Sec 1.1

Variables

- Characteristic of an "individual"

people, animals or things

- Something that varies

Types of Variables

1) Categorical / Qualitative
   - No Averages Possible
   - Eye Color, Gender, Zip Code ...

2) Quantitative Variables
   - Averages Possible
   - Height, Age, GPA, SAT Score ...

Distribution of A Variable

Tells what values a variable takes and how often it takes these values

- Pie Charts
- Bar graphs

} p. 9

- Dot Plots (p. 27)
- Stemplots (p. 34)
- Histograms (p. 37)

Relationships Between Categorical Variables

	Student Smokes	Student Not Smokes	
Both Parents Smoke	400	1380	1780
One Parent Smokes	416	1823	2239
No Parent Smokes	188	1168	1356
	1004	4371	5375

Marginal Distribution

$$\%\text{ of students smoke} = \frac{1004}{5375} = 19\%$$

Tells you nothing about any relationship

Relationships Between Categorical Variables

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Conditional Distribution

a) % of students smoke when both parents smoke $= \frac{400}{1780} = 22\%$

b) % of students smoke when neither parent smokes $= \frac{188}{1356} = 14\%$

} Compare

Conclusions

- When both parents smoke, student smoking goes from 14% to 22%
- 8% more students smoke when both parents smoke
- When both parents smoke, student smoking increases by 57% $\left(\frac{14-22}{14}\right)$

Simpson's Paradox

- "Lurking variables" which can change/reverse a relationship
- Most likely to occur when several groups are combined into single categorical group

Ex Where should I have surgery?

	Hospital A	Hospital B
Died After Surgery	63	16
Survived Surgey	2037	784
	2100	800

Hospital A loses $63/2100 = 3\%$ of patients

Hospital B loses $16/800 = 2\%$ of patients

So you choose Hospital B for your surgery

But previous data ignored the condition of the patient:

Good Condition

	A	B
Died	6	8
Survived	594	592
	600	600

Poor Condition

	A	B
Died	57	8
Survived	1443	192
	1500	200

Hospital A only loses $6/600 = 1\%$ of patients in good condition (like you) and Hospital B loses $8/600 = 1.3\%$ so... Hospital A is actually safer for you!

Organizing A Statistical Problem

"Statistic Problems Demand Consistency"

State Question you're trying to answer

Plan Statistical techniques needed

Do Needed calculations / graphs

Conclude In context of problem

Sec 1.2

Graphs of Quantitative Variables

1) Dotplots (P. 27)
2) Stemplots (P. 35)
3) Histograms (P. 37)

Shape < Symmetric / Skewed
Center (Median)
Spread
Outliers?

Making Graphs

1) Title

2) Label / Scale axes

↑ Include key for stemplots

Dotplot (P. 27)

Shape - Skewed Right

Center ≈ 3

Spread = 0 to 8 or 8

Outliers - Possibly 7 and 8

Stemplot

16 Test Scores:

stem | 1 digit (leaf)

9|0, 8|0, 9|6, 5|4, 8|0, 9|5, 10|0, 7|5,

8|7, 6|2, 6|5, 8|5, 9|2, 8|7, 7|4, 8|9

5	4
6	2 5
7	5 4
8	0 0 7 5 7 9
9	0 6 5 2
10	0

→

5	4
6	2 5
7	4 5
8	0 0 5 7 7 9
9	0 2 5 6
10	0

86%

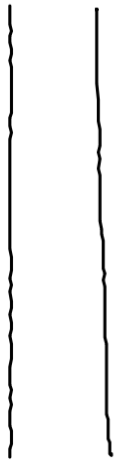
5|4 means 54%

Misc

1) Stems can be split (0-4, 5-9)

2) Use side by side stem plots to compare

Male Female



Histograms (P. 39)

STAT → EDIT → ENTER → Data in L_1

STATPLOT → ENTER →  → ZOOM → 9

2nd → Y=

- sketch... Use TRACE for values

Misc

1) Calculator histograms use actual frequencies
2) Histograms using relative frequencies (%) need to be done by hand
3) Histograms are not bar graphs
4) When comparing data where number of observations are different, use percents (P. 40)

Sec 1.3

Measure of Central Tendency (Center)

1) Mean ($\bar{x}$ for samples, μ for populations)

↑ "x bar" ↑ Mu

- Arithmetic average = $\frac{\sum_i x_i}{n}$
- Not resistant (affected by outliers)
- Best for symmetric distributions

2) Median (M)

- Midpoint of values

  Ex 2, 4, 6 ($M = 4$)

  2, 4, 6, 8 ($M = 5$)

- Very resistant

  Ex 10, 20, 30 ($\bar{X} = 20$, $M = 20$)

  10, 20, 100 ($\bar{X} = 43.3$, $M = 20$)

- Best for skewed distributions

Spread

Range = max − min

Variance (s^2)

$$s^2 = \frac{(x_1-\bar{x})^2 + (x_2-\bar{x})^2 + \cdots + (x_n-\bar{x})^2}{n-1} = \frac{1}{n-1}\sum (x_i-\bar{x})^2$$

Standard Deviation (s) = $\sqrt{\text{Variance}}$

- Not resistant
- Best for symmetric distributions

Interquartile Range (IQR)

- Middle 50% = $Q_3 - Q_1$
- Best for skewed distributions

5-Number Summary +2

Ex Ages of people at family reunion:

16 19 24 25 25 33 33 34 34 37 37 40 42 46 49 73

min = 16

$Q_1 = 25$

M = 34

$Q_3 = 41$

Max = 73

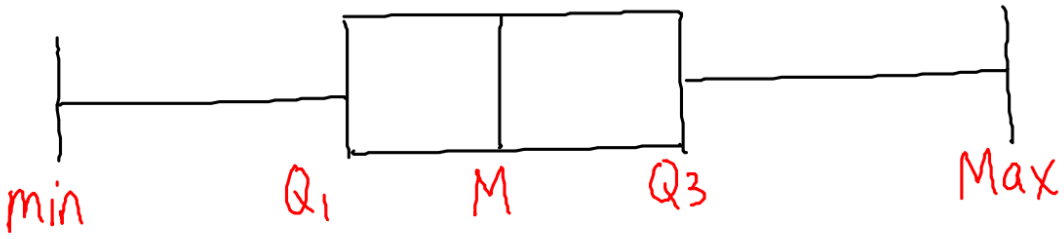
IQR = 16 yrs

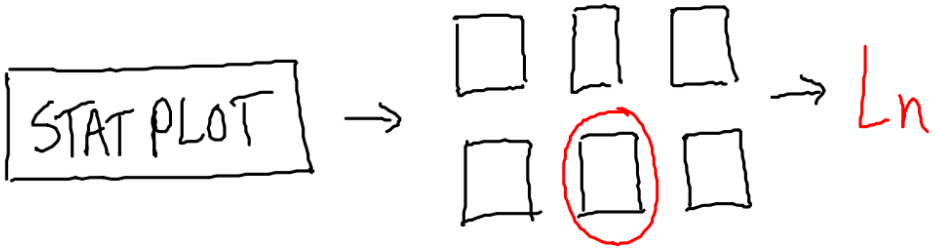
STAT → CALC → ENTER → 1-Var Stats Ln

$\bar{x} = 35.44$ yrs $s = 13.63$ yrs

Boxplots

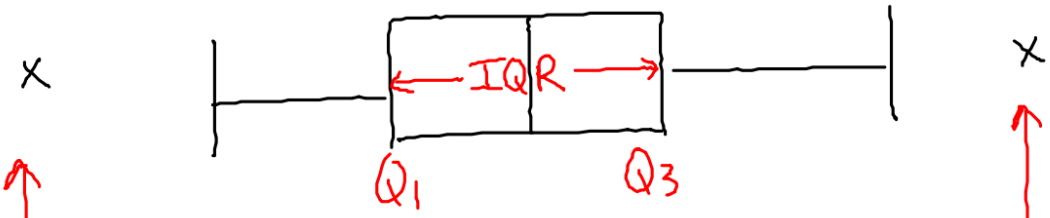
Used to display 5-number summary





Modified Boxplot

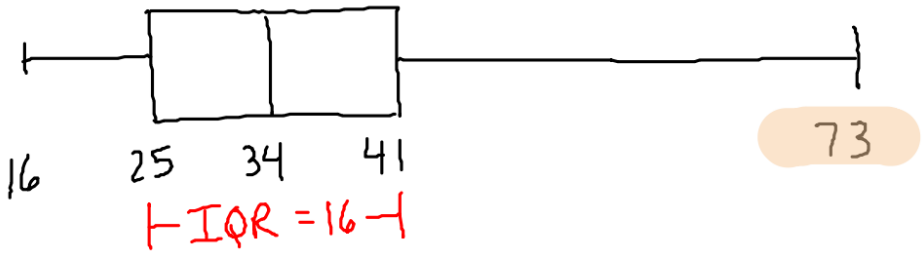
- Displays possible outliers



Outlier $< Q_1 - 1.5(IQR)$

Outlier $> Q_3 + 1.5(IQR)$

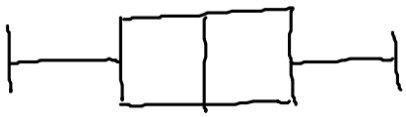
Ex Ages at family reunion



Outlier $< 25 - 1.5(16) < 25 - 24 < 1$

Outlier $> 41 + 1.5(16) > 41 + 24 > 65$

Modified Box Plot

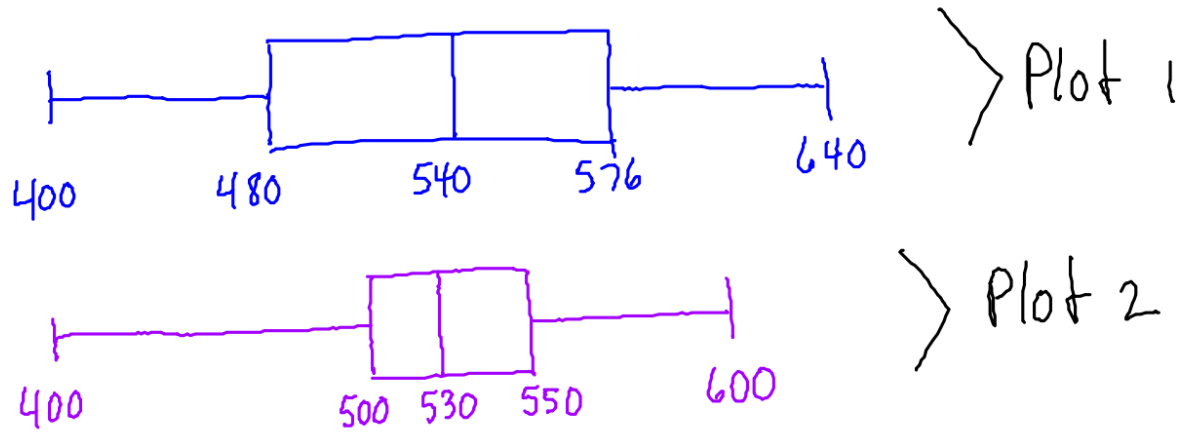


x

Side By Side Boxplots

L_1 = SAT Math Scores

L_2 = SAT Verbal Scores



Test Taking Strategies

- Review (online) Notes / Homework
- Read Section Summaries (Pp 21, 42, 69)
- Practice Solving Problems
  - Practice Test
  - Chapter Review Exercises (Pp 75-78)
- Work With A Study Buddy!

All answers in back of book :)