

# Stat 104 – Lecture 3

## Summary Measures

- Central Tendency
  - Sample midrange
  - Sample median
  - Sample mean

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## Measures of Center

- Sample Midrange
  - Average of the minimum and the maximum.
  - Body mass of *Canidae*:  
 $(1 + 36)/2 = 18.5$  kilograms
  - Greatly affected by outliers.

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## Measures of Center

- Sample Median
  - A value that divides the data into a lower half and an upper half.
  - About half the data values are greater than the median about half are less than the median.

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**Sample Median (n even)**  
Body Mass (kg) of *Canidae*

0		1,3,3,3,4,4,4
0*		5,5,5,5,5,6,6,7,8,9,9
1		0,0,1,2,3
1*		
2		2,3
2*		5
3		
3*		6

Median =  $(6+6)/2$   
= 6 kilograms

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**Numerical (Quantitative)**  
Body Mass of *Felidae*  
(rounded to nearest kg)

47, 12, 13, 4, 7, 3, 2, 5, 5,  
11, 4, 4, 10, 10, 17, 11, 21, 4,  
5, 2, 4, 162, 96, 55, 178,  
36, 5, 3, 3, 2, 8, 11, 40

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**Sample Median (n odd)**  
Body Mass (kg) of *Felidae*

0		2,2,2,3,3,3,4,4,4,4,4,5,5,5,7
1		0,0,1,1,1,2,3,7
2		1
3		6
4		0,7
5		5
9		6
16		2
17		8

Median = 8 kilograms

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## Measures of Center

- Formula for the sample mean

$$\bar{y} = \frac{\text{Total}}{n} = \frac{(\sum y_i)}{n}$$

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## Sample Mean

- Body mass of *Canidae*
- Total = 260
- n = 28

$$\bar{y} = \frac{\text{Total}}{n} = \frac{260}{28} = 9.3 \text{ kg}$$

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## What does each measure?

- The sample midrange is midway between the smallest and largest values.
- The sample median divides the distribution into a lower and an upper half.
- The sample mean is the balance point of the distribution.

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Which summary is “best”?

- For symmetric shapes the sample mean is most informative.
- For skewed shapes the sample median is better because it is less affected by outliers.

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## Summary Measures

- Dispersion or spread
  - Sample range
  - Sample mean absolute deviation
  - Sample standard deviation

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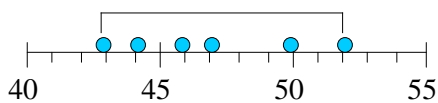
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## 9-hole Golf Scores

46, 44, 50, 43, 47, 52

Sample Range = maximum – minimum  
= 52 – 43 = 9 strokes



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## Measures of Spread

- Based on the deviation from the sample mean.
- Deviation from the mean:

$$(y - \bar{y})$$

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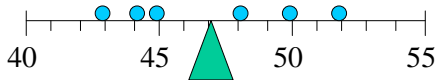
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## 9-hole Golf Scores

45, 44, 50, 43, 48, 52

$$\bar{y} = \frac{282}{6} = 47 \text{ strokes}$$



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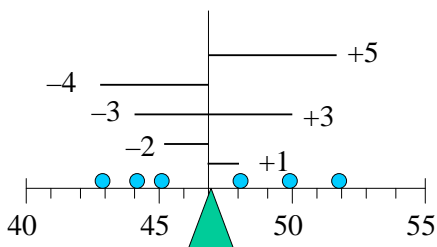
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## Deviations from the Mean



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## Sample Mean Absolute Deviation

$$MAD = \frac{(\sum |y - \bar{y}|)}{n}$$

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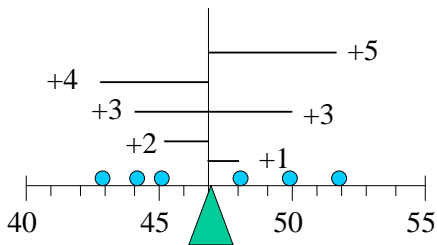
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## Absolute Deviations



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## Sample Mean Absolute Deviation

$$MAD = \frac{(4 + 3 + 2 + 5 + 3 + 1)}{6} = \frac{18}{6}$$

$$MAD = 3.0 \text{ strokes}$$

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