# STATS 260 Class 2

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## 1. population ($\mu$)

**Example**

- All I-beams being made by a particular manufacturer.
- All Canadians who will be eligible to vote in an upcoming election.
- All people who will at some point take a particular blood pressure medication.

## 2. Parameter

Measurement of a population

## 3. Sample (x)

A subset of the population

## 4. Statistic

Measurement of a sample

### 4.1. Descriptive Statistics

organize, summarize, display, and describe features of the data.

**Example**

Some sorts of questions descriptive statistics answers:

- What is the greatest tensile strength recorded? What is the range of recorded tensile strengths?
- What proportion of the sample of voters is older than 65?
- What is the average weight of the sample of people taking blood

pressure medication? How spread out are the measurements for resting heart rate?

### 4.2. Inferential Statistics

draw conclusions about the population based on the measurements from the sample.

**Example**

Some sorts of questions inferential statistics answers:

- What is a likely range of values of tensile strengths for all I-beams made by the manufacturer?

  NOTE: all I-beams → population
- Based on our survey, which party is likely to win the election?
- Can we conclude that there a relationship between weight and blood pressure?

## 5. Examples

Determine whether the underlined words refer to a:

- We wish to study poplar trees, so we make a selection of 15 poplar trees in a forest.

  → Sample
- From our selection of 15 poplar trees, we find the largest tree to have a height of 1.9 m.

  → Statistic
- A newspaper wants to determine the feelings of Victoria residents regarding a bridge to the mainland.

  → Population
- The newspaper phones 500 Victoria residents.

  → Sample
- It is found that 95% of these people are in favor of a bridge.

  → Statistic

## 6. Mean, Median, and Mode

### 6.1. Mean ( $\bar{x}$ )

| | | |
|---|---|---|
| Sample Mean | $\bar{x}$ | average of a sample (an estimation of $\bar{\mu}$ |
| Population Mean | $\bar{\mu}$ | mean of a population |

$$\bar{x} = \frac{x_1 + \ldots + x_n}{n}$$

**Example**

Suppose the following is data taken from some sample. Calculate the sample mean.

$10, 6, 12, 7, 3, 6$

$$44/6 = 7.333, \therefore x = 7.333$$

### 6.2. Median ( $\tilde{x}$ )

Middle of a sorted list

**Example**

Suppose we have the sample data: 6, 9, 3, 18, 11. Find the sample median of these data.

$3, 6, 9, 18, 11$

Median is then 18

NOTE: median is unaffected by outliers

### 6.3. Mode

The value that appears the most often

**Example**

Median of 3, 5, 9, 9, 9, 5 is 9

**Example**

The data set 1, 2, 3, 3, 3, 4, 4, 4, 5, 5 has two modes (3 and 4).

The data set 1, 2, 3, 4, 5 has **no modes** (since there is no observation that occurs more frequently than any other observation).

## 7. Standard Divination

| | | |
|---|---|---|
| **sample variance** | $s^2$ | **Sample Standard Deviation** |
| **population variance** | $\sigma^2$ | **Population Standard Deviation** |

**ith Deviation = diffrenence between** $x_i$ **and** $\bar{x}$

**Example**

Find the variance and standard deviation of the following sample:

7, 7, 9, 15, 16, 17, 19, 21, 22, 40

$$\bar{x} = 17.3$$

$$\tilde{x} = 16.5$$

$$s = 9.5730$$

$$s^2 = 93.5667$$

$$\sum x_1^2 = 3835\bar{x} = 17.3$$

$$s^2 = \frac{\sum x_i^2 - n(\bar{x})^2}{n-1}$$

**8. coefficient of variation (cv)**

used to compare 2 sets is a dimensionless quantity (i.e. no units of measurement) which can be used to assess the variability of a set of observations. The cv is calculated by

$$\frac{s}{\bar{x}}$$

**Example**

One set of observations has a mean of 35 with a standard deviation of 7. A second set of observations has a mean of 55 with a standard deviation of 9. Which data set has more variability?

More spread out

$$cv_1 = 7/35 = 0.2$$

$$cv_2 = 9/55 = 0.1636$$