Statistics

Fall 2022

Lecture 3

Class QZ 2

Consider the Sample $2, 4, 5, 5, 9$

1) Sample Size n

$n = 5$ ✓

Summation

2) Find $\sum x = 2 + 4 + 5 + 5 + 9 = 25$ ✓

Add all data elements

3) Find $\sum x^2 = 2^2 + 4^2 + 5^2 + 5^2 + 9^2 = 4 + 16 + 25 + 25 + 81 = 151$ ✓

Square each data elements, then add.

Summation

Consider QZ results of randomly selected students given below:

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

STEM Plot

11 13 13 15
20 20 23 - - - -
⋮
43 45 46 47

$n = 25$

Min = 11 , Max = 47

Range = Max − Min = 36

Midrange = $\frac{\text{Max} + \text{Min}}{2}$ = 29

Mode = 38

Find class width if we wish to have a freq. table with 4 classes.

Class width = $\frac{\text{Range}}{\#\text{ classes}} = \frac{36}{4} = 9$

If decimal ⇒ Round-up
If whole # ⇒ Add 1

⇒ CW = 9 + 1 = 10

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

CW = 10 , $n = 25$

20.5 (20 | 21)

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

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

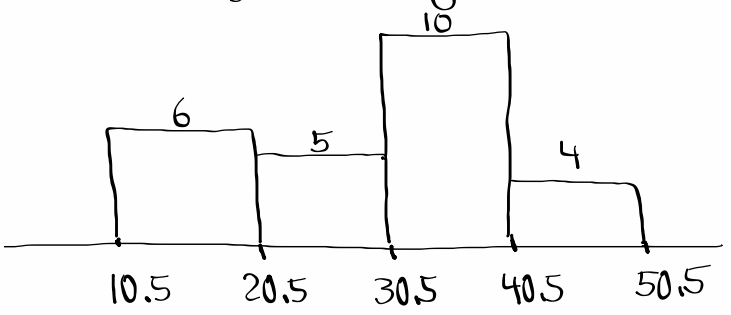
class limits	class BNDRS	class MP	class F	Cum. F	Rel. F	% F
11 - 20	10.5 - 20.5	15.5	6	6	.24	24%
21 - 30	20.5 - 30.5	25.5	5	11	.20	20%
31 - 40	30.5 - 40.5	35.5	10	21	.40	40%
41 - 50	40.5 - 50.5	45.5	4	25	.16	16%

About what percent of data elements are between 21 and 40, inclusive? 20% + 40% = 60%

About what percent of data elements are below 41? Total % of first 3 rows

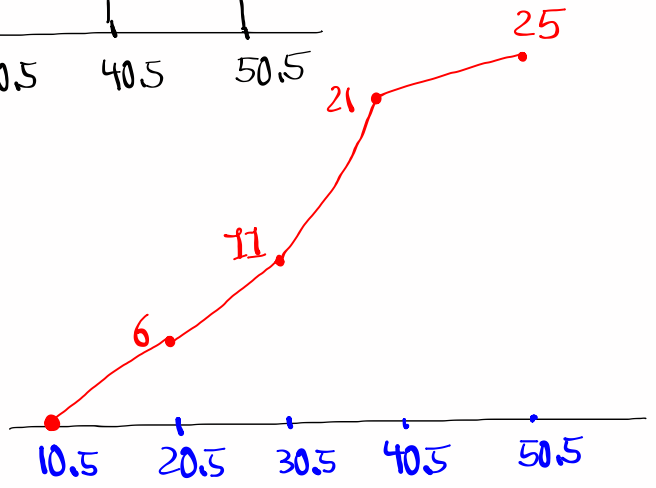
⇒ 24% + 20% + 40% = 84%

Draw histogram using class BNDRS & class F.



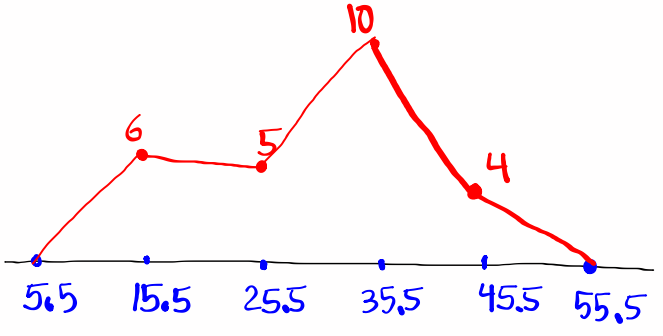
Draw ogive

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



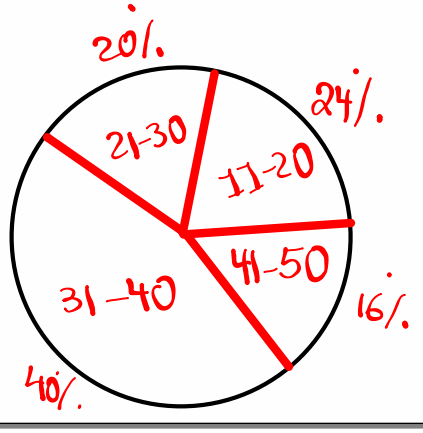
Draw Freq. Polygon

- Class MP
- One extra MP on each side
- Class F



Draw Pie chart

- Circle
- % F for size of each slice
- Class limits to name each slice



Basic Computations in Statistics: SG 5-8

n → Sample Size

x → Data elements

$\sum x$ → Sum of data elements

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

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

Consider the Sample below

1, 2, 4, 4, 5, 9

$n = 6$ $\quad \sum x = 1+2+4+4+5+9 = 25$

$\bar{x} = \frac{\sum x}{n} = \frac{25}{6} = 4.1\overline{6}$ Round to 1-decimal

$\boxed{\bar{x} \approx 4.2}$

Mode: 4

Consider the Sample below

2, 4, 5, 5, 7, 7, 8, 10

1) $n = \boxed{8}$ 2) Range $= 10-2 = \boxed{8}$ 3) Midrange $= \frac{10+2}{2} = \boxed{6}$

4) Mode: $\boxed{5 \& 7}$ Bimodal 5) $\sum x = 2+4+5+5+7+7+8+10 = \boxed{48}$

6) $\bar{x} = \frac{\sum x}{n} = \frac{48}{8} = \boxed{6}$

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n → Sample Size

x → Data elements

$\sum x$ → add data elements

x^2 → Data elements^2

$\sum x^2$ → Square each data elements, then add.

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

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

Consider the Sample below

1, 3, 6, 7, 12

1) $n = \boxed{5}$

2) Range $= 12 - 1 = \boxed{11}$

3) Midrange $= \frac{12+1}{2} = \boxed{6.5}$

4) Mode: $\boxed{\text{None}}$

5) $\Sigma x = 1+3+6+7+12 = \boxed{29}$

6) $\bar{x} = \frac{\Sigma x}{n} = \frac{29}{5} = \boxed{5.8}$

7) $\Sigma x^2 = 1^2+3^2+6^2+7^2+12^2 = \boxed{239}$

8) $s^2 = \frac{n\Sigma x^2 - (\Sigma x)^2}{n(n-1)} = \frac{5 \cdot 239 - 29^2}{5(5-1)} = \frac{354}{20} = \boxed{17.7}$

Consider the information given below

$n = 8$ $\quad \Sigma x = 119$ $\quad \Sigma x^2 = 1841$ $\quad$ Min $= 10$ $\quad$ Max $= 20$

1) Range $= 20 - 10 = \boxed{10}$

2) Midrange $= \frac{20+10}{2} = \boxed{15}$

3) $\bar{x} = \frac{\Sigma x}{n} = \frac{119}{8} = \boxed{14.875}$

4) $s^2 = \frac{n\Sigma x^2 - (\Sigma x)^2}{n(n-1)} = \frac{8 \cdot 1841 - 119^2}{8(8-1)} = \frac{567}{56} = \boxed{10.125}$

5) Round $\bar{x}$ to

a) whole # $\boxed{15}$ b) 1-decimal $\boxed{14.9}$ c) 2-decimal $\boxed{14.88}$

6) Round s^2 to

a) whole # $\boxed{10}$ b) 1-decimal $\boxed{10.1}$ c) 2-decimal $\boxed{10.13}$

Given $n=5$, $\Sigma x=20$, $\Sigma x^2=80$

1) $\bar{x}=\frac{\Sigma x}{n}=\frac{20}{5}=\boxed{4}$

2) $s^2=\frac{n\Sigma x^2-(\Sigma x)^2}{n(n-1)}=\frac{5\cdot 80-20^2}{5(5-1)}=\frac{0}{20}=\boxed{0}$

3) $\sqrt{s^2}=\sqrt{0}=\boxed{0}$

$n \rightarrow$ Sample Size

$x \rightarrow$ Data elements

$\bar{x} \rightarrow$ Sample Mean

$s^2 \rightarrow$ Sample Variance

$s \rightarrow$ Sample Standard deviation

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

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

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

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

$s^2 \geq 0$ & $s \geq 0$

Consider the Sample below

2, 4, 4, 5, 5

1) $n = \boxed{5}$ 2) $\Sigma x = \boxed{20}$ 3) $\Sigma x^2 = \boxed{86}$

4) $\bar{x} = \frac{\Sigma x}{n} = \frac{20}{5} = \boxed{4}$ 5) $s^2 = \frac{n\Sigma x^2 - (\Sigma x)^2}{n(n-1)} = \frac{5 \cdot 86 - 20^2}{5(5-1)} = \frac{30}{20} = \boxed{1.5}$

6) $s = \sqrt{s^2} = \sqrt{1.5} \approx \boxed{1.225}$

Consider the Sample below

0, 2, 4, 6, 8, 10

1) $n = \boxed{6}$ 2) $\Sigma x = \boxed{30}$ 3) $\Sigma x^2 = \boxed{220}$

4) $\bar{x} = \frac{\Sigma x}{n} = \frac{30}{6} = \boxed{5}$ 5) $s^2 = \frac{n\Sigma x^2 - (\Sigma x)^2}{n(n-1)} = \frac{6 \cdot 220 - 30^2}{6(6-1)} = \frac{420}{30} = \boxed{14}$

6) $s = \sqrt{s^2} = \sqrt{14} \approx \boxed{3.742}$

How To estimate s:

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

"The range rule-of-thumb"

Class QZ 3

Use the Sample below to find

1, 3, 3, 3, 5

1) $\Sigma x = \boxed{15}$

2) $\Sigma x^2 = \boxed{53}$

3) $\bar{x} = \frac{\Sigma x}{n} = \frac{15}{5} = \boxed{3}$

4) $s^2 = \frac{n\Sigma x^2 - (\Sigma x)^2}{n(n-1)} = \frac{5 \cdot 53 - 15^2}{5(5-1)} = \frac{40}{20} = \boxed{2}$