

Elementary Statistics Lecture 2



I randomly Selected 20 exams and here are the Scores:

52 55 60 63 68 ① $n = 20$

68 70 75 75 75 ② $\text{Range} = \text{Max} - \text{Min}$
 $= 100 - 52 = 48$

79 80 82 85 85 ③ $\text{Midrange} = \frac{\text{Max} + \text{Min}}{2}$
 $= \frac{100 + 52}{2} = 76$

85 88 92 96 100 ④ mode: 75 & 85 Bimodal

we like to make a freq. table with 3 classes. Organize the data

we need class width.

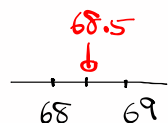
$$\text{class width} = \frac{\text{Range}}{\# \text{ of classes}} = \frac{48}{3} = 16$$

If decimal \Rightarrow Round-up

If whole \Rightarrow Add 1

$$\boxed{CW = 17}$$

Class limits	Class BNDRS	class MP	Class F	Cum. F	Rel. F	% F
52 - 68	51.5 - 68.5	60	6	6	.300	30%
69 - 85	68.5 - 85.5	77	10	16	.500	50%
86 - 102	85.5 - 102.5	94	4	20	.200	20%

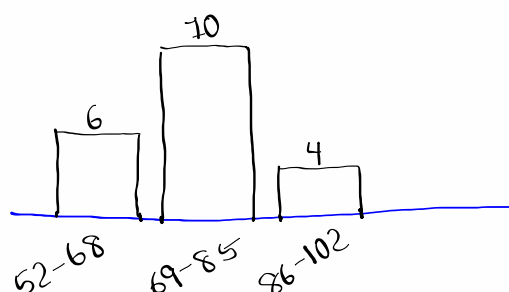


$$\text{class MP} = \frac{\text{+class limits}}{2} = \frac{\text{+class BNDRS}}{2}$$

$$\text{Rel. F} = \frac{f}{n} = \frac{6}{20}$$

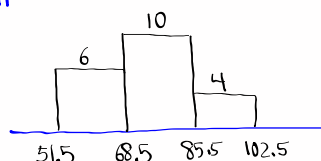
Bar chart

- class limits
- class F



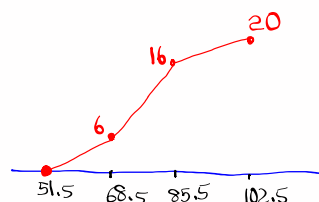
Histogram

- class BNDRS or class MP
- class F, Rel. F.



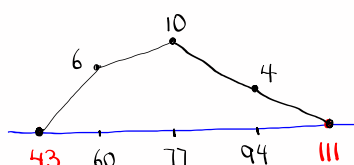
Ogive

- class BNDRS
- Cum. F
- start at 0 level



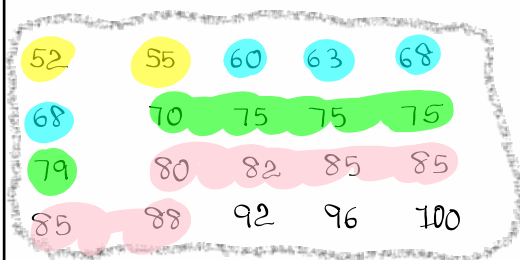
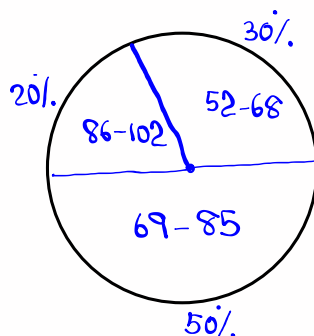
Freq. Polygon

- class MP
- Extra MP, one on each side
- class F
- start & finish at 0 level



Pie Chart

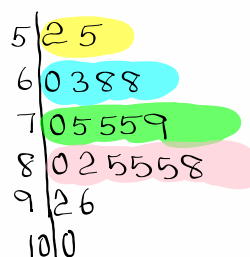
- Circle
- class limits or class MP to name each slice
- % F



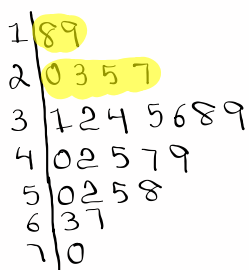
Sorted

SG 3 & 4

STEM Plot



I randomly selected 25 students. their ages are given below in the form of Stem Plot.



1) $n = 25$

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

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

4) Mode: None

5) Find class width if we wish to have

a) 4 classes

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

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

whole \rightarrow Add 1 \Rightarrow $CW = 14$

b) 5 classes

$$CW = \frac{\text{Range}}{5} = \frac{52}{5} = 10.4$$

decimal \Rightarrow Round-up

$$CW = 11$$

6) Construct 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	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%

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

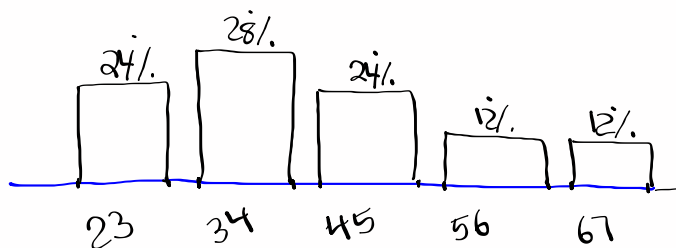
$$\text{Rel. F} = \frac{f}{n} = \frac{f}{25}$$

what % of these students were between 29 & 61, inclusive? $28\% + 24\% + 12\% = \boxed{64\%}$

Bar chart

- class MP

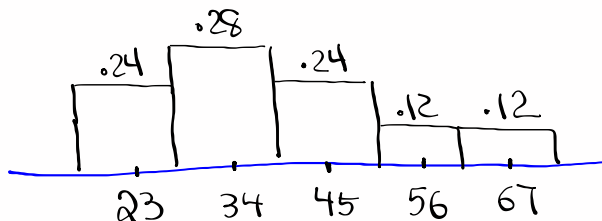
- % F



Histogram

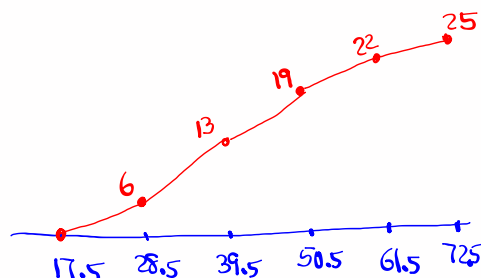
- class MP

- Rel. F.



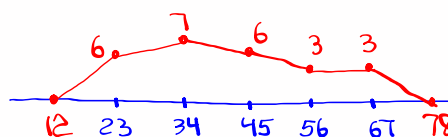
Ogive

- class BNDPS
- Cum. F



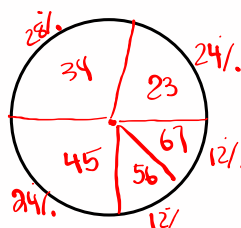
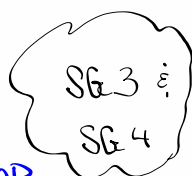
Freq. Polygon

- class MP
- Extra MP
- class F



Pie Chart

- Circle
- % F
- class MP



$n \rightarrow$ Sample Size

$x \rightarrow$ Data element

$\sum x \rightarrow$ Summation of $x \rightarrow$ Sum of data elements

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

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

Consider the Sample below

0 2 3 5 10

$$n = 5$$

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

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

Given 2, 3, 7, 8, 15, 20, 25, 30

$$n = 8$$

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

$$\bar{x} = \frac{\sum x}{n} = \frac{110}{8} = 13.75$$

$n \rightarrow$ Sample Size $\sum x \rightarrow$ Sum of data element

$x \rightarrow$ Data element

$x^2 \rightarrow$ Data element² $\sum x^2 \rightarrow$ Sum of data elements²

$\bar{x} \rightarrow$ Sample Mean $\bar{x} = \frac{\sum x}{n}$

$S^2 \rightarrow$ Sample Variance $S^2 = \frac{\sum (x - \bar{x})^2}{n - 1}$

$$S^2 = \frac{n \sum x^2 - (\sum x)^2}{n(n-1)}$$

Consider the sample below:

3 5 7 9 9

$$n = 5 \quad \sum x = 33$$

$$\text{mode} = 9 \quad \bar{x} = \frac{\sum x}{n} = \frac{33}{5} = 6.6$$

$$\sum x^2 = 3^2 + 5^2 + 7^2 + 9^2 + 9^2 = 245$$

$$S^2 = \frac{n \sum x^2 - (\sum x)^2}{n(n-1)} = \frac{5 \cdot 245 - 33^2}{5(5-1)} = \frac{136}{20} = 6.8$$

Sample Standard Deviation:

$$\text{Find} \rightarrow S = \sqrt{S^2}$$

$$\text{Estimate} \rightarrow S \approx \frac{\text{Range}}{4} \quad \text{"The Range rule-of-thumb"}$$

Given: $n=8$, $\sum x=96$, $\sum x^2=1290$, $\text{Min}=7$, $\text{Max}=20$

$$\text{Range} = \text{Max} - \text{Min} = 20 - 7 = 13$$

$$\text{Midrange} = \frac{\text{Max} + \text{Min}}{2} = \frac{20 + 7}{2} = 13.5$$

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

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

$$1104 \div 56 \text{ [MATH] } 1 \div \text{Frac [Enter] } \boxed{S^2 = \frac{138}{7}}$$

$$S = \sqrt{S^2}$$

Estimate S

$$138 \div 7 \text{ [Enter] } - - -$$

$$\wedge .5 \text{ [Enter] } \boxed{4.440}$$

$$S \approx \frac{\text{Range}}{4}$$

$$= \frac{13}{4} \boxed{3.25}$$

You can start SG 5