Statistics
Lecture 6

Feb 19-8:47 AM

Class QZ 5

Consider the Sample below

8 12 15 20 24
28 30 32 35 40

Clear all lists

Save this Sample in L1.

STAT → CALC

1: 1-Var Stats

with Menu
List: L1
FreqList:
Calculate

No Menu
1-Var Stats
L1 Enter

2nd 1

Clear

Use Your calc to Find

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

2) $S = 10.480 \approx \boxed{10}$ }

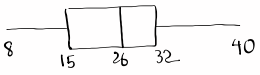
3) $S^2 = \boxed{\frac{4992}{45}}$ } Reduced Fraction

Min = 8
$Q_1 = 15$
Med = 26
$Q_3 = 32$
Max = 40

} 5-Number Summary

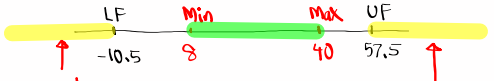
Oct 30-9:42 AM

Min = 8
$Q_1 = 15$
Med = 26
$Q_3 = 32$
Max = 40
5-Number Summary



To find S^2 in reduced fraction
VARS | 5: Statistics | 3: S_x
χ^2 | MATH | 1: ▶Frac | Enter
$S^2 = \frac{4942}{45}$
MATH | 2: ▶Dec | Enter
$109.8\overline{2}$

$IQR = Q_3 - Q_1 = 32 - 15 = 17$
Upper Fence $= Q_3 + 1.5(IQR) = 32 + 1.5(17) = 57.5$
Lower Fence $= Q_1 - 1.5(IQR) = 15 - 1.5(17) = -10.5$



Nothing there
NO outlier
Nothing there

Oct 31-7:28 AM

$\bar{x} = 24$ $S = 10$

By empirical Rule

68% Range $\rightarrow \bar{x} \pm S = 24 \pm 10 \rightarrow$ 14 to 34

95% Range $\rightarrow \bar{x} \pm 2S = 24 \pm 2(10) \rightarrow$ 4 to 44

"Usual Range"

99.7% Range $\rightarrow \bar{x} \pm 3S = 24 \pm 3(10) \rightarrow$ -6 to 54

Oct 31-7:35 AM

What is Standard deviation?

Sample Standard deviation $\rightarrow S \rightarrow S \geq 0$

$S = \sqrt{S^2}$ ← Variance

$S^2 = \frac{\sum (x-\bar{x})^2}{n-1}$ or $S^2 = \frac{n\sum x^2 - (\sum x)^2}{n(n-1)}$

Standard deviation is a number that indicates the spread of data elements from the mean.

If S is Small → Data elements are close to $\bar{x}$.

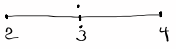
If S is big → Data elements are more spread out from $\bar{x}$.

If $S = 0$ → All data elements are identical and equal to $\bar{x}$.

Oct 31-7:38 AM

Consider the Sample below

2, 3, 3, 3, 4



$n = 5$ $\quad \sum x = 15$ $\quad \sum x^2 = 47$

$\bar{x} = \frac{\sum x}{n} = \frac{15}{5} = 3$

$S^2 = \frac{n\sum x^2 - (\sum x)^2}{n(n-1)} = \frac{5 \cdot 47 - 15^2}{5(5-1)} = \frac{10}{20} = .5$

$S = \sqrt{S^2} = \sqrt{.5} \approx .707$

Small S

Data elements are close to $\bar{x} = 3$

Oct 31-7:47 AM

Consider the Sample below

1 3 3 3 90

$n = 5$ $\quad \sum x = 100$ $\quad \sum x^2 = 8128$

$\bar{x} = \frac{\sum x}{n} = \frac{100}{5} = 20$

$S^2 = \frac{n\sum x^2 - (\sum x)^2}{n(n-1)} = \frac{5 \cdot 8128 - 100^2}{5(5-1)} = \frac{30640}{20} = 1532$

$S = \sqrt{1532} = 39.141$ Big S

Data elements are more spread out from $\bar{x}$.

Oct 31-7:51 AM

Given $n = 12$, $\sum x = 72$, $\sum x^2 = 432$

$\bar{x} = \frac{\sum x}{n} = \frac{72}{12} = \boxed{6}$

$S^2 = \frac{n\sum x^2 - (\sum x)^2}{n(n-1)} = \frac{12 \cdot 432 - (72)^2}{12(12-1)} = \frac{0}{132} = \boxed{0}$

$S = \sqrt{S^2} = \sqrt{0} = \boxed{0}$ Since $S = 0$

$\Rightarrow$ All data elements are identical and equal to $\bar{x} = 6$.

Oct 31-7:57 AM

Clear all lists

Store the Sample below in L1

18	12	10	20	25
15	19	24	17	16
28	30	5	32	21

$n = 15$

Mode → No Mode

Use Stat → CALC → 1:1-Var Stats

68% Range

$\bar{x} \pm S \rightarrow 19 \pm 8 \rightarrow$ 11 to 27

95% Range

$\bar{x} \pm 2S \rightarrow 19 \pm 2(8) \rightarrow$ 3 to 35

with L1 to find

$\bar{x} = 19.467 \approx 19$

$S = 7.511 \approx 8$

$S^2 = \frac{5923}{105}$

VARS | 5:Statistics | 3:S_x

χ^2 | MATH | 1:▶Frac | Ent

Oct 31-8:03 AM

Now Redo 1-Var Stats with L1

- Min = 5
- $Q_1 = 15$
- Med = 19
- $Q_3 = 25$
- Max = 32

5-Number Summary

$IQR = Q_3 - Q_1 = 10$

Upper fence $= Q_3 + 1.5(IQR)$

$= 25 + 1.5(10) =$ 40

Lower fence $= Q_1 - 1.5(IQR)$

$= 15 - 1.5(10) =$ 0

NO Outliers

Oct 31-8:12 AM

Class Qz 6

Consider the Following

5 – Number Summary

10 40 46 50 60

min Q_1 Med Q_3 Max

1) Draw Box Plot

2) IQR

$= Q_3 - Q_1 =$ 10

3) upper fence

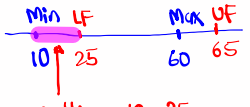
$UF = Q_3 + 1.5(IQR)$

$= 50 + 1.5(10) =$ 65

4) Lower fence

$LF = Q_1 - 1.5(IQR)$

$= 40 - 1.5(10) =$ 25



Outliers 10 – 25

Oct 31-8:21 AM

How to find $\bar{x}$ and s for group data using TI:

Class limits	class MP	class F	Cum. F
12 – 20	16	4	4
21 – 29	25	7	11
30 – 38	34	9	20
39 – 47	43	5	25

1) 4 classes

2) CW = 9

21 – 12 = 9

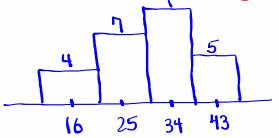
30 – 21 = 9

39 – 30 = 9

3) class MP $= \frac{\text{class limits}}{2}$

4) $n = 25$

5) Draw histogram using class MP & class F



clear all lists

class MP → L1

class F → L2

L1	L2
16	4
25	7
34	9
43	5

STAT → CALC

1: 1-Var Stats

Menu

List: L1

FreqList: L2

Calculate

No Menu

1-Var Stats

L1, L2

Enter

$\bar{x} = 30.4$

$s = 9$

$n = 25$

$s^2 = 81$

Oct 31-8:52 AM

Consider the chart below

Class MP	Class F
20	6
30	9
40	10
50	4
60	5

L1 L2

1) 5 classes

2) CW = 10

3) $n = \sum f = 6+9+10+4+5 = 34$

Class MP → L1

Class F → L2

Use 1-Var Stats with L1 & L2 to find

$\bar{x} = 37.941$

$S = 12.975$

$n = 34$

Find S^2 in reduced fraction

VARS | 5: Statistics | 3: S_x | x^2

MATH | 1: ▶Frac | Enter

$S^2 = \frac{94450}{561}$

Oct 31-9:05 AM

Complete the chart below

Class BNDRS	Class MP (L1)	Class F (L2)	Cum. F
14.5 – 22.5	18.5	3	3
22.5 – 30.5	26.5	7	10
30.5 – 38.5	34.5	15	25
38.5 – 46.5	42.5	10	35
46.5 – 54.5	50.5	5	40

1) 5 classes

2) CW = 8

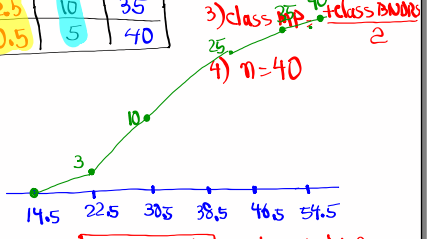
22.5 − 14.5 = 8

30.5 − 22.5 = 8

3) class MP = $\frac{\text{class BNDRS}}{2}$

4) n = 40

5) Draw ogive



6) Class MP → L1

Class F → L2

Use 1-Var Stats with L1 & L2

$\bar{x} = 35.9$

$S = 8.854$

$n = 40$

Find S^2 in reduced fraction

$S^2 = \frac{392}{5}$

Oct 31-9:13 AM

Clear all lists.

Store the following in L1

63	85	90	72	75
50	100	58	68	70
80	82	95	100	59
60	65	65	70	78
80	80	90	84	90

$n = 25$

Now let's Sort L1

STAT Edit 2:SortA(L1 Enter

View L1, Make STEM Plot

2nd 1 Enter

{50 58 59 60 ... 100 100}

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

How many data elements are below 80?

13

What % of data elements are below 80?

13 is what % of 25?

$\frac{13}{25} \cdot 100 = 52$

52%

Oct 31-9:26 AM

use 1-Var Stats with L1 to find

$\bar{x} = 76.36$

$s = 13.601$

$n = 25$

Find s^2 in reduced fraction

$s^2 = \frac{18499}{100}$

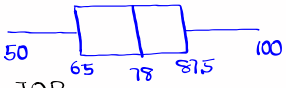
- Min = 50
- $Q_1 = 65$
- Med = 78
- $Q_3 = 87.5$
- Max = 100

Oct 31-9:38 AM

Min = 50
Q_1 = 65
Med = 78
Q_3 = 87.5
Max = 100

5-Number Summary

Draw Box Plot



IQR
$= Q_3 - Q_1 = 87.5 - 65 = \boxed{22.5}$

Upper Fence $= Q_3 + 1.5(IQR) = 87.5 + 1.5(22.5) = \boxed{121.25}$

Lower Fence $= Q_1 - 1.5(IQR) = 65 - 1.5(22.5) = \boxed{31.25}$

Any outliers? None

Oct 31-9:42 AM