DATA ANALYSIS & PROBABILITY

Statistics Review

MEASURES OF CENTRAL TENDENCY

Objective: IWBAT use measures of central tendency to summarize data sets.

Vocabulary:

- **Measure of Central Tendency** – *(Mean, Median, Mode)* – Used to organize and summarize a set of data
- **Mean** – (average) find the sum of the data values and divide by the number of data values in the set

$$\text{mean} = \frac{\text{sum of data values}}{\text{total number of data values in set}}$$

- **Median** – the middle value in an ordered set of data values; for a set with an even number of data, the median is the mean of the two middle values
- **Mode** – most frequently occurring value (or values) in a data set. Data set may have no mode, one mode, or more than one mode

Vocabulary:

- **Range of a data set** – difference between the greatest and least data values.

Example: Use the data set to find the mean, median, mode, and range of the data set.

58	62	66	70	76	78	81	84	77	73	68	63

1. Order the data.

2. Calculate the *mean*.

3. Identify the *median*.

4. Is there a *mode*? If yes, what is it? Is there more than one? If yes, what are the others?

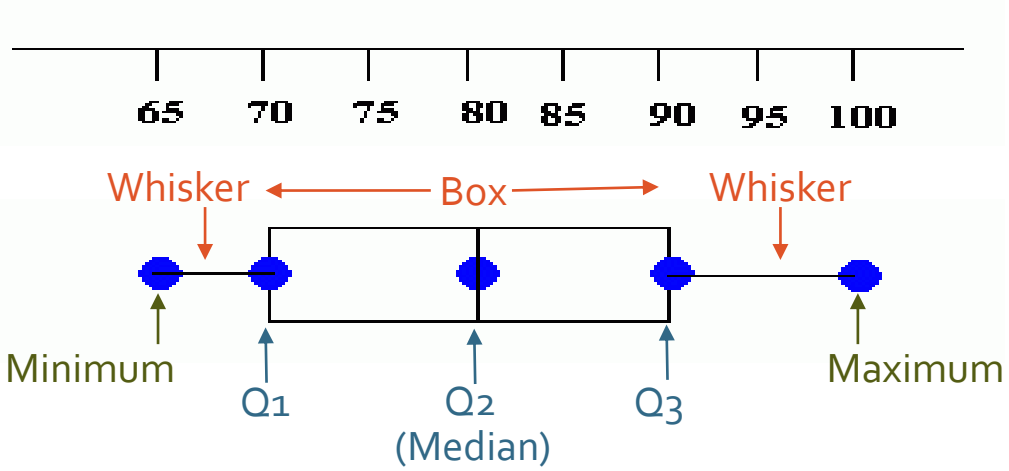
5. Calculate the *range*.

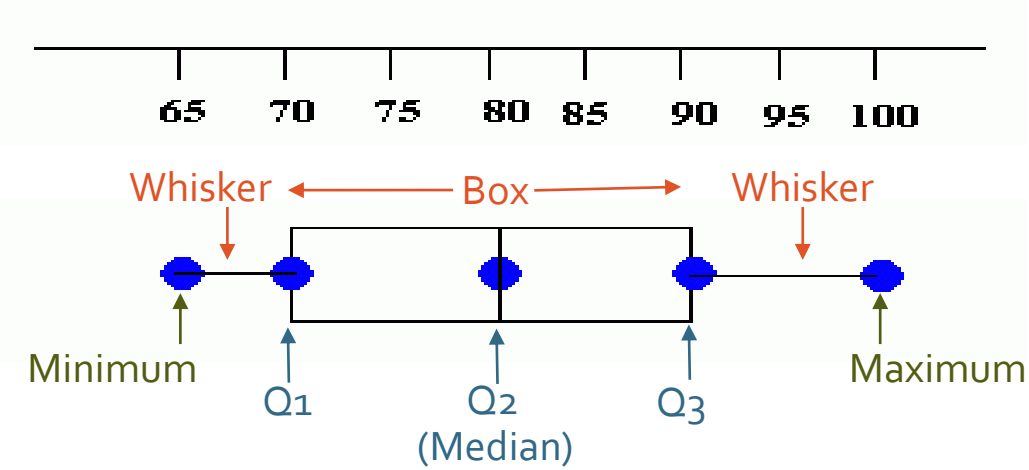
BOX-AND-WHISKER PLOTS

Objective: IWBAT make and interpret box-and-whisker plots, find quartiles and percentiles

Vocabulary:

- **Box-and-Whisker Plot** – graph that summarizes a set of data by displaying it along a number line; it consists of 3 parts: a box, 2 whiskers
- **Quartiles** – values that divide a data set into 4 equal parts; Q2 is the median of the data set, Q1 is the median of the lower half of the data, Q3 is the median of the upper half
- **Interquartile Range** – the difference between the third (Q3) and first (Q1) quartiles





- The **LEFT Whisker** extends from the minimum to Q1. It represents about 25% of the data.
- The **BOX** extends from Q1 to Q3 and has a vertical line through the median. The length of the box represents the ***interquartile range*** and contains about 50% of the data.
- The **RIGHT Whisker** extends from Q3 to the maximum. It represents about 25% of the data.

For an odd number of data values, do not include the Median in either half when finding the 1st and 3rd Quartiles.

Example: Draw a box-and-whisker plot using the data provided below.

314	321	315	316	314	311	307	316	312	314	303

1. Order the data.
2. What is the minimum? Maximum?
3. Identify the *median* (Q2).
4. Find Q1, the median of the lower half of the data.
5. Find Q3, the median of the upper half of the data.
6. Find Q1, Q2, Q3, the minimum, and the maximum on the number line.
7. Draw the box. Extend the whiskers to the minimum and to the maximum.

PROBABILITY

Objective: IWBAT find theoretical and experimental probabilities; find probabilities of mutually exclusive and overlapping events; find probabilities of independent and dependent events

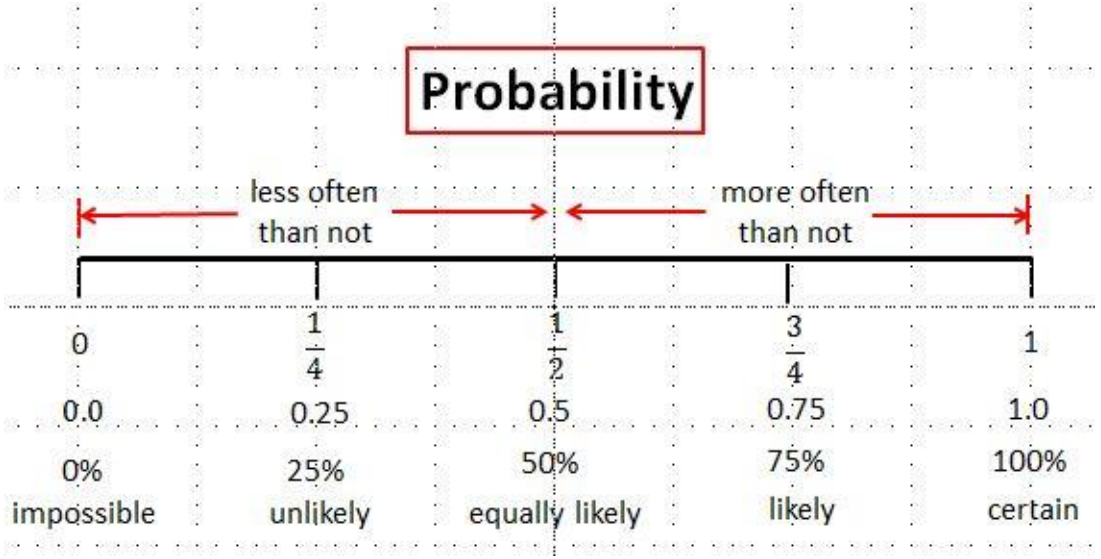
Vocabulary:

- **Outcome** – result of a single trial (example: spinning a wheel)
- **Sample Space** – all possible outcomes
- **Event** – any outcome or group of outcomes

Event	Sample Space	Favorable Outcomes
Rolling an Even #	1, 2, 3, 4, 5, 6	2, 4, 6

Vocabulary:

- **Probability** of an event, or P(event), tells how likely it is that an event will occur.
  - Probability can be written as a fraction, decimal, or percent
  - Probability of an event ranges from 0 to 1.



Vocabulary:

- **Theoretical Probability** – when all possible outcomes are equally likely to occur

$$P(\text{event}) = \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$$

Vocabulary:

- **Odds** – describe the likelihood of an event as a ratio comparing the number of favorable and unfavorable outcomes

$$\text{odds in favor} = \frac{\text{number of favorable outcomes}}{\text{number of unfavorable outcomes}}$$

$$\text{odds against} = \frac{\text{number of unfavorable outcomes}}{\text{number of favorable outcomes}}$$

Vocabulary:

- **Compound Event** – consists of two or more events linked by the word "and" or "or"
- **Mutually Exclusive** – two events that have no outcomes in common; P(A and B) = 0.
- **Overlapping Events** – events that have at least one outcome in common

Probability of Mutually Exclusive Events:

$$P(\text{A or B}) = P(\text{A}) + P(\text{B})$$

Probability of Overlapping Events:

$$P(\text{A or B}) = P(\text{A}) + P(\text{B}) - P(\text{A and B})$$

Vocabulary:

- **Independent Events** – the occurrence of one event does not affect the probability of the second event

  Probability of Two Independent Events:

$$P(\text{A and B}) = P(\text{A}) \bullet P(\text{B})$$

- **Dependent Events** – the occurrence of one event affects the probability of the second event

  Probability of Two Dependent Events:

$$P(\text{A then B}) = P(\text{A}) \bullet P(\text{B after A})$$