MTH 23.5 LECTURE NOTES (Ojakian)

Topic 3: Measures of Central Tendency and Addition

OUTLINE
References (**Algebra Book**: None; **Statistics Book**: 2.5, 2.6)

1. Adding and subtracting

2. Data summaries: Mean, median, mode, range, etc.

3. Accompanying notation, terminology and use of Excel

1. <u>Adding and Subtracting Numbers</u>

   (a) Minus sign used in 2 ways:

      i. In between expressions: Subtraction operation
      ii. In front of expression: Take "opposite"

   (b) Using the number line

      i. Start at 0
      ii. Add Positive: Move right
      iii. Add Negative: Move left
      iv. Subtract Positive: Move left
      v. Subtract Negative: Move right

   (c)

   PROBLEM 1. *Compute the following:* $5 + 2 + (-4) - (-5)$

2. <u>Preliminary Notation</u>

   PROBLEM 2. *Suppose we have the following two data sets:*

   - $X: \; x_1 = 4, \;\; x_2 = 7, \;\; x_3 = -5, \;\; x_4 = 0, \;\; x_5 = -1$
   - $Y: \; y_1 = 34.9, \;\; y_2 = -10, \;\; y_3 = -34.9, \;\; y_4 = 3, \;\; y_5 = 4, \;\; y_6 = 3$

   Evaluate the following:

   (a) $\displaystyle\sum x$

   (b) $\displaystyle\sum_{i=1}^{5} x_i$

   (c) $\displaystyle\sum_{i=3}^{5} x_i$

   (d) $\displaystyle\sum_{i=3}^{5} y_i$

(e) $\sum y$

3. <u>Measures of Central Tendency: Mean, Median, Mode</u>

    (a) Mean:

    (b) Mode:

    (c) Median:

        i. N odd: Middle number (i.e. number at position $\dfrac{N+1}{2}$)

        ii. N even: Average of two middle numbers (i.e. at positions $\dfrac{N}{2}$ and $\dfrac{N}{2}+1$).

    (d) Remark: Sometimes "average" refers to "mean" and sometimes "average" refers to any of mean, median, or mode.

    (e) EXERCISES

    PROBLEM 3. *Consider the data: 1, 4, 0, -2, 1.*

        i. What is the mean? What is the median?

        ii. If the largest number is increased, how does this effect the mean and median?

        iii. If the smallest number is decreased, how does this effect the mean and median?

    PROBLEM 4. *The* **net worth** *of someone is the amount of money that person would have if they sold everything they have and then subtracted their debt. Based on the Net Worth handout, answer the following questions (round numbers to nearest 1000):*

        i. Suppose there is bar with two typical 40 year olds and three typical 50 year olds. What is the mean net worth and what is the median net worth in the bar?

        ii. Suppose there is bar with 99 typical 40 year olds. What is the mean net worth and what is the median net worth in the bar? Now pick your favorite super rich man from the top eight; suppose he walks into the bar. Now what is the mean net worth and what is the median net worth bar?

4. <u>Using Excel</u>

    (a) Putting something in a box: Text, Number, or Function

    (b) Some functions:

        i. For summing use: `sum`

        ii. For mean use: `average`

        iii. For median use: `median`

        iv. For mode use: `mode`

    (c) Using different "worksheets".

    (d) Please! ... Organize your work clearly.

(e) Exercises

PROBLEM 5. *Experiment with Excel to find THREE different data sets, with the requested property.*

   i. *Its mean is larger than its median*

  ii. *Its median is larger than its mean*

 iii. *Its median is equal to its mean*

PROBLEM 6. *Go to* **Cengage Data** *(at webpage), download "Heights of Pro Basketball Players" from the $n \geq 30$ data. Find the median. Find the mean in two ways: 1) using the* `average` *function and 2) using the* `sum` *function, but not the* `average` *function.*

Webpage:

`https://college.cengage.com/mathematics/brase/understandable_statistics/7e/students/datasets/svls/frames/frame.html`

5. <u>Sample Mean versus Population Mean</u>

$\overline{X}$ = Sample Mean   and μ = Population Mean

PROBLEM 7. *Consider the basket-ball. Use Excel to find random samples of size 5. Compare various values of $\overline{X}$ to the ONE value of μ.*

(use rand() and sorting)

6. <u>Data Summaries in General</u>

(a) Summarize all the data with a single number (Examples: mean, median, mode)

(b) Other Data Summaries: Maximum and Minimum, Range, various percentages, various counts, etc.

(c)

PROBLEM 8. *Find examples of other data summaries.*