Statistics
Fall 2022
Lecture 6

Class QZ 5

Consider the chart below

Class BNDRS	Class F	Cum. F
12.5 - 20.5	2	2 ✓
20.5 - 28.5	8	10 ✓
28.5 - 36.5	5	15 ✓

Cum. F.

Draw ogive

"clearly label"

I randomly selected 24 exams, and here are the scores

75	83	52	100	80
65	68	95	90	88
70	72	94	86	86
60	58	70	77	89
90	80	70	60	

Clear all lists
[2nd] [+] 4:Clear all lists [Enter]

Reset all lists
[STAT] Edit 5:Set up Editor [Enter]

Store this Sample in L1
[STAT] Edit 1:Edit

Sort L1
[STAT] Edit 2:SortA([2nd] [1] [Enter]

View L1
[2nd] [1] [Enter]

{52 58 60 60 65 100}

Make STEM Plot

5	28
6	0058
7	000257
8	0036689
9	0045
10	0

Range = 100 − 52 = 48

Estimate $S \approx \frac{\text{Range}}{4} = \frac{48}{4} = 12$

Use your Calc to find [STAT] [→] CALC
1:1-Var Stats

$\bar{x} = 77.417$

$\Sigma x = 1858$

$\Sigma x^2 = 147762$

$S_x = 13.058$

$n = 24$

Min = 52

$Q_1 = 69$

Med = 78.5

$Q_3 = 88.5$

Max = 100

With Menu:
List: L1
FreqList: clear
Calculate

[2nd] [1]

No Menu:
1-Var Stats L1 [Enter]

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

$S^2 = \frac{23531}{138}$

Min = 52

Q_1 = 69

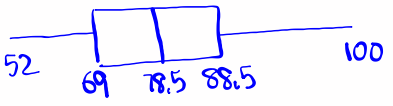
Med = 78.5

Q_3 = 88.5

Max = 100

5-Number Summary

Draw Box Plot



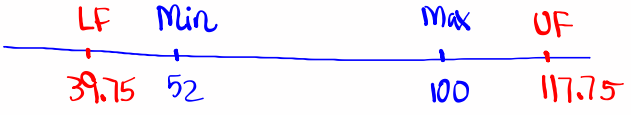
$IQR = Q_3 - Q_1$

$= 88.5 - 69 = \boxed{19.5}$

Upper Fence $= Q_3 + 1.5(IQR) = 88.5 + 1.5(19.5) = \boxed{117.75}$

Lower Fence $= Q_1 - 1.5(IQR) = 69 - 1.5(19.5) = \boxed{39.75}$

Discuss outliers



No outliers

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

$\bar{x} \approx 77$, $s \approx 13$

1) 68% Range

$\bar{x} \pm s = 77 \pm 13 \Rightarrow \boxed{64 \text{ to } 90}$

2) Usual Range "95% Range" $\Rightarrow \bar{x} \pm 2s = 77 \pm 2(13)$

$\Rightarrow \boxed{51 \text{ to } 103}$

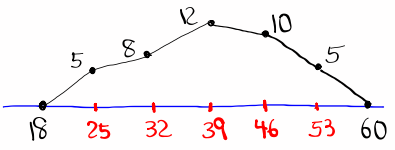
Clear all lists.

Class MP → L1 , Class F → L2

Class MP	Class F
25	5
32	8
39	12
46	10
53	5

(+7, +7, +7, +7)

Draw Freq. Polygon



Use L1 & L2 to find

$\bar{x} = 39.35$

$S_x = 8.529$

$n = 40$

Min = 25

$Q_1 = 32$

Med. = 39

$Q_3 = 46$

Max = 53

STAT → CALC

1:1-Var Stats

With Menu:

- ✓ List: L1 (2nd 1)
- ✓ freqList: L2 (2nd 2)
- ✓ Calculate

No Menu:

1-Var Stats L1, L2 Enter

above 7

Find S^2 in reduced fraction

$S^2 = \frac{9457}{130}$

VARS 5: Statistics 3: S_x

χ^2 MATH 1: ▶Frac Enter

Min = 25

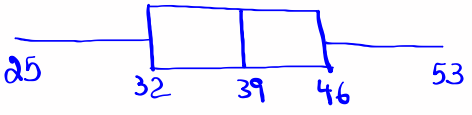
$Q_1 = 32$

Med. = 39

$Q_3 = 46$

Max = 53

Draw Box Plot



$IQR = Q_3 - Q_1 = 14$

Upper Fence

$= Q_3 + 1.5(IQR) = 67$

Lower Fence

$= Q_1 - 1.5(IQR) = 11$

Discuss outliers

Nothing below LF

Nothing above UF

⇒ No outliers

What is Standard deviation?

It is a non-negative numerical value that indicates how data elements are spread from the mean.

Sample standard deviation $\Rightarrow S$

$S \geq 0$, $S = \sqrt{S^2}$, $S \approx \frac{\text{Range}}{4}$

If S is small $\Rightarrow$ data elements are close to $\bar{x}$.

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

If $S = 0$ $\Rightarrow$ All data elements are the same and equal to $\bar{x}$.

Clear all lists.

Store the following in L1

10 10 10 10 10

Use 1-Var Stats with L1 to find

$\bar{x} = 10$ $S = 0$

Go back to L1, change the first 10 to 11

Now use 1-var Stats with L1 to find

$\bar{x} = 10.2$ $S = .447$ 11 10 10 10 10

Go back to L1, change the first 11 to 100

Now use 1-var Stats with L1 to find

$\bar{x} = 28$ $S = 40.249$ 100 10 10 10 10

Go back to L1, change the first 100 to 1000

Now use 1-var Stats with L1 to find

$\bar{x} = 208$ $S = 442.741$ 1000 10 10 10 10

Z- Score

Always round to 3-decimal Places.

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

Z-Score indicates how many Standard deviations is the data element above or below the mean.

It is a method to standardize data elements.

We can use Z-Scores to compare data elements from different samples.

Suppose $\bar{x} = 82$ and $S = 8$

Find Z-Score for 94.

$$Z = \frac{x - \bar{x}}{S} = \frac{94 - 82}{8} = 1.5$$

94 is 1.5 Standard deviations above $\bar{x}$.

Since $-2 \le Z \le 2 \Rightarrow$ 94 is a usual data element.

Find Z-Score for 62.

$$Z = \frac{x - \bar{x}}{S} = \frac{62 - 82}{8} = \boxed{-2.5}$$

62 is 2.5 Standard deviations below the mean.

Since $Z < -2 \Rightarrow$ 62 is unusual data element.

Find the data element with Z-Score of 1.75.

x $\quad Z = 1.75$

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

$$1.75 = \frac{x - 82}{8}$$

→ Cross-Multiply

$$x - 82 = 8(1.75)$$

$$x = 82 + 8(1.75)$$

$$\boxed{x = 96}$$

Lisa makes \$6500/month as a nurse.

John makes \$8000/month as a Salesman.

Who is doing better?

Nurse ⇒ $\bar{x} = 6000$, $s = 200$

Salesman ⇒ $\bar{x} = 7800$, $s = 500$

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

$= \frac{6500 - 6000}{200}$

$= \boxed{2.5}$

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

$= \frac{8000 - 7800}{500}$

$= \boxed{.4}$

Lisa is doing better

$Z_{Lisa} > Z_{John}$

$2.5 > .4$

Consider the STEM Plot below

3	0 2 6
4	0 1 4 8 9
5	2 3 5 5 8 8 9
6	4 4 4 7 8 9
7	3 5 5
8	0

1) $n = 25$

2) Range $= 80 - 30 = 50$

3) Midrange $= \frac{80+30}{2} = 55$

4) Mode $= 64$

5) Estimate $S \approx \frac{\text{Range}}{4} = \boxed{12.5}$

6) How many data elements are below 50? 8

7) what % of data elements are below 50?

8 is what percent of 25?

32% below 50 | 68% above

$\frac{8}{25} \cdot 100 = \boxed{32\%}$

8) what % of data elements are below 70?

$\frac{21 \text{ are below } 70}{25 \text{ total}} \cdot 100 = \frac{21}{25} \cdot 100$

84% Below 70 | 16% Above

$= \boxed{84\%}$

Class QZ 6:

Consider the 5-number Summary given below

40 , 50 , 60, 66, 80

1) Draw Box Plot

2) Find $IQR = Q_3 - Q_1 = \boxed{16}$

3) Upper fence $= Q_3 + 1.5(IQR) = \boxed{90}$

4) Lower fence $= Q_1 - 1.5(IQR) = \boxed{26}$