Statistics

Lecture 2

Feb 19-8:47 AM

In - Person QZ 1

1) what days & Time do we meet?

M T W 4:30 – 7:20 PM ✓

2) what Calculator is used for this class?

TI-83 or TI-84 ✓

3) Simplify $\dfrac{45 - 32}{\dfrac{8}{\sqrt{4}}} = \dfrac{13}{\dfrac{8}{2}} = \dfrac{13}{4} = 3.25$

Jun 24-6:57 PM

Consider the Sample below

1, 5, 7, 11

1) $n = 4$

2) Min. = 1, Max = 11

3) Range = Max − Min. = 11 − 1 = 10

4) Midrange = $\frac{\text{Max} + \text{Min.}}{2} = \frac{11+1}{2} = 6$

5) Mode = None

6) $\frac{\text{Range}}{4}$, if decimal → Round-up
if whole → Add 1
$\frac{10}{4} = 2.5 \approx \boxed{3}$

7) $\frac{\text{Range}}{5}$, if decimal → Round-up
if whole → Add 1
$\frac{10}{5} = 2 \approx \boxed{3}$

Jun 25-4:41 PM

8) $\Sigma x = 1 + 5 + 7 + 11 = \boxed{24}$

9) $\Sigma x^2 = 1^2 + 5^2 + 7^2 + 11^2 = \boxed{196}$

10) $\frac{\Sigma x}{n} = \frac{24}{4} = \boxed{6}$

11) $\frac{n\Sigma x^2 - (\Sigma x)^2}{n(n-1)} = \frac{4(196) - 24^2}{4(4-1)} = \frac{208}{12} = \frac{52}{3}$

In Your Calc

208 ÷ 12 [Math] [1: ▸Frac] [Enter] → $= 17.\overline{3} = \boxed{\frac{52}{3}}$

12) $\sqrt{\text{Last Answer}} = \sqrt{\frac{52}{3}} \approx \boxed{4.163}$

[2nd] [x^2] [Enter]

Jun 25-4:46 PM

I randomly selected 20 students, and here are their ages:

16	19	20	23	23
25	28	28	28	29
30	30	32	33	35
38	40	45	50	52

1) $n = 20$

2) Min. = 16, Max. = 52

3) Range = Max − Min
$= 52 - 16 = 36$

4) Midrange $= \frac{\text{Max} + \text{Min}}{2}$
$= \frac{52+16}{2} = 34$

5) Mode 28

6) $\frac{\text{Range}}{4}$, if decimal → Round-up; if whole → Add 1
$\frac{36}{4} = 9$ → 10

7) $\frac{\text{Range}}{5}$ If decimal → Round-up; If whole → Add 1
$\frac{36}{5} = 7.2$ → 8

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16	19	20	23	23
25	28	28	28	29
30	30	32	33	35
38	40	45	50	52

8) How many data elements are below 35?
14

9) What percent of data elements are below 35?
$\frac{14}{20} \cdot \frac{5}{100} = 70$
70%

10) Make STEM plot
Data must be Sorted

1	69
2	0335889
3	002358
4	05
5	02

STEM Plot

Jun 25-5:00 PM

Below are randomly selected exam scores

45	48	52	59	60
62	68	69	70	70
73	75	78	78	79
80	82	84	84	86
90	93	95	95	100

1) $n = 25$

2) Range $= 100 - 45 = \boxed{55}$

3) Midrange $= \frac{100 + 45}{2} = 72.5$

we like to organize this in a freq. table with 4 classes

we need class width

$CW = \frac{\text{Range}}{\#\text{ classes}}$

If decimal → Round-up

If whole → Add 1

$CW = \frac{55}{4} = 13.75$ $\boxed{CW = 14}$

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class limits	class BNDRS	class MP	class F	Cum. F	Rel. F	% F
45 – 58	44.5 – 58.5	51.5	3	3	.12	12%
59 – 72	58.5 – 72.5	65.5	7	10	.28	28%
73 – 86	72.5 – 86.5	79.5	10	20	.40	40%
87 – 100	86.5 – 100.5	93.5	5	25	.20	20%

58.5 is between 58 and 59

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

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

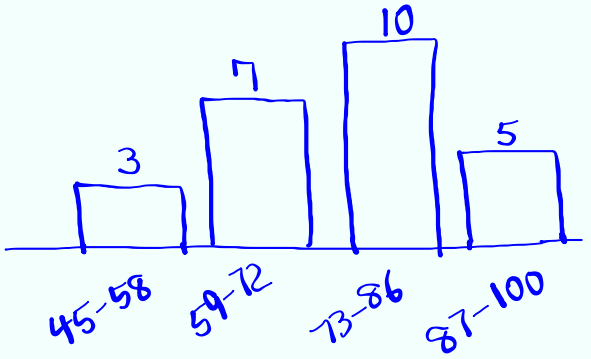
what % of data are between 59 & 86?

25% + 40% = $\boxed{65\%}$

Jun 25-5:12 PM

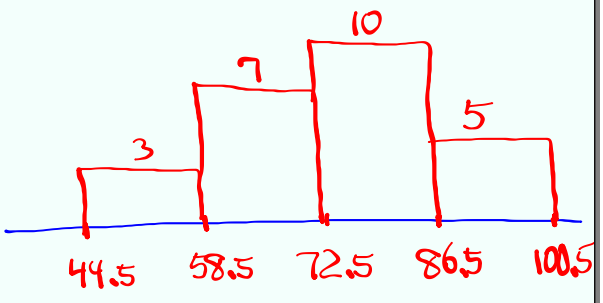
Bar chart

- class limits
- class F.



Histogram

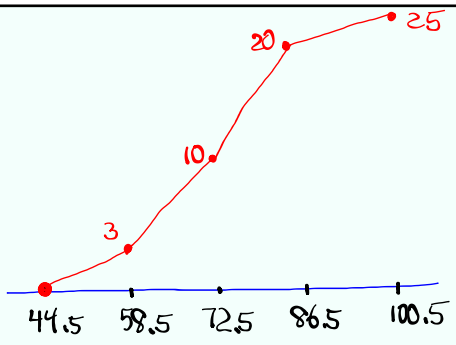
- class BNDRS
- class F



Jun 25-5:27 PM

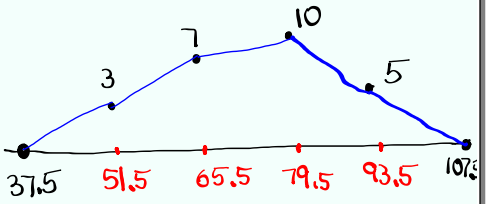
Ogive

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



Freq. Polygon

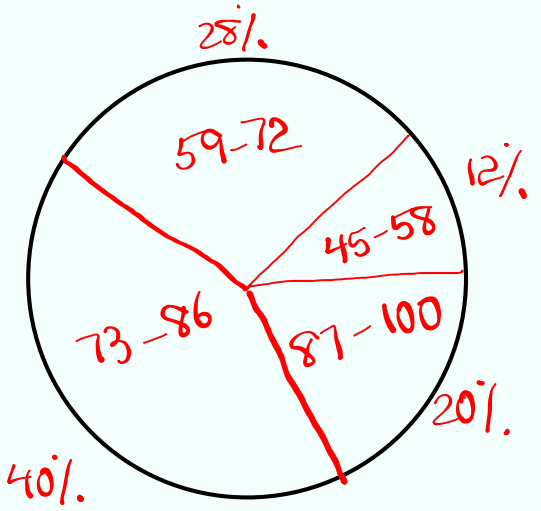
- class MP
- class F
- Additional MP, one on each side.
- Starts & Ends at 0 level.



Jun 25-5:31 PM

Pie chart

- class limits
- % F
- Circle



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Complete the freq. table below:

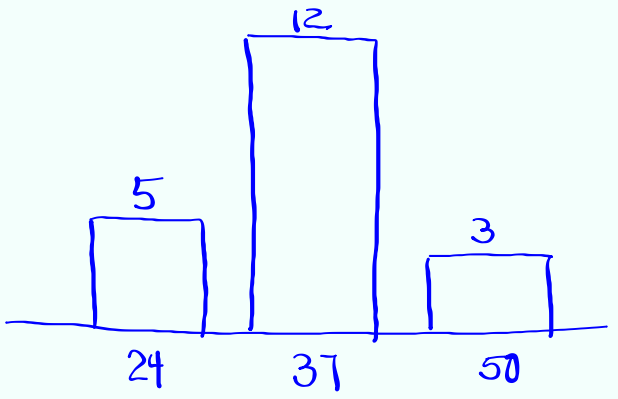
class limits	class BNDRS	class MP	class F	Com. F	Rel. F	%F
18 – 30	17.5 – 30.5	24	5	5	.25	25%
31 – 43	30.5 – 43.5	37	12	17	.60	60%
44 – 56	43.5 – 56.5	50	3	20	.15	15%

3 classes, CW = 13, $n = 20$ Rel. F. $= \frac{f}{n} = \frac{f}{20}$

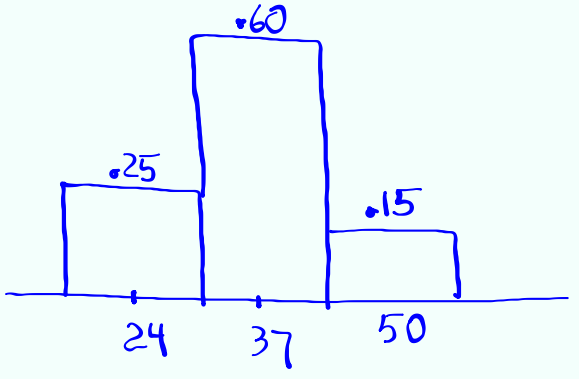
what % of data is above 30? 75%

Jun 25-5:52 PM

Bar chart
- Class MP
- Class F

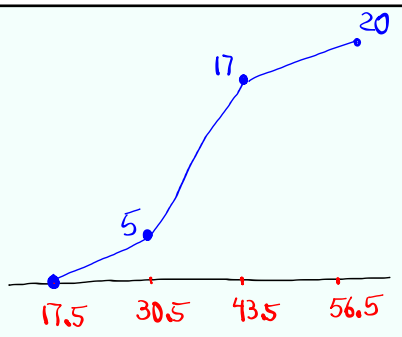


Histogram
- Class MP
- Rel. F.

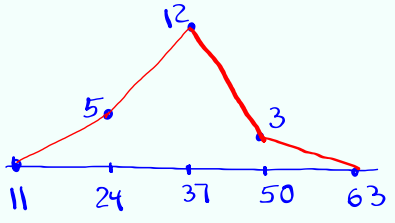


Jun 25-6:04 PM

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



Freq. Polygon
- Class MP
- Class F
- Additional MP one on each side
- Start & End at 0 level



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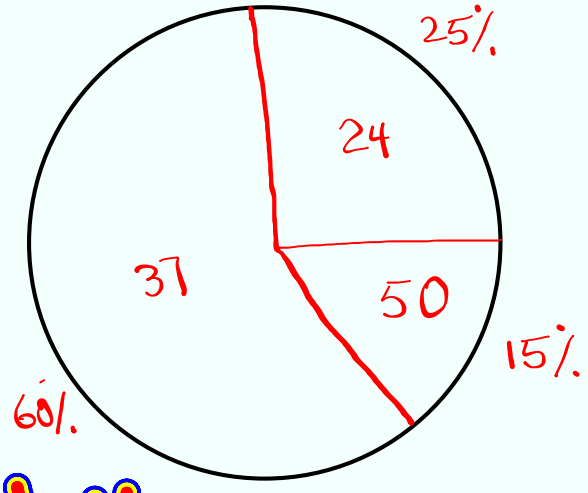
Pie chart

- Class MP
- % F
- Circle



SG 3 & 4

✓

Jun 25-6:15 PM

Working with Samples

x → Data element

$\sum x$ → Sum of data elements

n → Sample Size

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

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

Consider the Sample below

2, 3, 5, 5, 8

$n = 5$

$\sum x = 2+3+5+5+8 = 23$

$\bar{x} = \frac{\sum x}{n} = \frac{23}{5} = \boxed{4.6}$

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Consider the Sample below

1, 3, 4, 4, 5, 5, 8, 11

1) $n = 8$

2) $\Sigma x = 41$

3) $\bar{x} = \frac{\Sigma x}{n} = \frac{41}{8} = 5.125$ whole → 5; 1-dec. → 5.1; 2-dec. → 5.13

4) Mode 4 & 5

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$x \rightarrow$ Data element

$\Sigma x \rightarrow$ Sum of data elements

$n \rightarrow$ Sample Size

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

$x^2 \rightarrow$ data elements^2

$\Sigma x^2 \rightarrow$ Sum of data elements^2

$s^2 \rightarrow$ Sample Variance

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

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

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Consider the Sample below

1, 3, 3, 3, 7

$n = 5$

$\Sigma x = 17$ $\quad \Sigma x^2 = 77$

$\bar{x} = \frac{\Sigma x}{n} = \frac{17}{5} = 3.4$

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

$s^2 = \frac{5(77) - 17^2}{5(5-1)} = \frac{96}{20}$

$s^2 = 4.8$

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Consider the Sample below

2 3 3 3 5 5 5 8

$n = 8$

$\Sigma x = 34$ $\quad \Sigma x^2 = 170$

$\bar{x} = \frac{\Sigma x}{n} = \frac{34}{8} = 4.25$

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

204 ÷ 56 MATH 1:▶Frac Enter

$\frac{51}{14}$

$= \frac{8(170) - 34^2}{8(8-1)}$

$= \frac{204}{56} \approx 3.643$

Jun 25-6:34 PM

$\bar{x}$ → Sample Mean

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

s^2 → Sample Variance

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

s → Sample Standard Deviation

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

Standard Deviation = $\sqrt{\text{Variance}}$

Jun 25-6:40 PM

Given $n = 10$, $\Sigma x = 70$, $\Sigma x^2 = 490$

Find

1) $\bar{x} = \frac{\Sigma x}{n} = \frac{70}{10} = \boxed{7}$

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

$= \frac{10(490) - 70^2}{10(10-1)}$

$= \frac{0}{90} = \boxed{0}$

Do not use Ø for Zero.

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

$= \sqrt{0}$

$= \boxed{0}$

Jun 25-6:43 PM

Given $n=8$, $\Sigma x=42$, $\Sigma x^2=266$

1) $\bar{x}=\frac{\Sigma x}{n}=\frac{42}{8}=\boxed{5.25}$

2) $s^2=\frac{n\Sigma x^2-(\Sigma x)^2}{n(n-1)}=\frac{8(266)-42^2}{8(8-1)}=\frac{364}{56}=\boxed{6.5}$

3) $s=\sqrt{s^2}=\sqrt{6.5}=2.549509757$

whole → 3

1-dec. → 2.5

2-dec. → 2.55

3-dec. → 2.550

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How to estimate s:

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

The range rule-of-thumb.

A sample has a minimum of 25 and a maximum of 115. Estimate its standard deviation.

$$s\approx\frac{\text{Range}}{4}=\frac{115-25}{4}=\frac{90}{4}=\boxed{22.5}$$

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