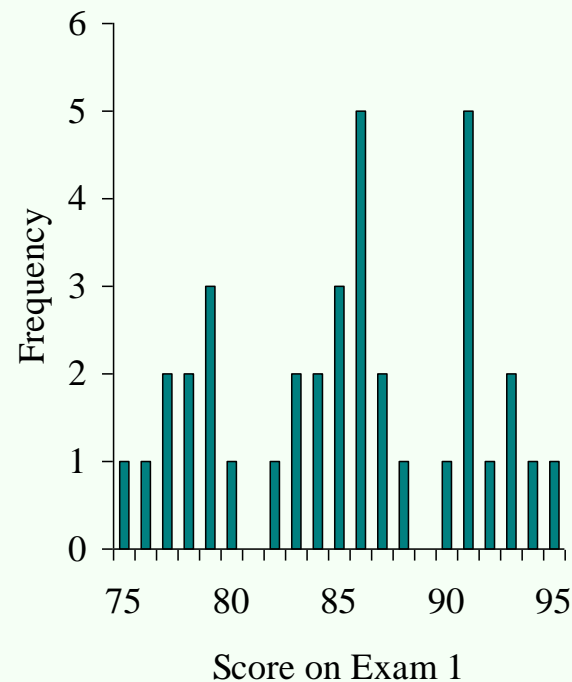
The Mode

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



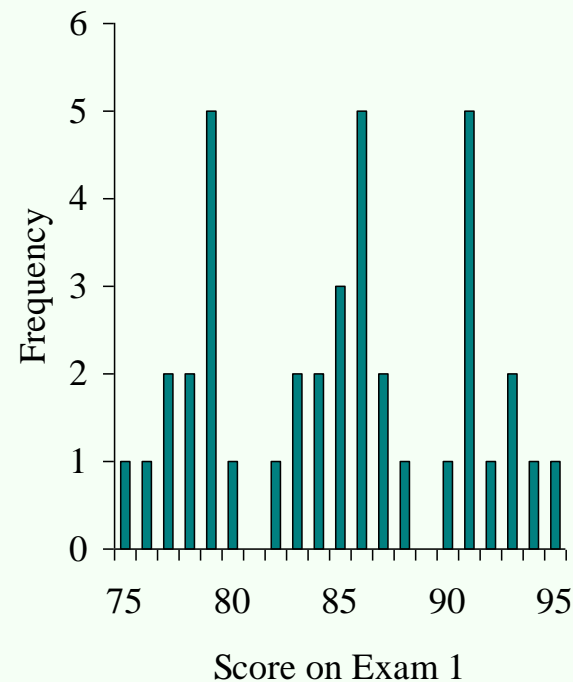
Bimodal Distributions

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



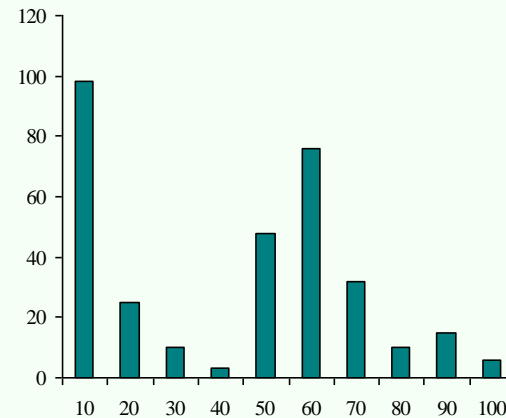
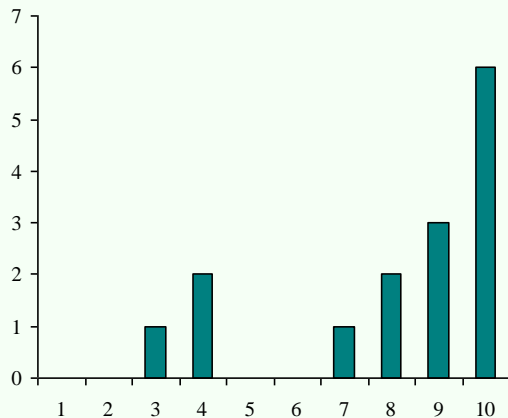
Multimodal Distributions

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



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



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

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

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

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

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:

$$(19 + 18) / 2 = 18.5$$

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

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}

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 ($N = 5$):

$$15 / 5 = 3$$

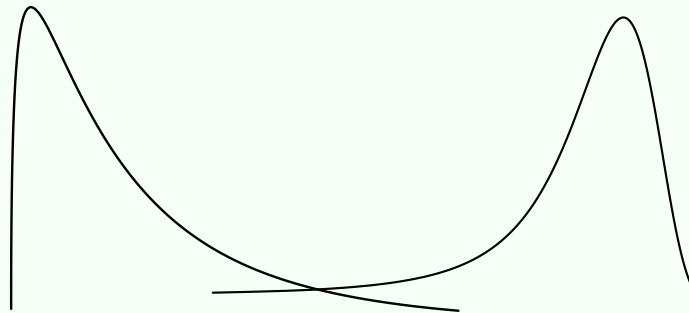
✚ Mean = $\bar{X} = 3$

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 ordinally scaled 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

Relations Between the Measures of Central Tendency

- ✚ In symmetrical distributions, the median and mean are equal
 - ✚ For normal distributions, $\text{mean} = \text{median} = \text{mode}$
- ✚ 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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