Statistics

Lecture 5

Feb 19-8:47 AM

Class QZ 4

Consider the Sample below

5 6 8 8

10 10 10 12

1) Mode = 10

2) Σx = 69

3) Σx^2 = 633

4) n = 8

$\Sigma x = 5+6+8+8+10+10+10+12 = 69$

$\Sigma x^2 = 5^2+6^2+8^2+8^2+10^2+10^2+10^2+12^2 = 633$

Range = 12 − 5 = 7

midrange = $\frac{12+5}{2}$ = 8.5

$\bar{x} = \frac{\Sigma x}{n} = \frac{69}{8} = 8.625$

Round-up → 9

Round to whole → 9

Round to 1-dec. → 8.6

" " 2-dec. → 8.63

$s^2 = \frac{n\Sigma x^2 - (\Sigma x)^2}{n(n-1)} = \frac{8 \cdot 633 - 69^2}{8(8-1)} = \frac{303}{56} \approx 5.411$

$s = \sqrt{s^2} = \sqrt{5.411} \approx 2.326$

Oct 26-9:43 AM

Consider the Sample below

3, 4, 6, 7, 10

1) $n = \boxed{5}$

2) Range $= 10 - 3 = \boxed{7}$

3) Midrange $= \frac{10+3}{2} = \boxed{6.5}$

4) Mode $= \boxed{\text{None}}$

5) $\Sigma x = 3 + 4 + 6 + 7 + 10 = \boxed{30}$

6) $\Sigma x^2 = 3^2 + 4^2 + 6^2 + 7^2 + 10^2 = \boxed{210}$

7) $\bar{x} = \frac{\Sigma x}{n} = \frac{30}{5} = \boxed{6}$

8) $s^2 = \frac{n\Sigma x^2 - (\Sigma x)^2}{n(n-1)} = \frac{5 \cdot 210 - 30^2}{5(5-1)}$

$= \frac{150}{20} = \boxed{7.5}$

9) $s = \sqrt{s^2} = \sqrt{7.5} \approx \boxed{2.739}$

10) Estimate s

$\approx \frac{\text{Range}}{4}$

$= \frac{7}{4} = \boxed{1.75}$

Estimate s $s \approx \frac{\text{Range}}{4}$ Range rule-of-thumb

Oct 30-7:34 AM

Empirical Rule

About 68% of data elements are within $\bar{x} \pm s$

About 95% of data elements are within $\bar{x} \pm 2s$ Usual Range

About 99.7% of data elements are within $\bar{x} \pm 3s$

Empirical rule is best when data distribution is symmetric and that happens when Mean = Mode = Median.

Oct 30-7:45 AM

Suppose we have a symmetric data with $\bar{x} = 78$ and $S = 10$.

Mean = Mode = Median

Empirical Rule

68% Range → $\bar{x} \pm S = 78 \pm 10$ → 68 to 88

95% Range → $\bar{x} \pm 2S = 78 \pm 2(10) = 78 \pm 20$

Usual Range → 58 to 98

99.7% Range → $\bar{x} \pm 3S = 78 \pm 3(10)$ → 48 to 108

Oct 30-7:51 AM

I Surveyed 200 students, their ages had a symmetric dist. with $\bar{x} = 32$ and $S = 5$.

Mean ≈ Mode ≈ Median

Empirical Rule

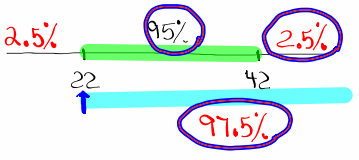
68% Range → $\bar{x} \pm S = 32 \pm 5$ → 27 to 37

Usual Range → $\bar{x} \pm 2S = 32 \pm 2(5)$ → 22 to 42

What % of these students are at least 22 Years old?

100% − 95% = 5%

5% ÷ 2 = 2.5%



How many of these students are at least 22 Years old?

Sample Size

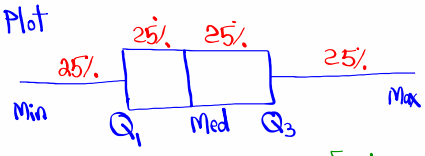
97.5% of 200 = .975(200) = 195

Oct 30-7:56 AM

5 – Number Summary

Min. Q_1 Median Q_3 Max.

Draw Box Plot



50% below median, 50% above Median

25% below Q_1, 75% above Q_1 (First Quartile)

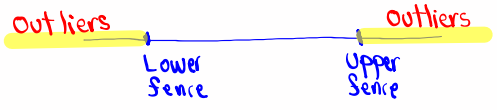
75% below Q_3, 25% above Q_3 (Third Quartile)

IQR → Inter-Quartile-Range

$$IQR = Q_3 - Q_1$$

Upper Fence $= Q_3 + 1.5(IQR)$

Lower Fence $= Q_1 - 1.5(IQR)$

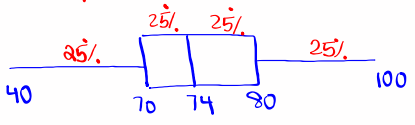


Oct 30-8:05 AM

Exam Scores had the Following 5-Number Summary

40 (Min) 70 (Q_1) 74 (Median) 80 (Q_3) 100 (Max)

Box Plot

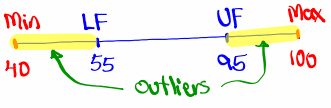


$IQR = Q_3 - Q_1 = 80 - 70 = \boxed{10}$

Upper Fence $= Q_3 + 1.5(IQR) = 80 + 1.5(10) = \boxed{95}$

Lower Fence $= Q_1 - 1.5(IQR) = 70 - 1.5(10) = \boxed{55}$

Discuss Outliers: 40 to 55 OR 95–100



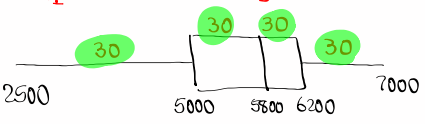
Oct 30-8:13 AM

I randomly Selected 120 nurses and below are the 5-Number Summary of their monthly Salaries

120 : 4 = 30

2500	5000	5800	6200	7000
Min	Q_1	Med	Q_3	Max

Box Plot



What % of them make at least $5000? 75%

How many of them make at least $5000? 90

$IQR = Q_3 - Q_1 = 6200 - 5000 = 1200$

Upper fence $= Q_3 + 1.5(IQR) = 6200 + 1.5(1200) = 8000$

Lower fence $= Q_1 - 1.5(IQR) = 5000 - 1.5(1200) = 3200$

outliers 2500 to 3200

SG 5

NO outliers

Oct 30-8:21 AM

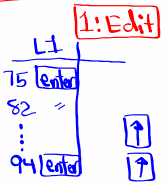
TI Instructions:

1) Clear All lists. 2nd + 4:clear all lists Enter

2) Reset all lists. STAT Edit 5:Set UpEditor Enter

3) Store the following in L1. STAT Edit 1:Edit

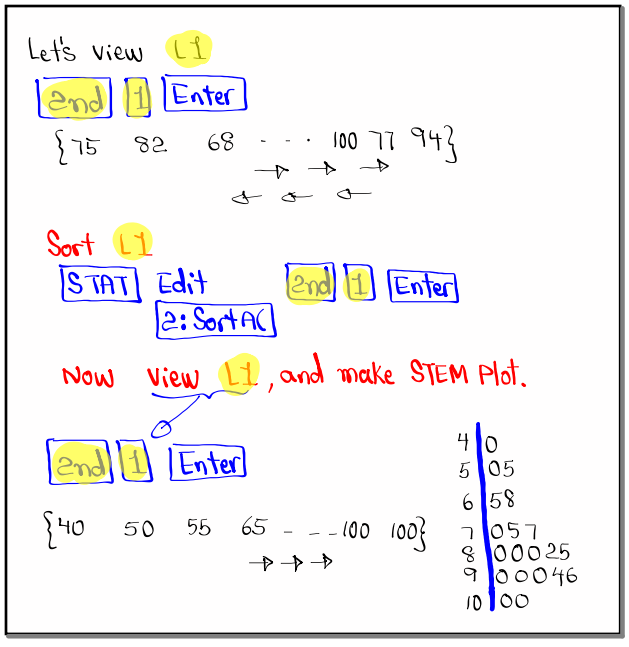
75	82	68	90	55
40	50	100	70	65
80	85	96	90	90
80	80	100	77	94



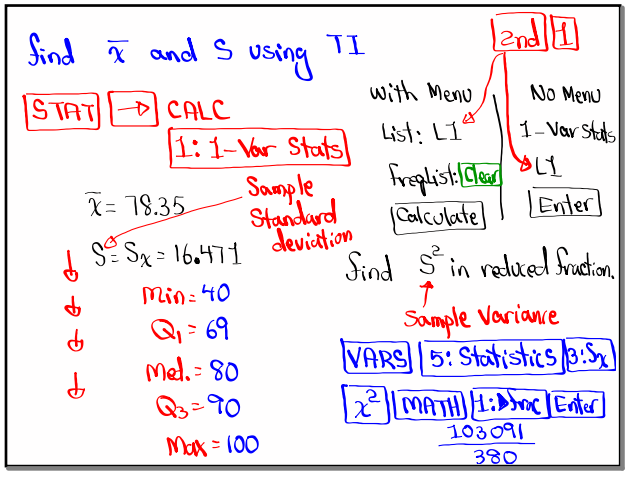
Let's quit: 2nd MODE

Clear the Screen: Clear

Oct 30-8:53 AM



Oct 30-9:02 AM



Oct 30-9:10 AM

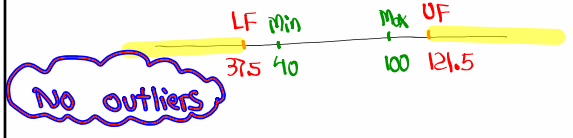
Min = 40
Q_1 = 69
Med. = 80
Q_3 = 90
Max = 100

Box Plot

$IQR = Q_3 - Q_1 = 90 - 69 = 21$

Upper Fence $= Q_3 + 1.5(IQR) = 90 + 1.5(21) =$ **121.5**

Lower Fence $= Q_1 - 1.5(IQR) = 69 - 1.5(21) =$ **37.5**



Oct 30-9:21 AM

Round $\bar{x}$ & s to a whole #

$\bar{x} \approx 78$ $\quad s \approx 16$

Assume data dist. is bell-shape (Symmetric)

68% Range $\bar{x} \pm s = 78 \pm 16 \rightarrow$ **62 to 94**

Usual Range $\bar{x} \pm 2s = 78 \pm 2(16) \rightarrow$ **46 to 110**

"95% Range"

Oct 30-9:27 AM

Consider the STEM plot below

4	0 5
5	2 6 8
6	0 3 5 5 9
7	0 2 2 5 5 5 8
8	2 3 5 6 8
9	0 4
10	0

1) $n = 25$

2) Range $= 60$

3) Midrange $= 70$

4) Mode $= 75$

5) Estimate $S \approx \frac{\text{Range}}{4}$ "Range rule-of-thumb" $S \approx \frac{60}{4} = \boxed{15}$

6) How many data elements are below 70? 10

7) What percent of data elements are below 70? $\frac{10}{25} \cdot 100 = \boxed{40\%}$

Sample Size n

work/finish SG 5

Oct 30-9:32 AM

class QZ 5

Consider the Sample below

8	12	15	20	24
28	30	32	35	40

Use Your calc to find

1) $\bar{x} = 24.4 \approx \boxed{24}$ } Round to whole #

2) $S = 10.480 \approx \boxed{10}$ } Round to whole #

3) $S^2 = \boxed{\frac{4942}{45}}$ } Reduced Fraction

Oct 30-9:42 AM