Math 110
Winter 2021
Lecture 4

Cont. on Ch.3 SG 5-9

1) Clear the Screen: Clear

2) Clear all lists: 2nd + 4:Clearall lists Enter

I randomly collected 25 exams, here are the results:

72	85	68	90	100
55	95	75	80	98
52	65	73	79	92
78	84	84	75	99
100	92	83	70	60

Store this in L1

STAT Edit 1: Edit

L1
72 enter
85 "
68 "
⋮
60 "

Let's quit 2nd MODE

Clear the Screen clear

Let's Sort L1: STAT Edit 2:SortA(L1 Enter

2nd 1

Let's view L1

2nd 1 Enter

L1

{52 55 60 → → →

Make Stem Plot

5	25
6	058
7	02355 89
8	03445
9	02258 9
10	00

$n = 25$ Min = 52 Max = 100 Range = 100 − 52 = 48

Midrange $= \frac{100+52}{2} = 76$ MODE = 75, 84, 92, 100 Multi modal

What % of this Sample falls below 75? $\frac{8}{25} \cdot 100 = 32\%$

Let's find $\bar{x}$ & S_x Estimate $S \approx \frac{\text{Range}}{4} = \frac{48}{4} = 12$

$\bar{x}$: Sample Mean S_x: Sample Standard deviation

2nd 1

STAT → CALC

1: 1-Var Stats

With Menu: List: L1, Freq List: Clear, Calculate

No Menu: 1-Var Stats L1 Enter

$\bar{x} = 80.16$

$S_x = S = 13.858$

$n = 25$

5-Number Summary:
Min = 52
$Q_1 = 71$
Med = 80
$Q_3 = 92$
Max = 100

Box Plot

$IQR = Q_3 - Q_1 = 92 - 71 = 21$

Upper Fence $= Q_3 + 1.5(IQR)$
$= 92 + 1.5(21)$
$= 123.5$

Lower Fence $= Q_1 - 1.5(IQR)$
$= 71 - 1.5(21)$
$= 39.5$

Our Sample does not have any outlier.

Find S^2

VARS 5: Statistics

3: S_x x^2 Enter

$S^2 = 192.057$ $S^2 = \frac{57617}{300}$

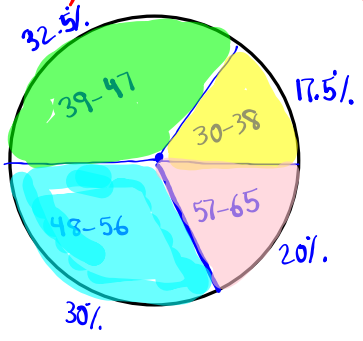
MATH 1: ▶Frac Enter

Consider the following Chart

Class Limits	Class MP	Class F	Cum F	Rel. F	% F
30 – 38	34	7	7	.175	17.5%
+9 39 – 47	43	13	20	.325	32.5%
+9 48 – 56	52	12	32	.300	30.0%
+9 57 – 65	61	8	40	.200	20.0%

4 classes, Class width = 9, $n = 40$, Rel. F $= \frac{F}{n} = \frac{F}{40}$

Pie Chart
- Circle
- % F
- label for slices "class limits"



How to find $\bar{x}$ & S for group data

Class MP → L1, Class F → L2

Clear all lists: 2nd + 4: clear all lists Enter

Store class MP in L1 & class F in L2 (No Sorting)

STAT Edit 1:

L1	L2
34	7
43	13
52	12
61	8

quit: 2nd MODE

2nd 2

2nd 1

STAT → CALC 1:1-Var Stats

With Menu: List: L1, Freq List: L2, Calculate

No Menu: 1-Var Stats L1, L2, 1, Enter

$\bar{x} = 47.725$

$S_x = S = 9.112$

$n = 40$

Find S^2

VARS 5: Statistics 3: S_x x^2 Enter

$S^2 = 83.025$ Convert to a reduced fraction

MATH 1: ▶Frac Enter $S^2 = \frac{3321}{40}$

Given $n=8$, $\sum x = 643$, $\sum x^2 = 52309$, Min $=65$, Max $=95$

1) Range $=$ Max $-$ Min
$= 95 - 65$
$= \boxed{30}$

2) Midrange $= \frac{\text{Max}+\text{Min}}{2}$
$= \frac{95+65}{2} = 80$

3) Estimate S
$S \approx \frac{\text{Range}}{4} = \frac{30}{4}$
$= \boxed{7.5}$

4) Class width for

1) 4 classes
$CW = \frac{\text{Range}}{4} = \frac{30}{4} = 7.5$
$\boxed{CW = 8}$

2) 5 classes
$CW = \frac{\text{Range}}{5} = \frac{30}{5} = 6$
$\boxed{CW = 7}$

5) $\bar{x} = \frac{\sum x}{n} = \frac{643}{8} = \boxed{80.375}$

6) $s^2 = \frac{n\sum x^2 - (\sum x)^2}{n(n-1)}$
$= \frac{8 \cdot 52309 - 643^2}{8(8-1)}$
$= \frac{5023}{56} = \boxed{89.696}$

7) Find s
$s = \sqrt{s^2} = \sqrt{\frac{5023}{56}} = \boxed{9.471}$

Consider the Stem Plot below

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

Data is Sorted

1) $n = 20$

2) Range $= 53 - 19 = 34$

3) Estimate $S \approx \frac{\text{Range}}{4} = \frac{34}{4} = \boxed{8.5}$

4) How many data elements are below 30? 5

5) what % of data elements are below 30?

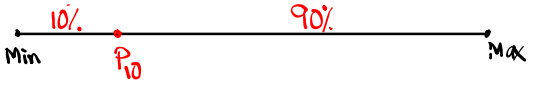
$\frac{5}{20} \cdot 100 = 25 \Rightarrow \boxed{25\%}$

6) what % of data elements are below 40?

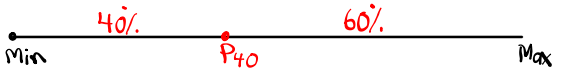
$\frac{12}{20} \cdot 100 = 60 \Rightarrow \boxed{60\%}$

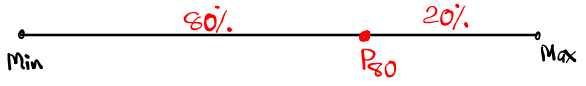
Percentile: Data must be Sorted.

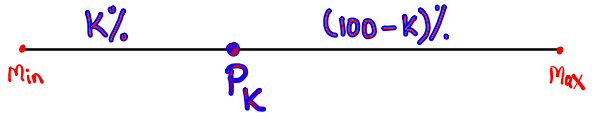
P_{10} ⇒ It is a numerical value that separates the bottom 10% from the top 90%.



P_{40} ⇒ It is a value that separates the bottom 40% from the top 60%.







How to Find P_K: Data must be Sorted

1) Find location $L = \frac{K}{100} \cdot n$

If L is decimal ⇒ Round up ⇒ P_K = Lth element

If L is a whole # ⇒ $P_K = \frac{\text{Lth element} + \text{Next element}}{2}$

2	0357
3	01335589
4	0235558 89
5	2345566 788
6	34

$n = 32$

Find P_{20}

$L = \frac{20}{100} \cdot 32 = 6.4$ $L = 7$

P_{20} = 7th element

$\boxed{P_{20} = 33}$

Find P_{45}

$L = \frac{45}{100} \cdot 32 = 14.4$ $L = 15$

P_{45} = 15th element $P_{45} = 45$

Find P_{80}

$L = \frac{80}{100} \cdot 32 = 25.6$ $L = 26$

P_{80} = 26th element $\boxed{P_{80} = 56}$

Suppose we find L = 20 (whole #)

$P_K = \frac{\text{20th element} + \text{Next element}}{2} = \frac{49+52}{2} = \boxed{50.5}$

Find K Such that $P_K = 48$

$K = \frac{B}{n} \cdot 100$ (B: Below; convert to %; n: Sample Size)

$K = \frac{17}{32} \cdot 100 = 53.125$

$\boxed{K \approx 53}$

53% below it & 47% above it

5	0 1 2 2 5 8
6	0 2 4 4 5 5 7 8 9
7	1 2 3 3 3 4 5 5 7 8 8 9
8	0 1 2 3 4 4 7 7 7 8 9
9	2 3 5 5 6 6 8 8 9
10	0

$n = 48$

Find P_{10}

$L = \frac{10}{100} \cdot 48 = 4.8$

$L = 5$ $P_{10} =$ 5th element

$\boxed{P_{10} = 55}$

Find P_{75}

$L = \frac{75}{100} \cdot 48 = 36$

$P_{75} = \frac{36\text{th element} + \text{Next element}}{2}$

$= \frac{87 + 88}{2} = \boxed{87.5}$

Find k Such that

$P_k = 65$ ← Below

$PR = K = \frac{B}{n} \cdot 100$

$= \frac{10}{48} \cdot 100 = 20.83$

$K \approx 21$

So $P_{21} = 65$

21% fall below it.

79% " above it.

What is standard deviation?

$S \geq 0$

It is a numerical value that indicates how data elements vary with respect to $\bar{x}$.

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

If S is big ⇒ data elements vary alot from $\bar{x}$. (More deviation)

If $S = 0$ ⇒ All data elements are the same as the mean $\bar{x}$.

Class QZ 2

Class BNDRS	Class F	Cum. F
17.5 – 25.5	3	
25.5 – 33.5	10	
33.5 – 41.5	7	
41.5 – 49.5	5	

Draw
Histogram & ogive