Statistics

Lecture 4

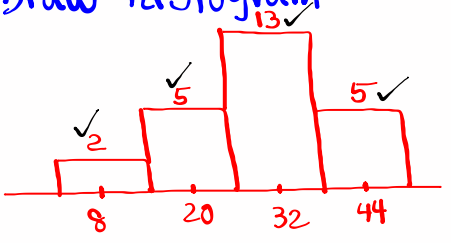
Feb 19-8:47 AM

Class QZ 3

Consider the table below

Class MP	Class F
8	2
20	5
32	13
44	5

1) Draw histogram



2) Sample Size

$n = 2 + 5 + 13 + 5 = 25$ ✓

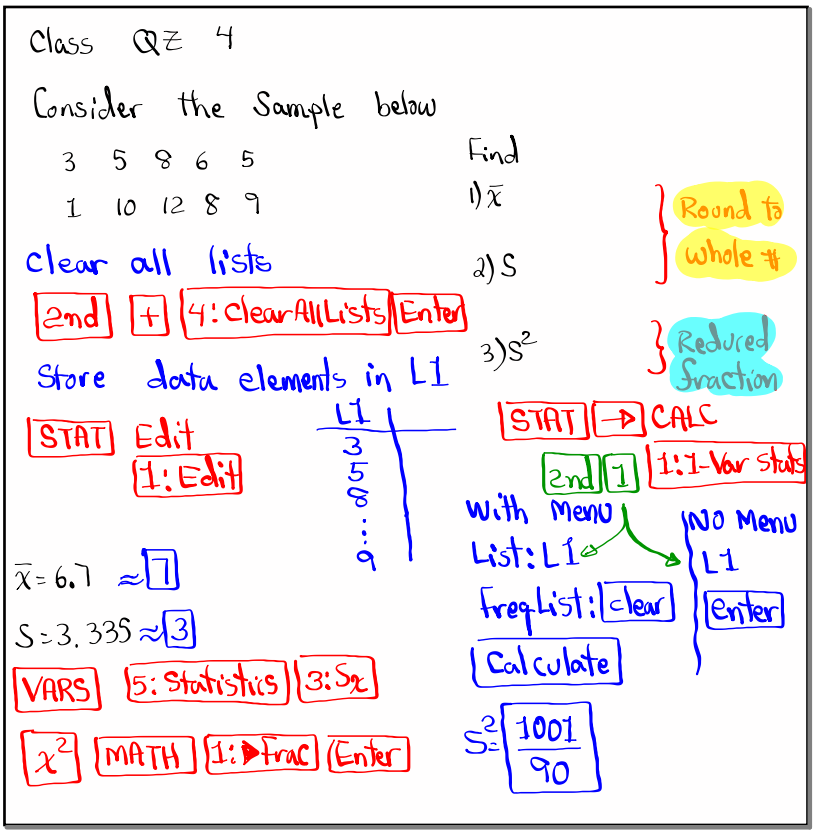
4 classes

CW = 20 − 8 = 12

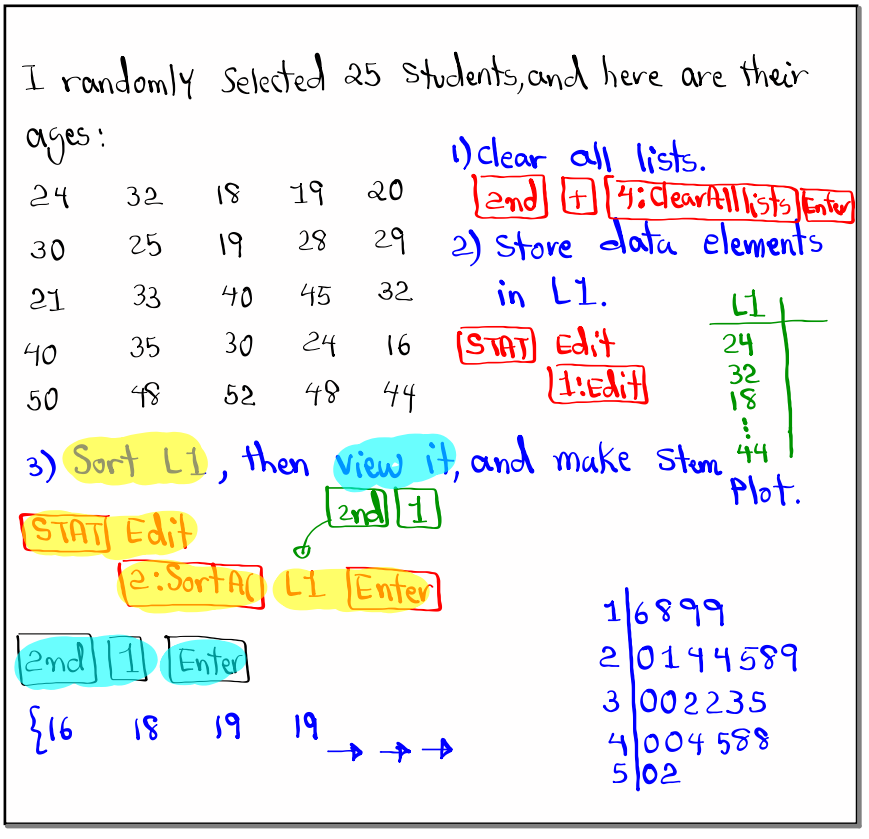
= 32 − 20 = 12

= 44 − 32 = 12

Feb 20-9:26 PM



Feb 27-6:28 PM



Feb 27-7:15 PM

Find $\bar{x}$ & s. Round to 1-decimal.

STAT → CALC

1:1-Var Stats

with Menu
List: L1
FreqList: clear
Calculate

NO Menu
L1
Enter

$\bar{x} = 32.08 \approx 32.1$

$s = s_x = 11.090 \approx 11.1$

what about s^2?

VARS
5: Statistics
3: s_x
x^2 Enter

$s^2 = 122.99\overline{3}$

Convert to reduced fraction
MATH 1:▶Frac
Enter

$n = 25$

Min = 16
$Q_1 = 22.5$
Med = 30
$Q_3 = 42$
Max = 52

5-Number Summary

$s^2 = \frac{18449}{150}$

Feb 27-7:26 PM

we had the following STEM Plot.

1	6 8 9 9
2	0 1 4 4 5 8 9
3	0 0 2 2 3 5
4	0 0 4 5 8 8
5	0 2

1) $n = 25$

2) How many data elements are below 40? 17

3) What % of data elements are below 40?

17 is what % of 25?

$\frac{17}{25} \cdot 100 = 68$ 68%

4) Range = 52 − 16 = 36

5) Midrange = $\frac{52+16}{2} = 34$

6) Estimate s

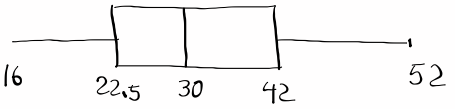
$s \approx \frac{\text{Range}}{4} = \frac{36}{4} = 9$

Feb 27-7:34 PM

We had the following 5-Number Summary:

Min = 16
Q_1 = 22.5
Med = 30
Q_3 = 42
Max = 52

1) Box Plot



2) IQR = $Q_3 - Q_1 = 42 - 22.5 =$ 19.5

3) Upper fence: $Q_3 + 1.5(IQR) = 42 + 1.5(19.5) =$ 71.25

Lower fence: $Q_1 - 1.5(IQR) = 22.5 - 1.5(19.5) =$ -6.75

4) Discuss outliers. No outliers

5) What % of students were below 42? Q_3

75%

Feb 27-7:40 PM

Working with grouped data

Class limits	Class MP	Class F
12 – 20	16	4
21 – 29	25	8
30 – 38	34	13
39 – 47	43	5

(+9, +9, +9)

1) Find all class MP.
2) Clear all lists.
Store class MP in L1
" " F in L2

L1	L2
16	4
25	8
34	13
43	5

STAT → CALC
1: 1-Var Stats

With Menu
List: L1
FreqList: L2
Calculate
2nd 1
2nd 2

No Menu
L1 , L2 Enter
1

$\bar{x} = 30.7$
$S_x = 8.351$
$n = 30$

Find S^2 in reduced fraction.
VARS 5: Statistics
3: S_x x^2
Math 1: ▶Frac Enter

$S^2 = \frac{20223}{290}$ ✓

Feb 27-7:46 PM

Percentile

1) Data must be Sorted.

2) Notation P_K

K% | (100-K)%

P_K

ex. P_{10} 10% | 90% at P_{10}

ex. P_{85} 85% | 15% at P_{85}

How to find P_K

Location $L = \frac{K}{100} \cdot n$

If decimal → Round-up P_K = Lth element

If whole # $P_K = \frac{\text{Lth element} + \text{Next one}}{2}$

3 | 025
4 | 00389
5 | 1235578
6 | 03568
7 | 235
8 | 04

1) $n = 25$

2) Find P_{20}

$L = \frac{20}{100} \cdot 25 = 5$

20% | 80% at 41.5

$P_{20} = \frac{5\text{th element} + \text{Next one}}{2}$

$= \frac{40 + 43}{2}$

$= \boxed{41.5}$

Feb 27-8:14 PM

3 | 025
4 | 00389
5 | 1235578
6 | 03568
7 | 235
8 | 04

3) Find P_{50} Median

$L = \frac{50}{100} \cdot 25 = 12.5$

$L = 13$

P_{50} = 13th element

50% | 50% at 55

$= \boxed{55}$

Doing Reverse:

Find K such that $P_K = 72$

80% | 20% at 72

$K = \frac{B}{n} \cdot 100$ (B: Below) Round to whole %

$K = \frac{20}{25} \cdot 100 = 80$ → $\boxed{P_{80} = 72}$

Feb 27-8:21 PM

Consider the Stemp Plot below

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

1) $n = 25$

2) Range = 55

3) Mode = 75

4) Estimate $S = \frac{\text{Range}}{4} = \frac{55}{4} = 13.75$

5) Find P_{30}

$L = \frac{30}{100} \cdot 25 = 7.5 \rightarrow L = 8 \rightarrow P_{30} = 8\text{th element}$

30% | 70%

68 = 68

6) Find P_{80}

$L = \frac{80}{100} \cdot 25 = 20 \rightarrow P_{80} = \frac{20\text{th element} + \text{Next one}}{2}$

80% | 20%

86 $= \frac{86 + 86}{2} = 86$

7) Find K such that $P_K = 75$ (Below)

$K = \frac{B}{n} \cdot 100 = \frac{70}{25} \cdot 100 = 40$

$P_{40} = 75$

40% | 60%

75

Feb 27-8:26 PM

Z - Score

It is a numerical value that indicates how many standard deviations is the data element from the mean. Always round to 3-decimal places.

$Z = \frac{x - \bar{x}}{s}$

If $-2 \leq Z \leq 2 \rightarrow$ Data element is usual.

If $Z < -2$ or $Z > 2 \rightarrow$ Data element is unusual

Unusual | Usual | Unusual

-2 2

Z Score is a way to Standardize data elements, then we can compare different data sets.

Feb 27-8:35 PM

Majid got 88 on exam 1. $\bar{x}=82$, $S=5$

$$Z=\frac{x-\bar{x}}{S}=\frac{88-82}{5}=\frac{6}{5}=\boxed{1.2}$$ Usual Score

Majid got 80 on exam 2. $\bar{x}=70$, $S=4$.

$$Z=\frac{x-\bar{x}}{S}=\frac{80-70}{4}=\frac{10}{4}=\boxed{2.5}$$ Unusual Score

Feb 27-8:40 PM

Lisa makes \$6000/mo. as a nurse and

Mark makes \$5000/mo as a Sales man.

Who is doing better?

Nurses : $\bar{x}=5200$ and $S=800$

Salemen : $\bar{x}=4500$ and $S=500$

Lisa $Z=\frac{6000-5200}{800}=1$ ⇒ Perform the Same

Mark $Z=\frac{5000-4500}{500}=1$

Feb 27-8:44 PM

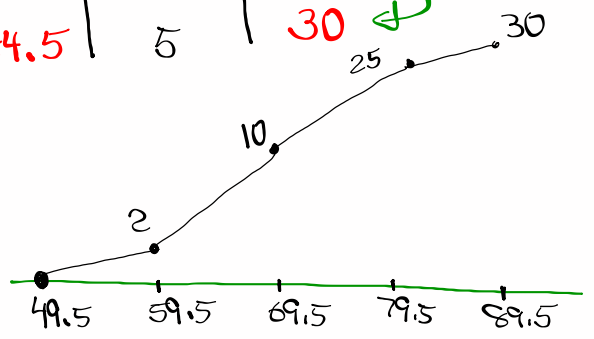
Complete the chart below

Class BNDRS	Class MP	Class F	Cum. F
49.5 – 59.5	54.5	2	2
59.5 – 69.5	64.5	8	10
69.5 – 79.5	74.5	15	25
79.5 – 89.5	84.5	5	30

+10

Sample Size

Ogive



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Clear all lists

Class MP → L1

Class F → L2

$\bar{x} = 72.1\overline{6} \approx 72$

$S = 8.172 \approx 8$

$n = 30$

L1	L2
54.5	2
64.5	8
74.5	15
84.5	5

STAT → CALC

1:1-Var Stats

List: L1

FreqList: L2

Calculate

NO Menu

L1, L2

Enter

Find S^2 in Reduced Fraction

$S^2 = \frac{5810}{87}$

Feb 27-8:55 PM

Use the rounded answer, find

68% Range $\bar{x} \pm s = 72 \pm 8 \Rightarrow$ 64 to 80

95% Range $\bar{x} \pm 2s = 72 \pm 2(8) \Rightarrow$ 56 to 88

Usual Range

SG 7 & 8

Feb 27-9:00 PM

Consider the chart below

x	y
2	6
3	10
3	8
4	12
5	16

clear all lists

$x \to L1$

$y \to L2$

No Sorting

STAT → CALC

2: 2-Var Stats

$\Sigma x = 17$

$\Sigma x^2 = 63$

$n = 5$

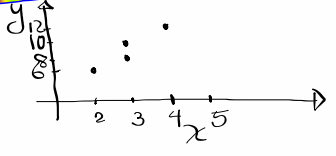
$\Sigma y = 52$

$\Sigma y^2 = 600$

$\Sigma xy = 194$

With Menu	No Menu
x list: L1	L1, L2
Y list: L2	1
Freq List: clear	enter
Calculate	

Scatter Plot



Feb 27-9:04 PM

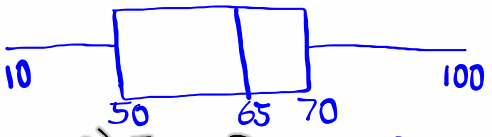
class QZ 5

Consider the following

5 - Number Summary

10 50 65 70 100

1) Draw Box Plot



2) IQR $= Q_3 - Q_1$

$= 70 - 50 = \boxed{20}$

3) upper fence & Lower fence.

Upper fence $= 70 + 1.5(20) = \boxed{100}$

Lower fence $= 50 - 1.5(20) = \boxed{20}$

Feb 27-9:14 PM