Statistics

Lecture 2

Feb 19-8:47 AM

I randomly selected 20 students and here are their ages.

SG 3 & 4

18	19	19	20	21
24	24	25	25	28
30	30	31	33	35
36	39	40	45	48

1) Sample Size $n = 20$

2) Min. = 18, Max. = 48

3) Range = Max − Min
$= 48 - 18 = \boxed{30}$

4) Midrange $= \frac{\text{Max} + \text{Min}}{2} = \frac{48+18}{2} = \frac{66}{2} = \boxed{33}$

5) Mode: 19, 24, 25, 30 Multimodal

6) STEM plot (Data must be Sorted)

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

I want to organize this Sample into 4 groups (classes)

Class width $= \frac{\text{Range}}{\#\text{ of classes}} = \frac{30}{4} = 7.5$

If decimal → Round-up

$\boxed{CW = 8}$

If whole # → Add 1

Jan 10-4:31 PM

Freq. table

class limits	class BNDRS	class MP	class F	Cum. F	Rel. F	% F
18 – 25	17.5 – 25.5	21.5	9	→ 9	.45	45%
26 – 33	25.5 – 33.5	29.5	5	14	.25	25%
34 – 41	33.5 – 41.5	37.5	4	18	.20	20%
42 – 49	41.5 – 49.5	45.5	2	20	.10	10%

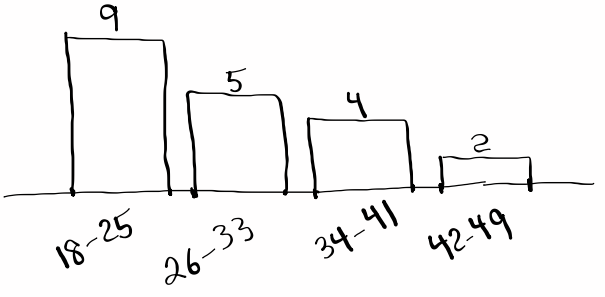
we need 4 Rows because we have 4 groups.

CW = 8, 25 ↑ 26, 25.5, class MP $= \frac{\text{class limits}}{2}$

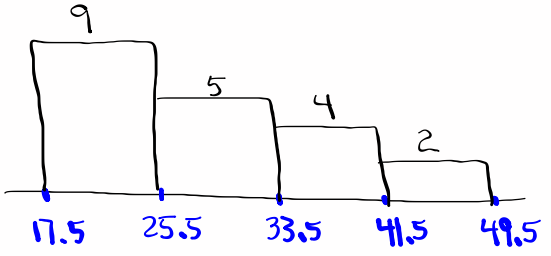
Rel. F $= \frac{f}{n} = \frac{f}{20}$

Jan 10-4:42 PM

Bar chart
- class limits
- class F

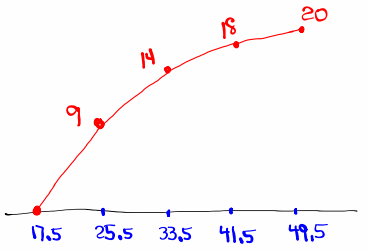


Histogram
- class BNDRS
- class F

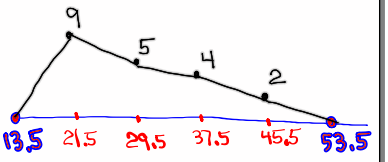


Jan 10-4:57 PM

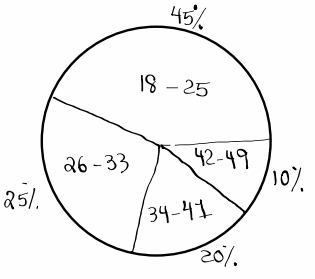
Ogive
- Class BNDRS
- Cum. F
- Start at 0 level.



Freq. Polygon
- class MP
- class F
- extra MP, one on each side
- Start & Stop at 0 level.



Pie Chart
- Circle
- class limits to name each slice
- % F for size of each slice



Jan 10-5:01 PM

I randomly Selected 25 exams and here are the Scores.

52	58	60	65	68
70	72	75	75	75
78	80	82	83	85
85	85	88	90	92
95	95	99	100	100

1) Sample Size $\boxed{n = 25}$

2) Min. = 52 , Max = 100

3) Range = Max − Min
= 100 − 52 = 48

4) Midrange = $\frac{\text{Max} + \text{Min}}{2}$
= $\frac{100+52}{2} = 76$

5) Mode = 75 & 85 Bimodal

6) I want to make a freq. table with 3 classes.

Class width = $\frac{\text{Range}}{\#\text{ of Classes}} = \frac{48}{3} = 16$

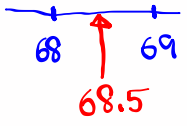
If decimal → Round-up

If whole # → Add 1

$\boxed{CW = 17}$

Jan 10-5:11 PM

Class limits	Class BNDRS	Class MP	class F	Cum. F	Rel. F	% F
52 – 68	51.5 – 68.5	60	5 → 5		.20	20%
69 – 85	68.5 – 85.5	77	12	17	.48	48%
86 – 102	85.5 – 102.5	94	8	25	.32	32%



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

Rel. F $= \frac{f}{n} = \frac{5}{25}$

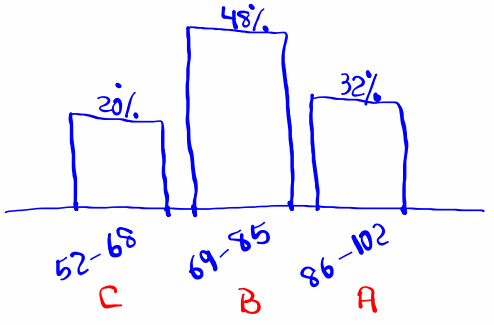
STEM Plot

5	28
6	058
7	025558
8	0235558
9	02559
10	00

52	58	60	65	68
70	72	75	75	75
78	80	82	83	85
85	85	88	90	92
95	95	99	100	100

Jan 10-5:19 PM

Bar chart
- class limits
- % F



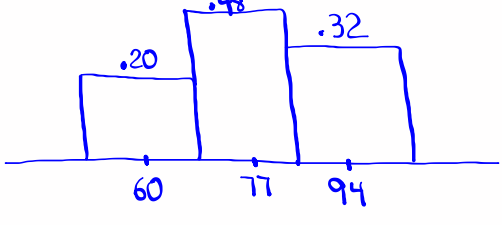
what % of Scores were at least 69?

48% + 32% = 80%

what % of Scores were at most 85?

20% + 48% = 68%

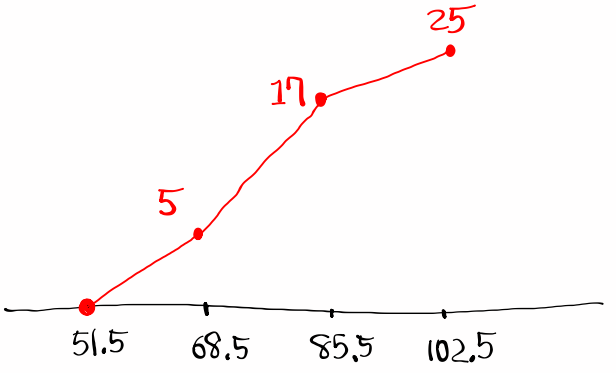
Draw Histogram
- class MP
- Rel. F.



Jan 10-5:32 PM

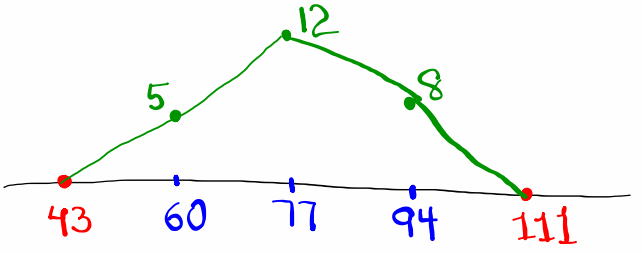
Ogive

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



Freq. Polygon

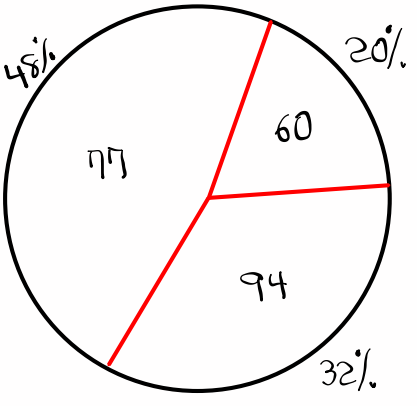
- class MP
- Extra MP one on each side
- class F.
  - Start & stop at 0 level.



Jan 10-5:39 PM

Pie chart

- Circle
- class MP to name each slice
- % F for size of each slice



SG 3 & 4

Jan 10-5:44 PM

Consider the Sample below

2, 3, 4, 4, 8

1) $n = 5$

2) Mode = 4

3) Range = $8 - 2 = 6$

4) Midrange = $\frac{8+2}{2} = 5$

5) $\sum x = 2+3+4+4+8 = \boxed{21}$

6) $\sum x^2 = 2^2+3^2+4^2+4^2+8^2 = \boxed{109}$

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

$\bar{x} = \frac{\sum x}{n} = \frac{21}{5} = \boxed{4.2}$

s^2 → Sample Variance

$s^2 = \frac{\sum (x-\bar{x})^2}{n-1}$ with some algebra $s^2 = \frac{n\sum x^2 - (\sum x)^2}{n(n-1)}$

$s^2 = \frac{5(109) - 21^2}{5(5-1)} = \frac{104}{20} = \boxed{5.2}$

s → Sample standard deviation

$s = \sqrt{s^2}$ $\quad s = \sqrt{5.2} \approx 2.280 \approx \boxed{2.3}$

Jan 10-6:06 PM

Consider the Sample below

1, 2, 4, 4, 4, 10

1) $n = 6$ 2) Range = $10 - 1 = 9$

3) Midrange = $\frac{10+1}{2} = 5.5$ 4) Mode = 4

5) $\sum x = 1+2+4+4+4+10 = 25$

6) $\sum x^2 = 1^2+2^2+4^2+4^2+4^2+10^2 = 153$

7) $\bar{x} = \frac{\sum x}{n} = \frac{25}{6} \approx \boxed{4.167} \approx \boxed{4.2} \approx \boxed{4.17} \approx 4$

8) $s^2 = \frac{n\sum x^2 - (\sum x)^2}{n(n-1)} = \frac{6 \cdot 153 - 25^2}{6(6-1)} = \frac{293}{30} \approx \boxed{9.767}$ (Round-up 5)

9) $s = \sqrt{s^2} = \sqrt{9.767} \approx \boxed{3.125}$

How to estimate s:

$s \approx \frac{\text{Range}}{4}$ $\quad s \approx \frac{9}{4} = \boxed{2.25}$

Range Rule-of-Thumb

Jan 10-6:16 PM

Consider the Sample below

5 5 5 5 5 5 5 5

1) $n = 8$ 2) Mode = None

3) $\Sigma x = 40$ 4) $\Sigma x^2 = 200$

5) $\bar{x} = \frac{\Sigma x}{n} = \frac{40}{8} = \boxed{5}$

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

$= \frac{8 \cdot 200 - 40^2}{8(8-1)}$

$= \frac{0}{56} = \boxed{0}$

Do not write Ø for 0.

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

$= \sqrt{0}$

$= \boxed{0}$

Jan 10-6:26 PM

What is Sample Standard deviation?

It is a non-negative value that indicates how data elements are spread out with respect to $\bar{x}$.

When S is Small → Data elements are close to $\bar{x}$.

When S is big → Data elements are more spread out from $\bar{x}$.

When S is Zero → All data elements are Same as $\bar{x}$. (No deviation)

Jan 10-6:35 PM

Given: $n=10$, $\Sigma x=36$, $\Sigma x^2=166$, Min$=1$, Max$=8$

Range $= 8-1=7$

Midrange $= \frac{8+1}{2}=4.5$

$\bar{x} = \frac{\Sigma x}{n} = \frac{36}{10} = 3.6$

$s^2 = \frac{n\Sigma x^2-(\Sigma x)^2}{n(n-1)} = \frac{10\cdot 166-36^2}{10(10-1)} = \frac{364}{90} \approx \boxed{4.044}$

$s = \sqrt{s^2} = \sqrt{4.044} \approx 2.011 \approx \boxed{2}$

Estimate s $\quad s \approx \frac{\text{Range}}{4} = \frac{7}{4} = 1.75 \approx 2$

Range rule-of-thumb

Jan 10-6:40 PM