Statistics
Summer 2022
Lecture 2

Consider the data below

2, 3, 5, 5, 10

1) Sample Size $\boxed{n = 5}$

2) Range = Max − Min
$= 10 - 2 = \boxed{8}$

3) Midrange $= \frac{\text{Max} + \text{Min}}{2} = \frac{10+2}{2} = \boxed{6}$

4) Mode $= \boxed{5}$

5) $\Sigma x = 2+3+5+5+10 = \boxed{25}$

6) $\Sigma x^2 = 2^2+3^2+5^2+5^2+10^2 = \boxed{163}$

7) $\frac{\Sigma x}{n} = \frac{25}{5} = \boxed{5}$

8) $\frac{n\Sigma x^2 - (\Sigma x)^2}{n(n-1)} = \frac{5 \cdot 163 - 25^2}{5(5-1)}$

$= \frac{190}{20} = \boxed{\frac{19}{2}}$

I randomly selected 20 exams, and here the scores

52 55 60 63 68
68 70 75 75 75
79 80 82 85 85
85 88 92 96 100

1) $n = 20$

2) Range $= 100 - 52 = 48$

3) Midrange $= \frac{100+52}{2} = 76$

4) Mode: 75 & 85
Bimodal

5) $\frac{\text{Range}}{4} = \frac{48}{4} = 12$

6) STEP Plot

5	25
6	03 88
7	05559
8	02 5558
9	26
10	0

7) what percent of this data falls below 80?

$\frac{11}{20} \cdot 100 = 55\%$

55% | 45%
80

Let's make a freq. table with 3 classes.

class width $= \frac{\text{Range}}{\#\text{ classes}}$ → $CW = \frac{48}{3} = 16$ +1

If decimal ⇒ Round-up

If whole ⇒ Add 1

$CW = 17$

class limits	class BNDRS	class MP	class F.	Cum. F	Rel. F	% F
52 – 68	51.5 – 68.5	60	6	6	.3	30%
69 – 85	68.5 – 85.5	77	10	16	.5	50%
86 – 102	85.5 – 102.5	94	4	20	.2	20%

+CW +CW

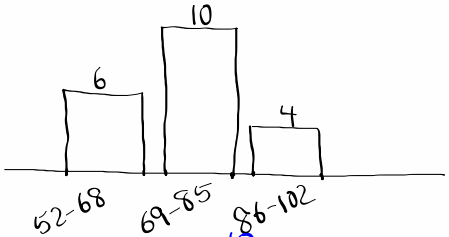
n = 20

68.5
68 69

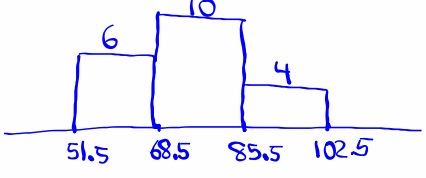
class MP $= \frac{\text{class limits}}{2} = \frac{\text{class BNDRS}}{2}$

Rel. F $= \frac{f}{n} = \frac{f}{20}$

Bar chart
- class limits
- class F

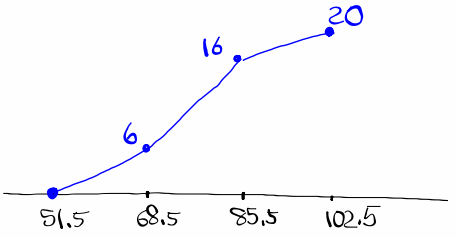


Histogram
- class BNDRS
- class F



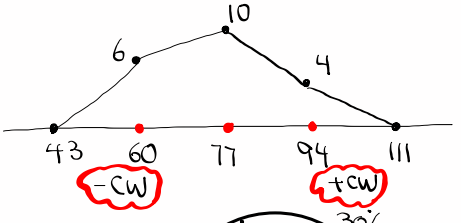
Ogive

- Class BNDRS
- Cum. F.



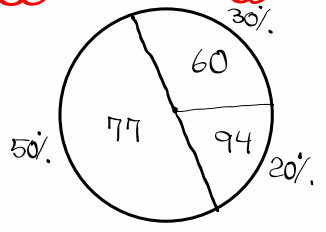
Freq. Polygon

- Class MP
- Extra MP, one on each side
- Class F



Pie Chart

- Circle
- % F is for size of slice.
- Class MP to name each slice



I randomly selected 25 students. Here are their ages.

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

1) $n = 25$

2) Range $= 70 - 18 = \boxed{52}$

3) Midrange $= \frac{70+18}{2} = \boxed{44}$

4) Mode = None

5) Find class width for a freq. table with

a) 4 classes

$CW = \frac{\text{Range}}{4}$

$= \frac{52}{4} = 13$

If whole $\Rightarrow$ +1

$\boxed{CW = 14}$

b) 5 classes

$CW = \frac{\text{Range}}{5}$

$= \frac{52}{5} = 10.4$

If decimal $\Rightarrow$ Round-up

$\boxed{CW = 11}$

Make a freq. table with 5 classes CW = 11

class limits	class BNDRS	class MP	class F	Cum. F	Rel. F	% F
18 – 28	17.5 – 28.5	23	6	6	.24	24%
29 – 39	28.5 – 39.5	34	7	13	.28	28%
40 – 50	39.5 – 50.5	45	6	19	.24	24%
51 – 61	50.5 – 61.5	56	3	22	.12	12%
62 – 72	61.5 – 72.5	67	3	25	.12	12%

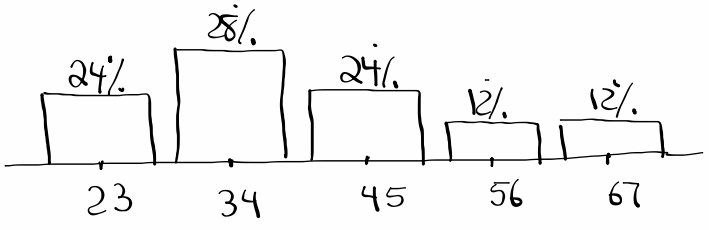
$n = 25$

28 — 29, 28.5 , class MP = $\frac{\text{class limits}}{2}$, Rel. F = $\frac{f}{n} = \frac{f}{25}$

what % of these students are between 29 & 61, inclusive? 28% + 24% + 12% = 64%

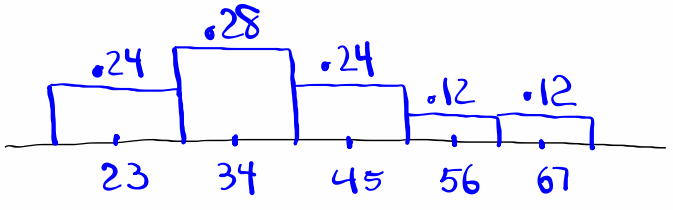
Bar chart

- class MP
- % F

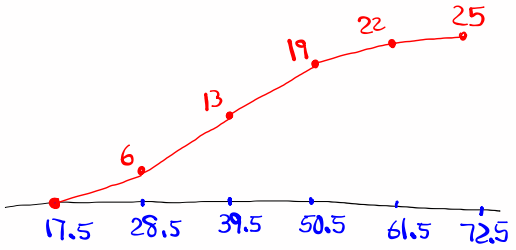


Histogram

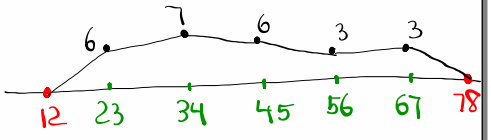
- class MP
- Rel. F.



Ogive
- Class BNDRS
- Com. F.

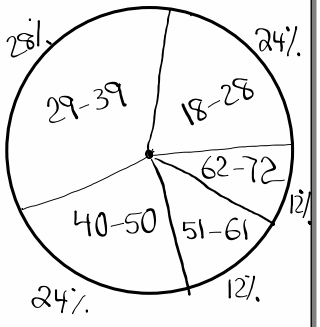


Freq. Polygon
- Class MP
- Extra MP, one on each side
- Class F



Pie Chart
- class limits (Name each Slice)
- % F (Size of each Slice)
- Circle

SG 3 & 4



Basic Computations in Statistics:

n → Sample Size

x → Data element

$\sum x$ → Summation of x → Add all data elements

$\bar{x}$ → x-bar → Sample Mean (Average)

$\bar{x} = \frac{\sum x}{n}$

Consider the Sample below
0 2 3 5 10

1) $n = 5$

2) Range $= 10 - 0 = 10$

3) Midrange $= \frac{10+0}{2} = 5$

4) Mode = None

5) $\sum x = 0 + 2 + 3 + 5 + 10 = 20$

6) $\bar{x} = \frac{\sum x}{n} = \frac{20}{5} = 4$

Consider the Sample below

2 3 7 8 15 20 25 30

1) $n = 8$

2) $\Sigma x = 2+3+7+8+15+20+25+30 = 110$

3) $\bar{x} = \frac{\Sigma x}{n} = \frac{110}{8} = 13.75$

a) Round to a whole # → 14

b) Round to 1-decimal. → 13.8

n → Sample Size

x → Data element

x^2 → Data element^2

Σx → Add all data elements

Σx^2 → Square each data element, then add.

$\bar{x}$ → Sample Mean → $\bar{x} = \frac{\Sigma x}{n}$

s^2 → Sample Variance → $s^2 = \frac{\Sigma (x-\bar{x})^2}{n-1}$

Use $s^2 = \frac{n\Sigma x^2 - (\Sigma x)^2}{n(n-1)}$

Consider the Sample below

3 5 7 9 9

1) $n = \boxed{5}$ 2) Mode $= \boxed{9}$

3) $\Sigma x = 3+5+7+9+9 = \boxed{33}$

4) $\Sigma x^2 = 3^2+5^2+7^2+9^2+9^2 = \boxed{245}$

5) $\bar{x} = \frac{\Sigma x}{n} = \frac{33}{5} = \boxed{6.6}$

6) $s^2 = \frac{n\Sigma x^2 - (\Sigma x)^2}{n(n-1)} = \frac{5 \cdot 245 - 33^2}{5(5-1)} = \frac{136}{20} = \boxed{6.8}$

6.8 [MATH] [1: ▶Frac] [Enter] $= \boxed{\frac{34}{5}}$

Given: $n = 8$, $\Sigma x = 57$, $\Sigma x^2 = 433$

Min $= 4$, Max $= 10$

1) Range $= 10-4 = \boxed{6}$ 2) Midrange $= \frac{10+4}{2} = \boxed{7}$

3) $\bar{x} = \frac{\Sigma x}{n} = \frac{57}{8} = \boxed{7.125}$

whole → 7

1-decimal → 7.1

2-decimal → 7.13

4) $s^2 = \frac{n\Sigma x^2 - (\Sigma x)^2}{n(n-1)} = \frac{8 \cdot 433 - 57^2}{8(8-1)} = \frac{215}{56}$

215 [▫/▫] 56 [Math] [1: ▶Frac]

Math [Enter]

2: ▶Decimal

Enter $\frac{215}{56} \approx 3.839$

Sample Standard Deviation s:

$s \geq 0$

To find $s \Rightarrow s = \sqrt{s^2}$

To estimate $s \Rightarrow s \approx \frac{\text{Range}}{4}$

"The range rule-of-thumb"

Given $n = 8$ $\quad \Sigma x = 96$ $\quad \Sigma x^2 = 1290$

Min $= 7$ $\quad$ Max $= 20$

Range $= \boxed{13}$ $\quad$ Midrange $= \boxed{13.5}$

$\bar{x} = \frac{\Sigma x}{n} = \frac{96}{8} = \boxed{12}$

$s^2 = \frac{n\Sigma x^2 - (\Sigma x)^2}{n(n-1)}$

$= \frac{8 \cdot 1290 - 96^2}{8(8-1)} = \frac{1104}{56}$

1104 ÷ 56 MATH 1:▶Frac Enter $= \boxed{\frac{138}{7}}$

Find s

$s = \sqrt{s^2} = \sqrt{\frac{138}{7}} \approx \boxed{4.440}$

2nd x^2 (138 ÷ 7) Enter

Estimate s

$s \approx \frac{\text{Range}}{4} = \frac{13}{4} = \boxed{3.25}$

Consider the Sample below

3 4 4 5 5

1) $n = 5$ 2) Mode = 4 & 5 3) $\Sigma x = 21$

4) $\Sigma x^2 = 91$ 5) $\bar{x} = \frac{\Sigma x}{n} = \frac{21}{5} = 4.2$

6) $S^2 = \frac{n\Sigma x^2 - (\Sigma x)^2}{n(n-1)} = \frac{5 \cdot 91 - 21^2}{5(5-1)} = \frac{14}{20} = \frac{7}{10} = .7$

7) find $S = \sqrt{S^2} = \sqrt{.7}$

From algebra $\sqrt{x} = x^{.5}$

$\sqrt{.7} = .7^{.5} =$ .837

.7 [^] .5 [Enter]

Z - Score ⟷ To standardize

$Z = \frac{x - \bar{x}}{S}$ Always round to 3-decimal places.

Z score is a value that indicates how many Standard deviation is the data element above or below the mean.

It allows us to compare data elements from different Samples.

$-2 \leq Z \leq 2$ ⇒ usual element

$Z < -2$ or $Z > 2$ ⇒ unusual element.

Noelle got 90 on exam 1 and 79 on exam 2.

Exam 1: $\bar{x} = 82$, $S = 5$ $\quad z = \frac{x - \bar{x}}{S} = \frac{90 - 82}{5} = \frac{8}{5} = \boxed{1.6}$

Exam 2: $\bar{x} = 70$, $S = 4$ $\quad z = \frac{x - \bar{x}}{S} = \frac{79 - 70}{4} = \frac{9}{4} = \boxed{2.25}$

Mark had a z-Score of -1.5 on exam 2.

What was his Score? $\quad z = \frac{x - \bar{x}}{S}$

Make Sure to bring TI-83 or TI-84 to class tomorrow.

$$-1.5 = \frac{x - 70}{4}$$

Cross-multiply

$$x - 70 = 4(-1.5)$$

$$x = 70 - 6 \quad \boxed{x = 64}$$