**8.3 Describing and Analyzing Data – Overview**

**Measures of Center**

**Mean (Average Value)**

* Simple, arithmetic average of the data.
  + Sum all numbers and divide by the sample size (*n*).

**Example 1 – Mean**

Data: 1, 5, 2, 9, 3

* Same calculation for the population and sample mean

(just different notation).

* + Sample mean = (pronounced ”x-bar”)
  + Population mean = (Greek letter mu)
* Mean is NOT a resistant measure.
  + This means it is heavily affected by outliers.

**Example 2 – Median**

Case 1 – Odd *n*

7 Obs: 10, 5, 6, 1, 3, 9, 8

Sorted:

Case 2 – Even *n*

8 Obs: 10, 5, 6, 1, 3, 9, 8, 3

Sorted:

**Median (Middle Value)**

* The middle value in an ordered list.
* Median IS a resistant measure.
  + NOT affected by outliers.

**Mode (Most Common Value)**

* The most frequently occurring value(s).
  + Unimodal data has one mode.
  + Bimodal data has 2 modes.
  + Multimodal data has more than 2 modes.
  + Can be no modes (every value is distinct).
* This is the only measure of center that can be used with categorical data.
  + Ex) Most common favorite color (can’t average this)

**Measures of Spread (Dispersion)**

**Range**

* Range = Max - Min
* Gives idea of the entire ”range” of values, how much distance do they span in total.
* Ex) Case 2 above: Range =

**Standard Deviation**

**Graphical user interface, text, application

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* Complex formula that measures the average distance that each data point is from the mean.

Chart, box and whisker chart

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**Using your Calculator!**

Using TI-83/84 (and TI-30 XS MultiView / XIIS) to calculate mean, median, sample / population st dev.

Steps for the TI-30 XIIS

1. 2nd 🡪 STAT 🡪 1-VAR (Enter)

2. DATA

X1 = # (scroll down)

FRQ = 1 (for ALL Xs, scroll down)

X2 = # (scroll down)

…

3. STATVAR (scroll across)

4. To exit this menu: 2nd 🡪 EXIT STAT 🡪 Y

b) FRQ: L2

c) CALC

Steps for the TI-30XS MultiView

1. Data 🡪 Enter data in L1

2. 2nd 🡪 stat 🡪 1-Var Stats

a) DATA: L1

b) FRQ: ONE

c) CALC

Steps for the TI-83/84

1. Enter data: STAT → Edit → Enter data in L1

*(Demo dataset: 10, 23, 4, 6, 9, 3, 15, 6)*

2. Calculate: STAT → CALC → 1-Var Stats

* 1. List is L1.
  2. Leave FreqList blank.
  3. Calculate!

**A picture containing diagram

Description automatically generated**

Data here:

10, 23, 4, 6, 9, 3, 15, 6, 12, 11, 19, 10, 6, 8, 15

**Example 3**

Find the mean, median, mode and sample standard deviation of the following dataset.

* Data (7 obs): 35, 70, 31, 37, 65, 38, 38

**Other Considerations**

**Outliers**

* Data values that are extreme when compared to the rest of the data .
* Can significantly impact measures of center and spread.

**Types of Distributions**

Chart, histogram

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Best measure of center:

**Empirical Rule (68 – 95 – 99.7 Rule)**

* When data is approximately bell shaped, the standard deviation allows us to make fairly accurate approximations about the locations of our data values.

\_\_\_\_\_ of the data lies within 1 standard deviation of the mean.

\_\_\_\_\_ of the data lies within 2 standard deviations of the mean.

Chart, histogram

Description automatically generated \_\_\_\_\_ of the data lies within 3 standard deviations of the mean.

Mean

- 1 step (st dev) + 1 step

* We can use these breakdowns to find probabilities within certain intervals.

**Example 4**: Suppose that diameters of a new species of apple have a bell-shaped distribution with a mean of 7 cm and a standard deviation of 0.5 cm. Using the empirical rule, find the following percentages of apples with diameters that are:

Step 1

Draw and label curve

Step 2

Shade area of interest

a) Between 5.5 cm and 8.5 cm

A picture containing text, lamp

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b) More than 7.5 cm.

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Description automatically generated

c) No more than 5.5 cm.

**Example 5**: Suppose that IQ scores have a bell-shaped distribution with a mean of 105 and a standard deviation of 15. Using the empirical rule answer the following questions:

a) What percentage of IQ scores are greater than 75?

b) Between which two values do the middle 68% of IQ scores fall between?