

Last Class

- Scientific Method
- Statistics
 - ↳ Descriptive
 - ↳ Inferential
- Data
 - ↳ Observations
 - ↳ Variables
 - ↳ Continuous
 - ↳ Categorical

Statistical of Social Sciences - Summer 2011 Survey - Windows Internet Explorer

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http://www.surveymonkey.com/s/WFC3GDS

Statistical of Social Sciences - Summer 2011

Exit this survey

Instructions: The purpose of this survey is to ascertain basic student information for the purposes of deriving statistics for this class. This information will be displayed in class, but your name will not appear next to it. You absolutely may opt to not provide any information. Please fill out the questions you are comfortable answering.

What is your age (in years)?

← *Numeric
Limitless choice*

What is your height in inches?

← *Continuous*

What following categories do you identify yourself as (check all that apply)?

White/Caucasian Black/African American Hispanic/Latin American American Indian/Native American Asian/Pacific Islander Other Choose not to respond

What is your gender? — *Categorical*

Female Male Choose not to reply

What is your major(s)?

Accounting
 Business Administration
 Criminal Justice

Done Internet 100%

Measures of Centrality

19	1	→ Minimum	
20	2		
21	4		
22	2		
25	2		
26	1		
27	1		• Mean
28	1		
29	2		
30	2	→ $\bar{x} = 31.55$	• Median
32	2		
33	1		
35	1		
39	1		• Mode
45	1		
47	1		
48	2		
50	1		
70	1	→ Maximum	

$$N = 29$$

Mean

$$\bar{X} = \frac{1}{n} \sum_{i=1}^N x_i$$

number n variable x_i i th observation

$$x_i = \frac{x_1 + x_2 + x_3 + \dots + x_n}{N}$$

ex:

$$N=29$$

$$19 + 20 + 20 + 21 + 21 + 21 + \dots + 70$$

$$= 915 = \sum_{i=1}^N x_i$$

$$\Rightarrow \frac{915}{29} = \boxed{31.55} = \bar{X}$$

Avg.
Age

→ Mean is the expected value

- Median

↳ Middle value

↳ Half above, half below.

- ① 19
- 20
- 20
- 21
- 21
- 21
- 21
- 22
- 22
- 22
- 25
- 25
- 26
- 27
- 28
- 29
- 29
- 30
- 30
- 32
- 32
- 33
- 35
- 39
- 45
- 47
- 48
- 48
- 50
- 70

$$N = 29$$

$$\text{Median} = \frac{(N+1)}{2}$$

= ith observation

ex: $N = 29$

$$\text{Median} = \frac{29+1}{2} = 15$$

$\Rightarrow 29$

↳ If odd number of observations, then formula works.

↳ If even number of observations, then average the two middle values.

i.e., suppose that $N = 10$, then

$$\frac{10+1}{2} = 5.5, \text{ so}$$

average the
5th 3 6th
observation

Mode

↳ The most frequent observation

ex: 4 students were 21, thus its the mode.

ex.

$$\text{Mean} = 31.55$$

$$\text{Median} = 29$$

$$\text{Mode} = 21$$

Measures of variability

Class 1: A, B, C - variability

$$\bar{x} = B$$

Class 2: B, B, B - no variability

$$\bar{x} = B$$

	1 st yr	2 nd	3 rd
Stock A:	-\$50	\$100	-\$10
Stock B:	\$13	\$14	\$13

Same average return
= \$13.3

- Range
- Quantile
- Variance
- Standard Deviation

Range

= maximum value - minimum value

Stock A: \$100 - \$-50

= \$150

Stock B: \$14 - \$13

= \$1

Quantile

↳ Generic term used to denote splitting data into several equally numbered groups.

→ 4 groups ⇒ quartiles

→ 5 groups ⇒ quintiles

→ 10 groups ⇒ deciles

Class: $\underbrace{F, F}, \underbrace{C, C, C, C}, \underbrace{B, B}, \underbrace{A, A, A, A}$
 $\bar{x} = 2.5$

Quantiles

$\{ \textcircled{F} F, \textcircled{C} \}$ Min = F

$\{ C, C, \textcircled{C} \}$ $Q_1 = C$

$\{ \textcircled{B}, B, \textcircled{A} \}$ Median = $\frac{C+B}{2}$

$\{ A, A, A \}$ $Q_3 = A$

Max = A

ex:

F, C, C, C, C, C, B, B, B, B, B, A

$$\bar{x} = 2.5$$

Quartiles:

{F, C, C}

{C, C, C}

{B, B, B}

{B, B, A}

min = F

Q₁ = C

median = C/B

Q₃ = B

max = A

Median = Half above, half below

Quartiles = Groups of 25% of observations

Quintiles (5 groups): Groups of 20% of observations

Deciles (10 groups): Groups of 10% of observations

Finding Quantiles

$N = 12$, for quartiles, that's a group of 3.

$$\Rightarrow \frac{N}{\# \text{ of groups}}$$

Interquartile Range

$$Q_3 - Q_1$$

ex. 1: $A - C$

$$(4.0) - (2.0) = 2.0$$

ex. 2: $B - C$

$$(3.0) - (2.0) = 1.0$$

FYI

Interquintile Range

$$Q_4 - Q_1$$

ex. 1, 2, 3, 4, 5

Quartiles?

$$\frac{5}{4} = 1.25$$

$$\left\{ 1 \rightarrow 1.5 \right\}$$

Variance

↳ Variability around the mean.

$$\sum_{i=1}^n \frac{(x_i - \bar{x})^2}{N}$$

ex. (ages)

$$\begin{aligned} & (19 - 31.55)^2 \\ & + (20 - 31.55)^2 \\ & \quad \vdots \\ & + (70 - 31.55)^2 \end{aligned}$$

Ex: Grades as GPA (e.g. 1.0, 2.0, etc)

1.0, 2.0, 2.0, 3.0, 4.0
(F)

Calculate: Mean, Median, Mode, Range, Variance.

$$\text{Mean} = \frac{1+2+2+3+4}{5} = \frac{12}{5} = \boxed{2.4}$$

$$\text{Median} \Rightarrow \frac{5+4}{2} = \frac{6}{2} = 3^{\text{rd}} \text{ obs.} \\ \Rightarrow \boxed{2.0}$$

$$\text{Mode} = \boxed{2.0} \text{ (appears twice)}$$

$$\text{Range} = 4.0 - 1.0 = \boxed{3.0}$$

Variance $\cdot N=5, \bar{x}=2.4$

$$x_1: 1.0 - 2.4 = -1.4^2 = 1.96$$

$$x_2: 2.0 - 2.4 = -0.4^2 = 0.16$$

$$x_3: 2.0 - 2.4 = -0.4^2 = 0.16$$

$$x_4: 3.0 - 2.4 = 0.6^2 = 0.36$$

$$x_5: 4.0 - 2.4 = 1.6^2 = 2.56$$

$$\begin{array}{r} 5.2 \\ \hline 5 \overline{) 5.2} \\ \underline{5.2} \\ 0 \end{array} \Rightarrow \boxed{1.04}$$

Average grade is 2.4,
but varies 1.04^2

Standard Deviation

$$= \sqrt{\text{Variance}}$$

ex: $\sqrt{1.04} = 1.02$

$\bar{x} = 2.4$, but varies 1.02

σ = Standard deviation = $\sqrt{\frac{\sum (x_i - \bar{x})^2}{N}}$

\uparrow
Sigma

= $\sqrt{\text{Variance}}$