2.3
Measures of Central Tendency

Measure of Central Tendency

- A value that represents _____ entry of a _____

1)

2)

3)

- Mean _____ – the _____ of the data entries _____of entries
- Formula:

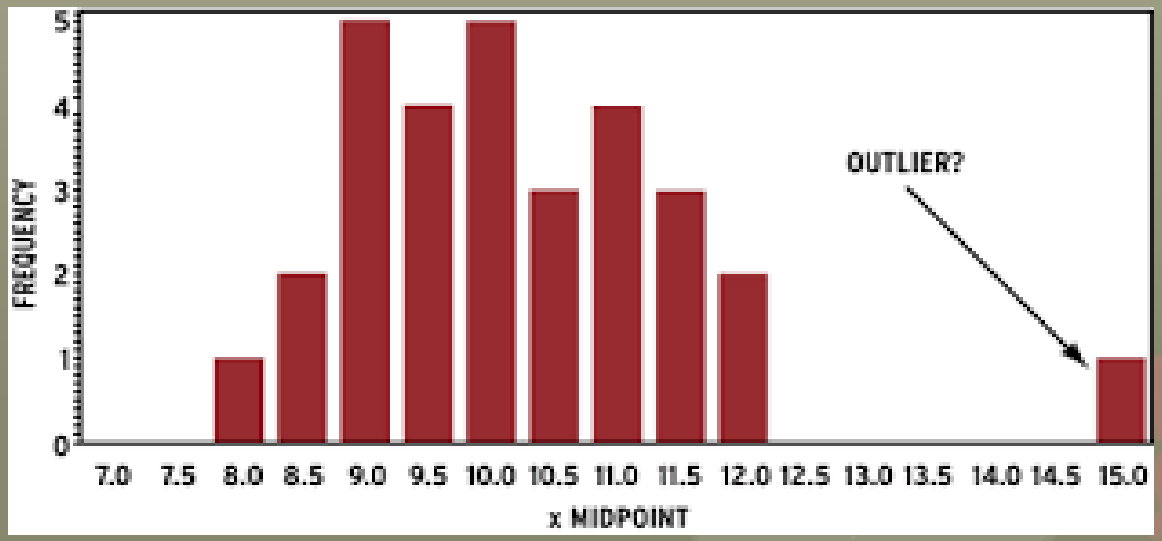
- Advantages:
  - _____ – means of different samples of the same population _____
  - Takes into account _____
- Disadvantage:
  - _____

- Median – _____when data is arranged _____
  - _____ number of data entries – median is the _____
  - _____ number of data entries – median is the _____

- Mode – the value that _____
  - Bimodal – _____
  - Multimodal – _____
  - _____

Critical Thinking

- Always consider whether or not the calculated _____
  - Do they really _____
- May be affected by _____ – data entries that are _____ from the rest of the data
  - Outliers cause _____



EX:

- Find the mean, median, and mode of the data, if possible. If any measure of center cannot be found or does not represent the center of data, explain why.

- **Prices (in dollars) of basketball shoes**

  70, 130, 80, 20, 100, 120, 125, 90, 20, 145

Weighted Mean

- Computed when data values are _____ _____
- EX:
- EX:
- Formula:

EX:

- You are taking a class in which your grade is determined from 5 sources: 50% from your test mean, 15% from your midterm, 20% from your final exam, 10% from lab work, and 5% from homework. Your scores are 86 (test mean), 96 (midterm), 82 (final exam), 98 (lab work), and 100 (homework). What is the weighted mean of your scores?
- The minimum average for an A is 90. Did you get an A?

Mean of a Frequency Distribution

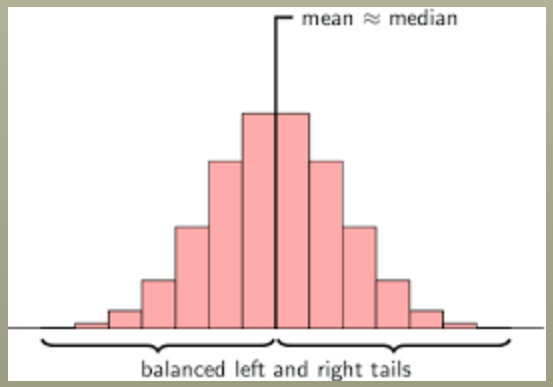
- 1) Find the _____ of _____
- 2) Find the _____ of the _____ of the _____.
- 3) Find the _____.
- 4) Divide _____.

EX: Find the mean of the frequency distribution.

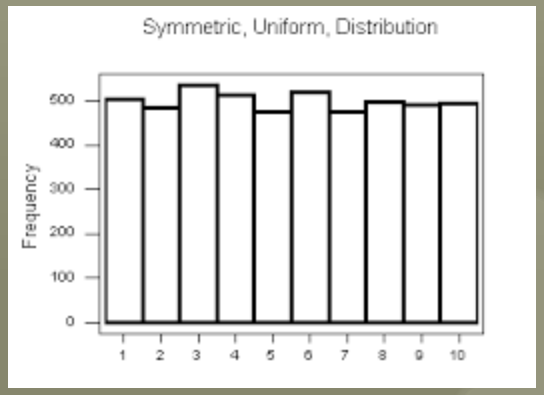
Class	Frequency
41-50	1
51-60	2
61-70	6
71-80	8
81-90	14
91-100	9

Shapes of Distributions

- _____



- _____



- Skewed – distribution of data is _____ and _____ than to the _____
- Skewed to the _____
  - Longer left tail
  - Mean and median are to the left of the mode
- Skewed to _____
  - Longer right tail
  - Mean and median are to the right of the mode

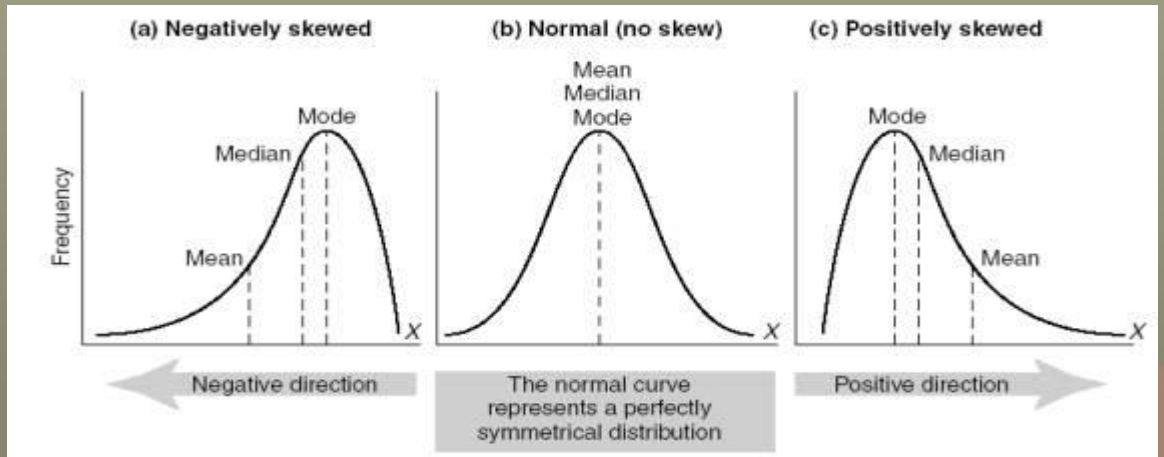
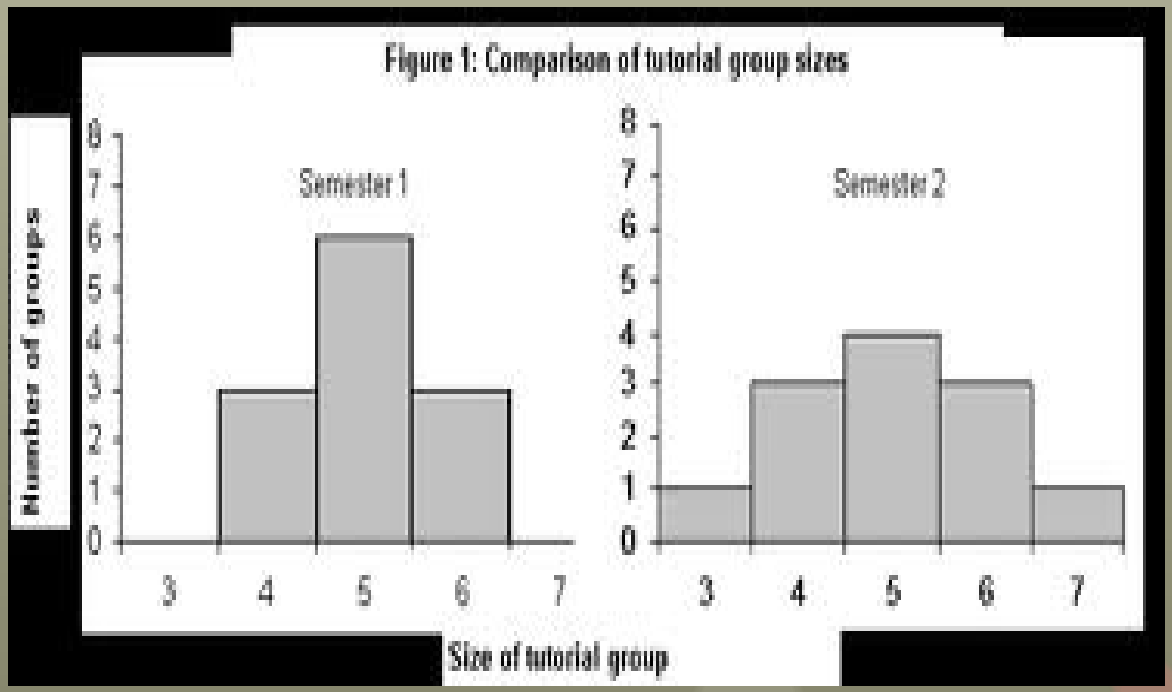


FIGURE 15.6 Examples of normal and skewed distributions

3.3
Measures of Variation

Measures of Variation

- How far the data is _____



Ways to Measure Variation:

- **Range** : _____
- Advantage:
- Disadvantage :

- **Deviation** – the _____between a _____and the _____
- EX:

- The sum of all deviations in a data set is always 0
- EX:

- **Standard Deviation (s):** measure of variation of _____ from the _____
- Represents _____ data is from the _____

  - Can be _____
  - _____
    _____
  - Outliers _____
  - Can be used to compare the variation of data in different sets if the units are the same and if the means are approximately the same
  - EX:

To Find Standard Deviation

- **For a Population:**
- 1) Find the _____of the data set
- 2) Find the _____ of each entry
- 3) _____ each deviation
- 4) _____ all the squares
- 5) Divide by the _____
- 6) Take the _____

- **For a Sample :**
- Everything is the same, except divide by _____ in step 5

Formulas:

- NOTE:
- The step _____ is called the **population** or **sample** _____.
  - This measure of variation may not be very useful or commonly used since its _____ of the original units
  - Taking the square root in the last step _____ the original units, thus making _____ a better measure of variation

EX: Find the range, mean, variance, and standard deviation of the population data set

- Salaries (in thousands)for Skyline Elementary teachers
- 41, 38, 39, 45, 47, 41, 44, 41, 37, 42

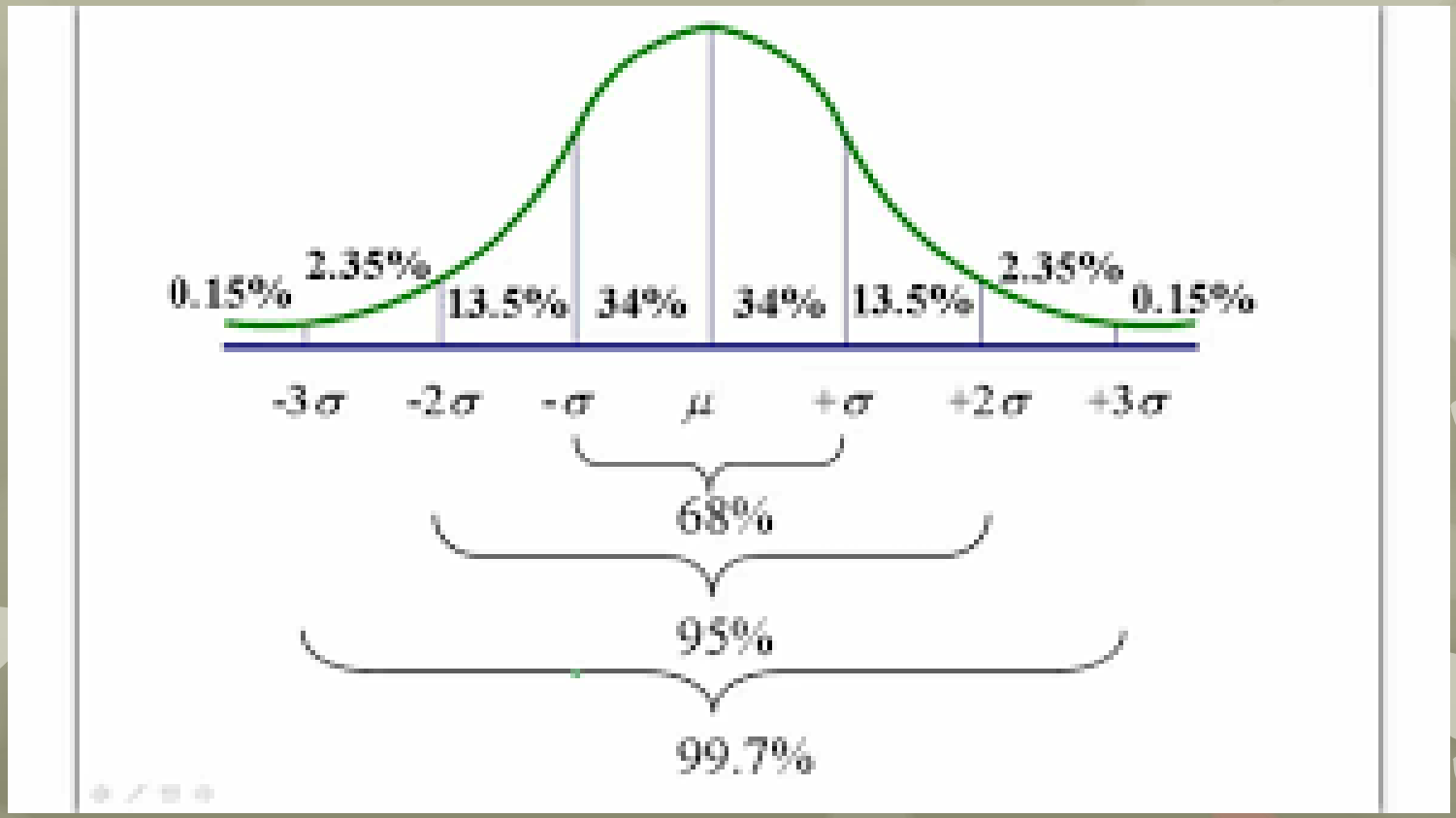
EX: Find the range, mean, variance, and standard deviation of the sample data set

- Recovery time (in days) for high school football players that suffered concussions
- 4, 7, 6, 7, 9, 5, 8, 10, 9, 8, 7, 10

Usual and Unusual Values

- Values that lie _____ from the mean are considered _____
- Values that are _____ from the mean are _____
- Values that are _____ from the mean are _____

Empirical Rule (or 68-95-99.7 Rule)



- 68% of data:_____
- 95% of data:_____
- 99.7% of data:_____

EX:

- In a survey conducted by the National center for Health Statistics, the sample mean height of women in the United States (ages 20-29) was 64.2 inches, which a sample standard deviation of 2.9 inches. Estimate the percent of women whose heights are between 58.4 inches and 64.2 inches.

Coefficient of Variation

- Used to _____ different sets of data with _____
  - EX: Heights and Weights
  - Expressed as a _____
  - The _____ the _____ _____ to the data set
- Formula:

EX:

- The table shows the heights (in inches) and weights (in pounds) of a basketball team. Find the coefficient of variation for the heights and weights. Then compare the results.

Heights	Weights
72	180
74	168
68	225
76	201
74	189
69	192
72	197
79	162
70	174
69	171
77	185
73	210

2.5
Measures of Position

Fractiles

- Numbers that _____an ordered data set into _____

- Used to show the _____ of a data entry within a data set

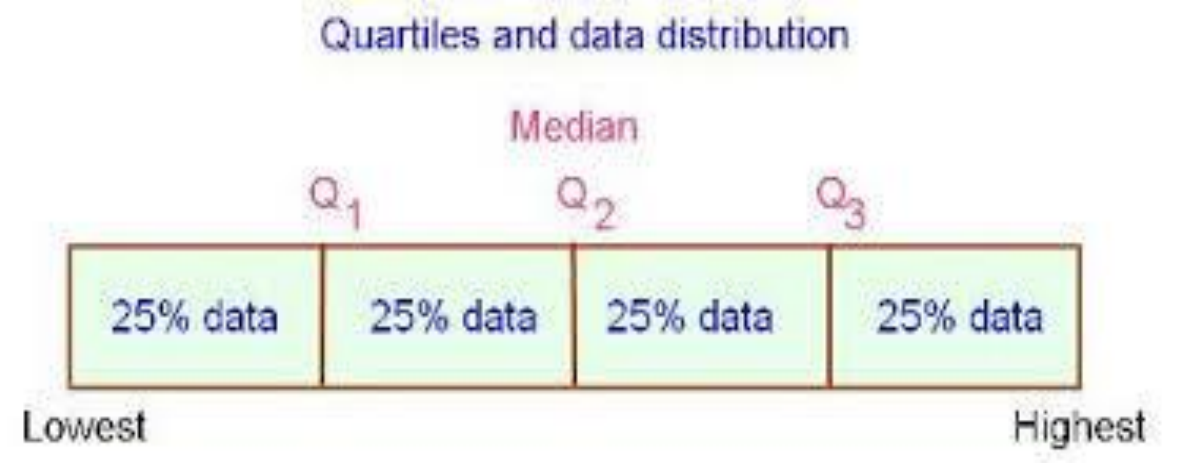
1)

2)

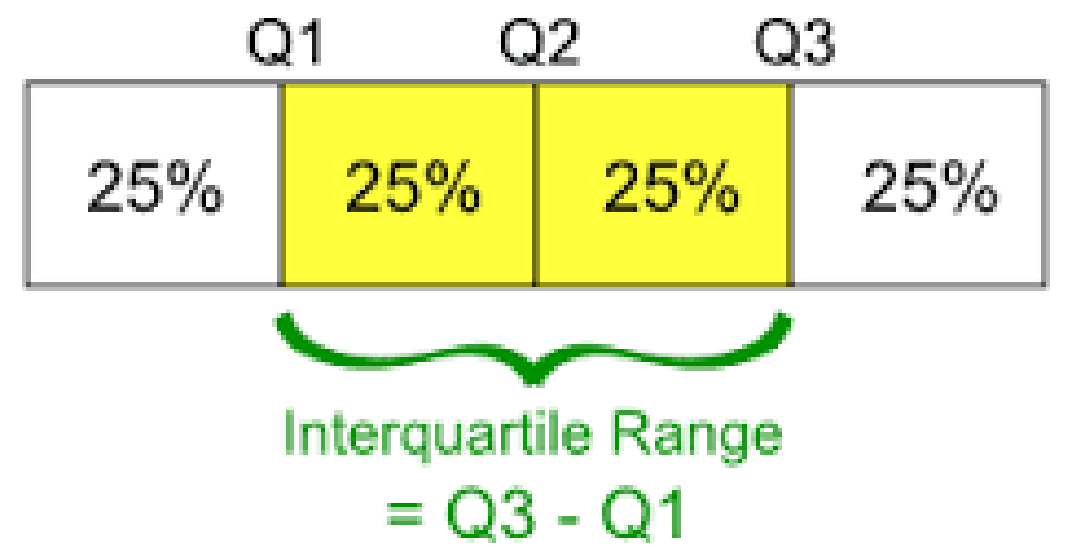
3)

Quartiles

- Divides data into 4 equal parts



- **Interquartile Range (IQR)** – shows the spread of the _____ of the data
- IQR =



- **Using the IQR to Identify Outliers**
- 1) Find _____
- 2) Find the _____
- 3) Multiply the IQR _____
- 4) _____ the result from step 3 from Q1
  - Any data entry _____ is an outlier
- 5) _____the result from step 3 to Q3
  - Any data entry_____ is an outlier.

EX: Find the quartiles, the IQR, and identify any outliers.

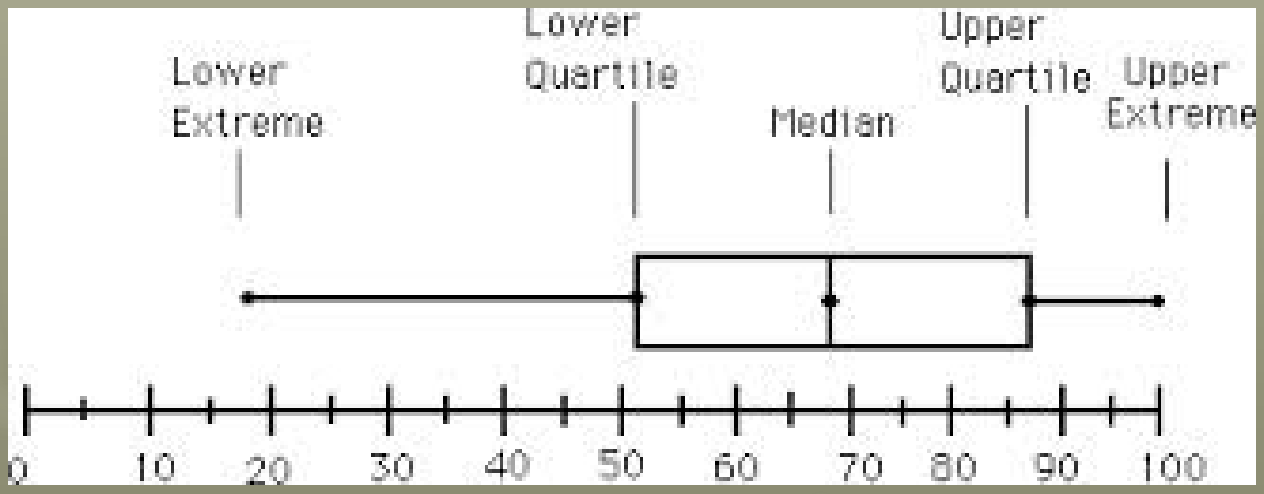
- 56, 63, 51, 60, 57, 60, 60, 54, 63, 59, 80, 63, 60, 62, 65

5-Number Summary

- Important features of a data set:

Boxplot (Box-and-whisker plot)

- Graph of data displaying the 5 point summary



To Construct a Boxplot:

- Find the _____
- Construct a scale that includes _____
- _____extending from Q1 to Q3 with a line draw in at Q2.
- _____from the box to the min and the max

EX: Find the 5 point summary and construct a box and whisker plot.

- 39, 36, 30, 27, 26, 24, 28, 35, 39, 60, 50, 41, 35, 32, 51

Percentiles

- Divide data into _____.
- Often used in _____related fields to indicate how _____ compares with _____.
- EX:

- **To find the percentile that corresponds to a specific data entry *x*:**
- Percentile of x =

EX: Find the percentile that corresponds to $30,000.

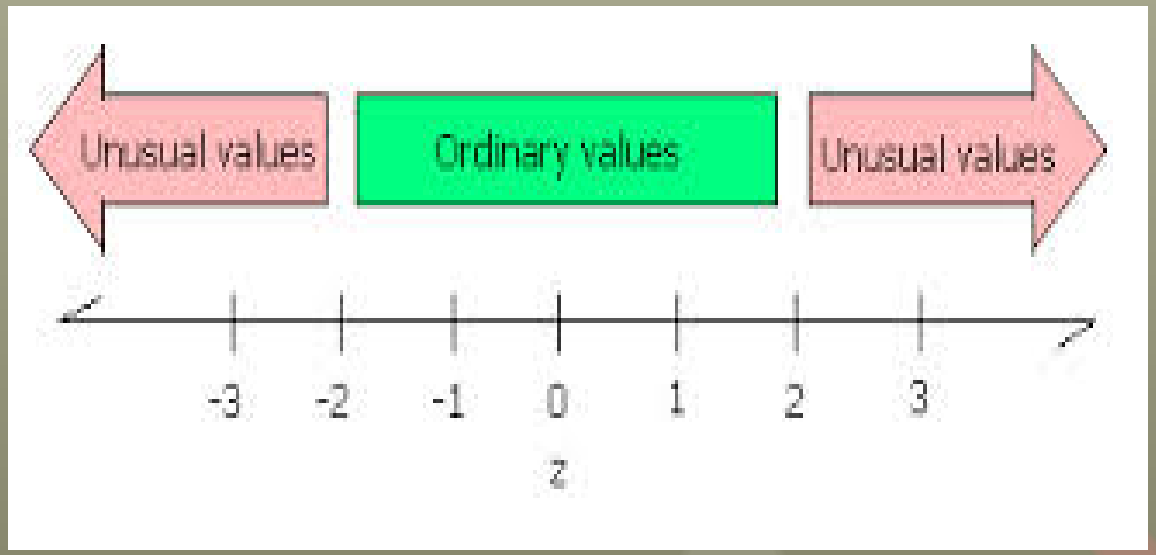
- Tuition costs (in thousands of dollars) for 25 universities.

44, 30, 38, 23, 20, 29, 19, 44, 29, 17, 45, 39, 29, 18, 43, 45, 39, 24, 44, 26, 34, 20, 35, 30, 36

Standard Score or Z-Score

- The _____that a given value x is _____
  - A measure of _____ compared to the mean
  - Whenever a data value is less than the mean, is corresponding z score is _____
  - Whenever a data value is greater than the mean, its corresponding z score is _____
  - EX: z score = -2
  - EX: z score = 3
- Formula:

- Unusual:
  - Z scores _____
- Usual/Ordinary:
  - Z score is between(or equal to) _____



EX: Comparing Z scores

- The table shows the means heights and the standard deviations for a population of men and a population of women. Compare the z-scores for a 6 foot tall man and a 6 foot tall woman.

Men's Heights	Women's Heights
Mean = 69.9 in.	Mean = 64.3 in.
SD = 3 in.	SD = 2.6 in.