

Statistics
Summer 2023
Lecture 3



Feb 19-8:47 AM

class QZ 2

Complete the chart below

class BNDRS	class F	Cum. F.
18.5 - 26.5	3	3
26.5 - 34.5	7	10
34.5 - 42.5	2	12

1) 3 Rows \rightarrow 3 classes

2) Sample Size n

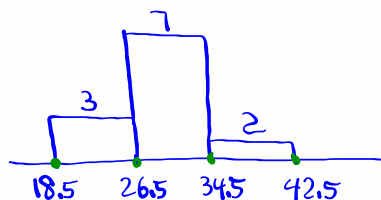
$$n = \sum f = 3 + 7 + 2 = 12$$

3) class width

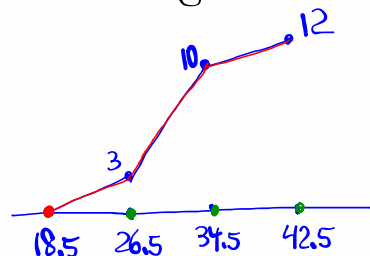
$$CW = 26.5 - 18.5 = 8$$

Draw (clearly label)

1) Histogram (No gap)



2) Ogive (Increasing)



Jun 13-11:44 AM

Consider the Sample below

0 8 5 4 1) $n = 8$

4 4 5 1 2) $\text{Min} = 0$ 3) $\text{Max} = 8$

4) $\text{Range} = \text{Max} - \text{Min} = 8$ 5) $\text{Midrange} = \frac{\text{Max} + \text{Min}}{2} = 4$ 6) $\text{Mode} = 4$

7) $\sum x = 0 + 8 + 5 + 4 + 4 + 4 + 5 + 1 = 31$ 8) $\sum x^2 = 0^2 + 8^2 + 5^2 + 4^2 + 4^2 + 4^2 + 5^2 + 1^2 = 163$

9) $\bar{x} = \frac{\sum x}{n} = \frac{31}{8} = 3.875$ 10) $S^2 = \frac{n \sum x^2 - (\sum x)^2}{n(n-1)} = \frac{8 \cdot 163 - 31^2}{8(8-1)} = \frac{343}{56} = 6.125$

$\bar{x} \approx 4$ 11) $S = \sqrt{S^2} = \sqrt{6.125} \approx 2.475$

$S \approx 2$

Using Empirical Rule

12) 68% Range $\Rightarrow \bar{x} \pm S = 4 \pm 2 \Rightarrow 2 \text{ to } 6$

13) 95% Range $\Rightarrow \bar{x} \pm 2S = 4 \pm 2(2) \Rightarrow 0 \text{ to } 8$ Usual Range

Jun 14-7:37 AM

Given: $n=10$, $\text{Min}=1$, $\text{Max}=7$, $\sum x=36$, $\sum x^2=162$

1) $\text{Range} = \text{Max} - \text{Min} = 6$ 2) $\text{Midrange} = \frac{\text{Max} + \text{Min}}{2} = 4$

3) $\bar{x} = \frac{\sum x}{n} = \frac{36}{10} = 3.6$ 4) Estimate $S \approx \frac{\text{Range}}{4} = \frac{6}{4} = 1.5$

$\bar{x} \approx 4$

5) find $S = \sqrt{S^2} = \sqrt{3.6} = 1.897$ 6) $S^2 = \frac{n \sum x^2 - (\sum x)^2}{n(n-1)} = \frac{10 \cdot 162 - 36^2}{10(10-1)} = \frac{324}{90} = 3.6$

$S \approx 2$

Use Empirical Rule, find

7) Usual Range $\Rightarrow \bar{x} \pm 2S = 4 \pm 2(2) = 0 \text{ to } 8$ 95% Range

8) 99.7% Range $\Rightarrow \bar{x} \pm 3S = 4 \pm 3(2) = -2 \text{ to } 10$

Jun 14-7:50 AM

A sample of 200 students had the following 5-number summary of their ages. $\rightarrow 200 \div 4 = 50$

15 20 32 36 80
 ↑ ↑ ↑ ↑ ↑
 Min Q_1 Median Q_3 Max

1) Draw Box Plot (clearly label)

2) $IQR = Q_3 - Q_1 = 36 - 20 = 16$

3) Upper Fence = $Q_3 + 1.5(IQR) = 36 + 1.5(16) = 60$

4) Lower Fence = $Q_1 - 1.5(IQR) = 20 - 1.5(16) = -4$

Range = Max - Min = $80 - 15 = 65$

Estimated $S \approx \frac{\text{Range}}{4} = \frac{65}{4} = 16.25$

Jun 14-8:03 AM

I randomly selected 18 students and graded their exams. Here are the scores

52 58 60 65 69 1) $n = 18$

73 76 76 76 79 2) Range = $100 - 52 = 48$

82 85 88 88 90 3) Midrange = $\frac{100 + 52}{2} = 76$

95 98 100 4) Mode = 76 5) Estimate $S \approx \frac{\text{Range}}{4} = \frac{48}{4} = 12$
 Range Rule-of-Thumb

6) Make STEM Plot (Data must be Sorted)

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

7) How many data elements are below 70? 5

8) What % of data elements are below 70?
 $\frac{5}{18} \cdot 100 \approx 28\%$
 About 28% are below 70.

Jun 14-8:15 AM

We can verify that $\sum x = 1410$ & $\sum x^2 = 113718$

Find

9) $\bar{x} = \frac{\sum x}{n} = \frac{1410}{18} = 78.3 \approx 78$

10) $S^2 = \frac{n \sum x^2 - (\sum x)^2}{n(n-1)} = \frac{18 \cdot 113718 - 1410^2}{18(18-1)} = \frac{58824}{306} \approx 192.235$

11) $S = \sqrt{S^2} = \sqrt{192.235} = 13.865 \approx 14$

$S \approx 14$

Using Empirical Rule, find

12) 68% Range
 $\bar{x} \pm S = 78 \pm 14 \Rightarrow 64 \text{ to } 92$

13) Usual Range
 95% Range
 $\bar{x} \pm 2S = 78 \pm 2(14) = 50 \text{ to } 106$

Jun 14-8:28 AM

Class QZ 3

Given: $n=8$, $\sum x = 69$, $\sum x^2 = 627$

Find (Round 3-decimal)

1) $\bar{x} = \frac{\sum x}{n} = \frac{69}{8} = 8.625$ ✓

2) $S^2 = \frac{n \sum x^2 - (\sum x)^2}{n(n-1)} = \frac{8 \cdot 627 - 69^2}{8(8-1)} = \frac{255}{56} = 4.554$ ✓

3) $S = \sqrt{S^2} = \sqrt{4.554} = 2.134$ ✓

Round \bar{x} & S to whole #, use empirical rule to find

68% Range
 $\bar{x} \pm S = 9 \pm 2 \Rightarrow 7 \text{ to } 11$

Usual Range
 95% Range
 $\bar{x} \pm 2S = 9 \pm 2(2) \Rightarrow 5 \text{ to } 13$

99.7% Range
 $\bar{x} \pm 3S = 9 \pm 3(2) \Rightarrow 3 \text{ to } 15$

Jun 14-8:39 AM

Z-Score

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

Always round to 3-decimal Places.

$-2 \leq Z \leq 2 \Rightarrow$ usual data element

$Z < -2$ or $Z > 2 \Rightarrow$ Unusual data element

Suppose $\bar{x} = 88$ and $S = 10$

Find Z-Score if $x = 100$.

$$Z = \frac{x - \bar{x}}{S} = \frac{100 - 88}{10} = \frac{12}{10} = \boxed{1.2}$$

Since $-2 \leq Z \leq 2 \Rightarrow 100$ is a usual data element.

Find x if $Z = -2.8$

$$Z = \frac{x - \bar{x}}{S} \quad -2.8 = \frac{x - 88}{10}$$

Since $Z = -2.8$ is below -2 , then $x = 60$ is unusual data element.

Cross-Multiply
 $x - 88 = 10(-2.8)$
 $x - 88 = -28$
 $x = -28 + 88$
 $x = \boxed{60}$

Jun 14-9:09 AM

Suppose 40 nurses had a mean monthly salary of \$6200 with standard deviation of \$400.

1) Lisa makes \$6875/month.
 what is her Z-Score. $Z = \frac{x - \bar{x}}{S} = \frac{6875 - 6200}{400}$
 Lisa's salary is usual $Z = \boxed{1.688}$
 $-2 \leq Z \leq 2$

Suppose 40 Salesmen had a mean salary of \$5800 with standard deviation of \$500.

2) Jose makes \$6875, just like Lisa.
 what is his Z-Score? $Z = \frac{x - \bar{x}}{S} = \frac{6875 - 5800}{500}$
 Jose's salary is unusual (high) $Z > 2$ $Z = \boxed{2.15}$
 Jose is doing much better.

3) Tom is also a nurse, his Z-Score is -1.6 . Find his salary.
 $Z = \frac{x - \bar{x}}{S} \quad -1.6 = \frac{x - 6200}{400}$
 $x - 6200 = -1.6(400)$ Cross-Multiply,
 $x = -1.6(400) + 6200$ Solve for x .
 $x = \boxed{\$5560}$

Jun 14-9:16 AM

TI Instructions

1) To clear the Screen

clear

2) To clear all lists.

2nd **+** **4:ClearAllLists**

Enter

3) To quit

2nd **MODE**

4) To reset all lists.

STAT **Edit**

5:Set Up Editor

Enter

Jun 14-9:29 AM

How to store data elements in a list.

Store the following sample in a List.

8 2 10 3 1

STAT **Edit**
1:Edit

L1
8 **enter**
2 **enter**
⋮
1 **enter**

Now quit

2nd **MODE**

How to view L1:

2nd **1** **Enter**

{ 8 2 10 3 1 }

L1

Jun 14-9:35 AM

How to Sort a list:

STAT Edit 2nd 1 Enter
2:SortA() L1

Now view L1

2nd 1 Enter { 1 2 3 8 10 }

Jun 14-9:44 AM

How to find \bar{x} & S :

STAT \rightarrow CALC
1:1-Var Stats
 Menu:
 List: L1
 Freq List: clear
Calculate
 No Menu:
 1-Var Stats L1
Enter

$\bar{x} = 4.8$
 $S_x = 3.962$
 $n = 5$
 $\rightarrow \sum x = 24$ $\sum x^2 = 178$

How to find S^2

VARS 5: Statistics 3: S_x x^2 Enter

How to convert to reduced fraction 15.7

MATH 1: \rightarrow Frac Enter $\frac{157}{10}$

clear all lists \rightarrow 2nd + 4: clear all lists Enter

Reset all lists \rightarrow Stat Edit Enter
5: Set up Editor

Jun 14-9:47 AM

I randomly selected 10 students, here are their ages:

25 30 24 18 32
20 28 40 19 35

Store them in L1

[STAT] Edit
[1:Edit]

L1
25
30
⋮
35

quit & clear screen

[2nd] [Mode] [clear]

Let's view L1

[end] [1] [Enter] { 25 30 24 18 32 →
→ → →
← ←

Jun 14-10:00 AM

Let's sort L1, then view it.

[STAT] Edit [end] [1] [Enter] [end] [1] [Enter]
[2:SortA]

{ 18 19 20 24
→ → →
← ← ←

Find \bar{x} , s , and n .

[STAT] → [CALC] [1:1-Var stats] [L1] [Enter]
with menu List: L1 [end] [1]
FreqList: [clear] [calculate]

$\bar{x} = 27.1$
 $s = s_x = 7.264$
 $n = 10$

5-Number Summary
Min = 18
Q1 = 20
Med. = 26.5
Q3 = 32
Max = 40

$\sum x = 271$ $\sum x^2 = 7819$

No Menu

Jun 14-10:08 AM

Now find S^2

VARS 5: Statistics 3: Sx χ^2 Enter

52.76

Convert to reduced fraction

MATH 1: ▸ Frac Enter

$\frac{1583}{30}$

Jun 14-10:16 AM

Complete the following chart

class limits	class MP	class F
15 - 27	21	3
28 - 40	34	7
41 - 53	47	10
54 - 66	60	5

1) 4 Rows → 4 classes

2) $n = \sum f = 25$

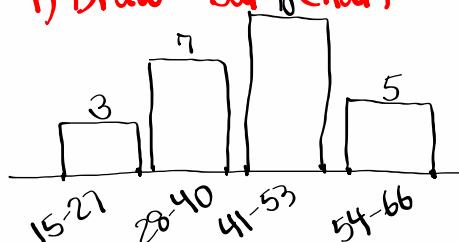
3) CW = 13

$28 - 15 = 13$

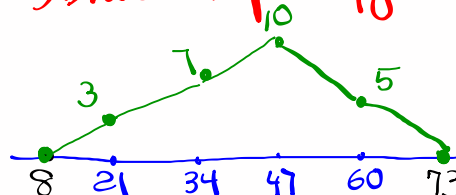
$41 - 28 = 13$

$54 - 41 = 13$

4) Draw Bar chart



5) Draw Freq. Polygon



Jun 14-10:40 AM

How to find \bar{x} , S , and n for grouped data.

- 1) Clear all lists.
- 2) Reset all lists.
- 3) class MP \rightarrow L1, class F \rightarrow L2

L1	L2
21	3
34	7
47	10
60	5

STAT \rightarrow CALC
 1: 1-Var stats
 with Menu: 2nd [1] \rightarrow L1, 2nd [2] \rightarrow L2
 List: L1
 FreqList: L2
 Calculate

No Menu
 $\bar{x} = 42.84$
 $S = S_x = 12.287$
 $n = 25$

Find S^2 in reduced fraction
 VARS 5: Statistics 3: S_x x^2 Enter
 150.973
 MATH 1: \rightarrow frac Enter
 $\frac{11323}{75}$

Jun 14-10:52 AM

Complete the chart below:

class BNDRS	class MP	class F	Cum. F
17.5 - 27.5	22.5	4	4
27.5 - 37.5	32.5	8	12
37.5 - 47.5	42.5	13	25
47.5 - 57.5	52.5	5	30

4 Rows \rightarrow 4 classes
 CW = 10
 27.5 - 17.5
 $n = 30$

Draw ogive

Jun 14-11:04 AM

Find \bar{x} , S , and n using class MP & class F.

1) clear all lists.
 2) Reset all lists.
 3) class MP \rightarrow L1, class F \rightarrow L2

L1	L2
22.5	4
32.5	8
42.5	13
52.5	5

STAT \rightarrow CALC
 1: 1-Var Stats
 with Menu
 List: L1
 Freqlist: L2
 Calculate

No Menu
 L1, L2 Enter
 $\bar{x} = 38.8\bar{3}$
 $S = S_x = 9.279$
 $n = 30$

Find S^2 in reduced fraction.

VARS 5: Statistics 3: S_x x^2 Enter 86.092
 MATH 1: Frac Enter $\frac{7490}{87}$

Jun 14-11:14 AM

I randomly selected 25 exams, and here are the scores:

82	75	100	55	60	✓ 1) clear all lists ✓ 2) Store this data in L1 ✓ 3) Sort L1
80	50	90	94	92	
78	70	92	63	67	
70	75	84	90	93	
69	75	88	99	79	

STAT Edit 2nd 1
 2: SortA Enter

4) Now view L1, and make

STEM Plot
 2nd 1 Enter

{ 50 55 60 63 67 \rightarrow
 \rightarrow \rightarrow \rightarrow
 \leftarrow \leftarrow

5	05
6	0379
7	0055589
8	0248
9	0022349
10	0

Jun 14-11:24 AM

5	05
6	0379
7	0055589
8	0248
9	0022349
10	0

5) How many data elements are below 70? **6**

6) what % of data elements are below 70?

$$\frac{6}{25} \cdot 100 \Rightarrow \boxed{24\%}$$

Find \bar{x} , S , and n .

STAT \rightarrow CALC No Menu
 1:1-Var Stats L1 **Enter**

$\bar{x} = 78.8$
 $S = S_x = 13.611$
 $n = 25$

With Menu
 List: L1
 FreqList: **clear**
Calculate

Min = 50
 $Q_1 = 69.5$
 Med. = 79
 $Q_3 = 91$
 Max = 100

Jun 14-11:35 AM

Find S^2 in **reduced fraction**

VARs **5: Statistics** **3: S_x** **x^2** **Enter**

MATH **1: \rightarrow Frac** **Enter**

185.25

Class QZ 4

How important is it to learn
 Your TI-83 or TI-84 Calc?

Jun 14-11:41 AM