# Statistics

# Lecture 2

Feb 19-8:47 AM

SG 3 & SG 4

How to organize raw data in a freq. table and draw graphs in Statistics:

1) Min. & Max.

2) Range = Max − Min

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

If decimal ⇒ Round-up to a whole #

If whole ⇒ Add 1

ex: A data set has a min. of 20 and max. of 50.

Range = Max − Min = 50 − 20 = 30

Class width if we wish to have

1) 3 classes (whole)

$CW = \frac{\text{Range}}{3} = \frac{30}{3} = 10$

$CW = 11$

2) 4 classes (Decimal)

$CW = \frac{\text{Range}}{4} = \frac{30}{4} = 7.5$

$CW = 8$

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A freq. table

| class limits | class BNDRS | class MP | class F | Cum. F | Rel. F | %F |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |

I randomly Selected 20 students, here are their ages:

18 19 21 24 25
25 25 29 30 32
32 34 35 35 35
38 40 42 48 50

1) Sample Size $n=20$

2) Min. $=18$, Max $=50$

3) Range $=$ Max $-$ Min $= 50-18 = 32$

4) Midrange $= \frac{\text{Max} + \text{Min}}{2} = \frac{50+18}{2} = \frac{68}{2} = 34$

5) Mode $25$ & $35$ Bimodal

6) Find class width if we wish to have a freq. table with 3 classes.

$CW = \frac{\text{Range}}{3} = \frac{32}{3} = 10.\overline{6}$ ← Decimal

$CW = 11$

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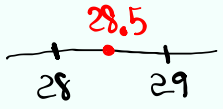
| class limits | class BNDRS | class MP | class F | Cum. F | Rel. F | %F |
|---|---|---|---|---|---|---|
| 18 – 28 | 17.5 – 28.5 | 23 | 7 | 7 | .35 | 35% |
| 29 – 39 | 28.5 – 39.5 | 34 | 9 | 16 | .45 | 45% |
| 40 – 50 | 39.5 – 50.5 | 45 | 4 | 20 | .20 | 20% |




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

$n$

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

we will graph

Bar chart Histogram Ogive

Freq. Polygon Pie chart

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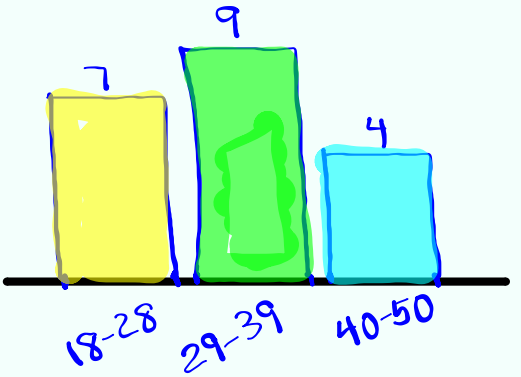
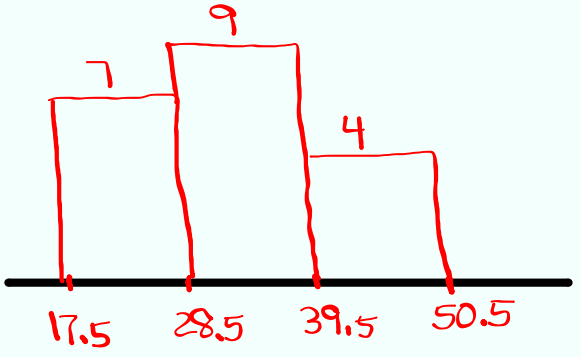
Bar chart
- class limits
- class F




Histogram
- class BNDRS
- class F

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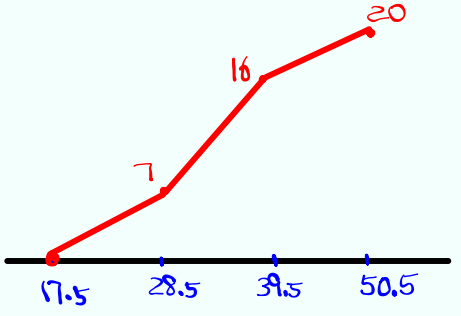
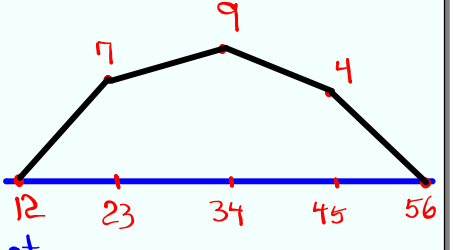
Ogive
- class BNDRS
- Cum. F.
- start at 0 level




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

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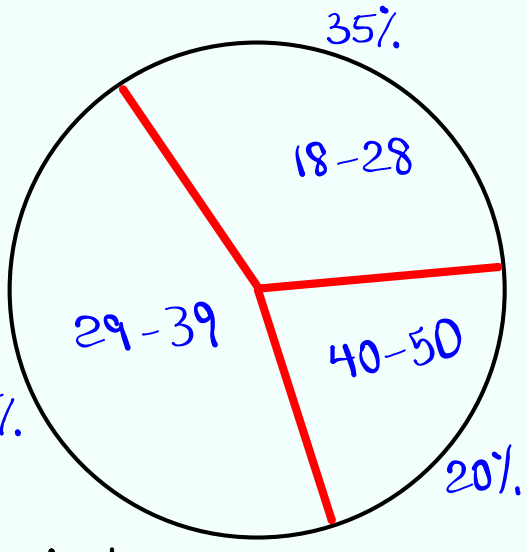
Pie chart

- Circle
- Class limits
  to name each slice
- %. F to Size
  each slice




what %. of students were below 40 yrs old? 45% + 35%

= 80%.

Sep 9-7:38 PM

I randomly selected 25 exams and here are the Scores:

| | | | | |
|---|---|---|---|---|
| 50 | 56 | 58 | 60 | 65 |
| 69 | 69 | 70 | 73 | 75 |
| 75 | 75 | 76 | 79 | 80 |
| 82 | 82 | 82 | 86 | 88 |
| 89 | 90 | 95 | 100 | 100 |

1) $n = \boxed{25}$

2) Range = 100 − 50 = $\boxed{50}$

3) Midrange = $\frac{100+50}{2}$ = $\boxed{75}$

4) Mode $\boxed{75 \text{ & } 82}$

5) Find class width if we wish to have

a) 4 classes

$CW = \frac{\text{Range}}{4} = \frac{50}{4} = 12.5$

$= \boxed{13}$

b) 5 classes

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

$\boxed{CW = 11} = \frac{50}{5} = 10$

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50 56 58 60 65
69 69 70 73 75
75 75 76 79 80
82 82 82 86 88
89 90 95 100 100

Make STEM plot

"Data must be Sorted"

| | |
|---|---|
| 5 | 068 |
| 6 | 0599 |
| 7 | 0355569 |
| 8 | 0222689 |
| 9 | 05 |
| 10 | 00 |

Make a freq. table with 4 classes. CW=13

| Class limits | Class BNDRS | Class MP | Class F | Cum. F | Rel. F | %F |
|---|---|---|---|---|---|---|
| 50 – 62 | 49.5 – 62.5 | 56 | 4 | 4 | .16 | 16% |
| 63 – 75 | 62.5 – 75.5 | 69 | 8 | 12 | .32 | 32% |
| 76 – 88 | 75.5 – 88.5 | 82 | 8 | 20 | .32 | 32% |
| 89 – 101 | 88.5 – 101.5 | 95 | 5 | 25 | .20 | 20% |

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

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

What % are between 63 and 88, inclusive?

64%

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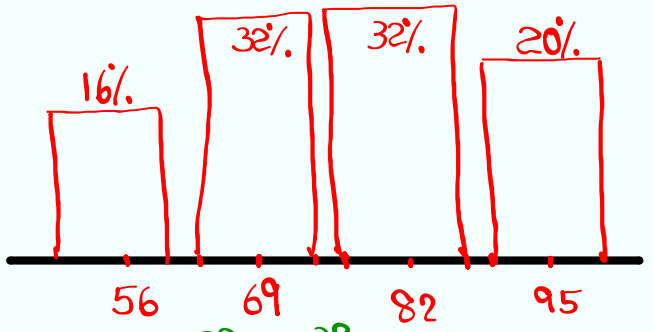
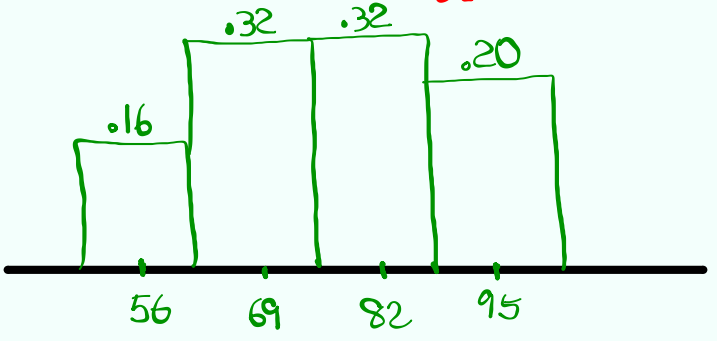
Bar Chart
- Class MP
- % F




Histogram
- Class MP
- Rel. F.

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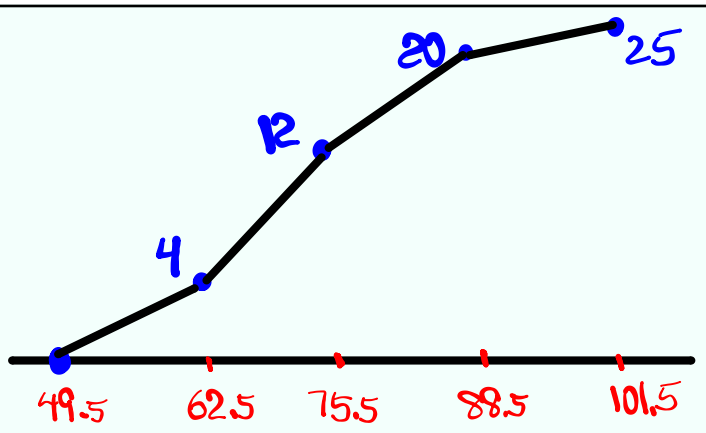
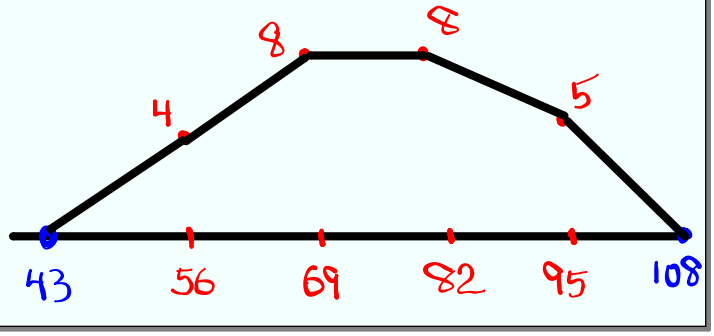
Ogive
- class BNDRS
- Cum. F.




Freq. Polygon
- class MP
- extra MP
- class F

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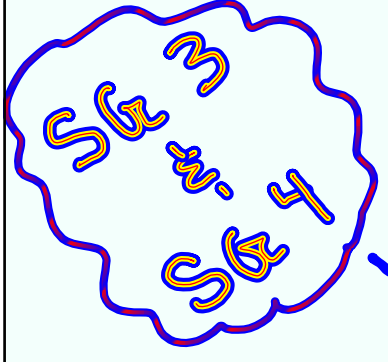
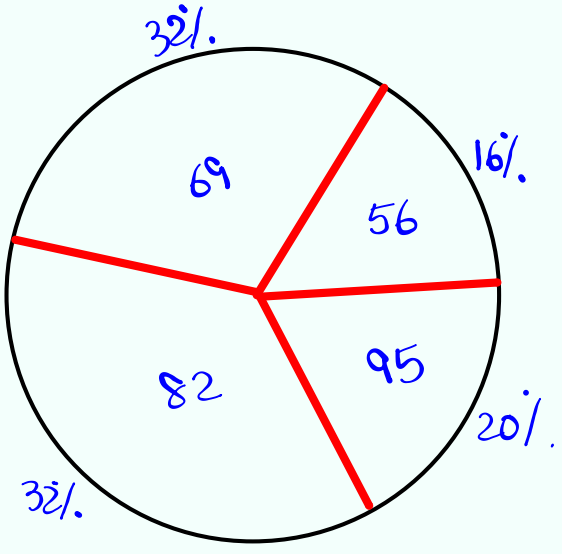
Pie chart
- Circle
- class MP
- %F

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Consider the following Sample

1 3 3 3 5

1) $n = 5$ 2) Range $= 5 - 1 = 4$

3) Midrange $= \frac{5+1}{2} = 3$ 4) Mode $= 3$

5) $\sum x = 1 + 3 + 3 + 3 + 5 = 15$

($\sum$: Summation; $x$: data element)

6) $\sum x^2 = 1^2 + 3^2 + 3^2 + 3^2 + 5^2 = 53$

7) $\frac{\sum x}{n} = \frac{15}{5} = 3$

8) $\frac{n \cdot \sum x^2 - (\sum x)^2}{n(n-1)} = \frac{5 \cdot 53 - (15)^2}{5(5-1)} = \frac{40}{20} = 2$

9) $\sqrt{\text{last Answer}} = \sqrt{2}$ Round to 3-dec. Places $\approx 1.414$

Sep 9-8:36 PM

$x$ → 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

1 3 5 7 9

1) $n = 5$ 2) Range $= 9 - 1 = 8$ 3) Midrange $= \frac{9+1}{2} = 5$

4) Mode None 5) $\sum x = 1+3+5+7+9 = 25$ 6) $\bar{x} = \frac{\sum x}{n} = \frac{25}{5} = 5$

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$x \rightarrow$ data element

$n \rightarrow$ Sample Size

$\sum x \rightarrow$ Sum of data elements

$\sum x^2 \rightarrow$ Square data elements then add

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

$s^2 \rightarrow$ Sample Variance

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

Sep 9-8:52 PM

Consider the Sample below

2 3 3 4 8

1) $n = 5$ 2) Range $= 6$ 3) Midrange $= 5$

4) Mode $= \boxed{3}$ 5) $\sum x = 2+3+3+4+8 = \boxed{20}$

6) $\sum x^2 = 2^2+3^2+3^2+4^2+8^2 = \boxed{102}$

7) $\bar{x} = \frac{\sum x}{n} = \frac{20}{5} = \boxed{4}$ 8) $s^2 = \frac{n\sum x^2 - (\sum x)^2}{n(n-1)}$

$= \frac{5\cdot 102 - 20^2}{5(5-1)} = \frac{110}{20} = \boxed{5.5}$

$\boxed{s^2 \geq 0}$ Always

Google what we know when Sample Variance is Zero.

8) $\sqrt{s^2} = \sqrt{5.5} \approx \boxed{2.345}$

whole 2 2-dec. 2.35

1-Dec. 2.3

Sep 9-8:55 PM

$\bar{x}$ → Sample Mean

$s^2$ → Sample Variance

$s$ → Sample Standard deviation

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

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

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

$s \geq 0$

Ask google what we know when Standard dev. is Zero

Sep 9-9:03 PM

Given $n = 5$ $\quad \sum x = 25$ $\quad \sum x^2 = 133$

Min = 3 $\quad$ Max = 7

Range = $7 - 3 = \boxed{4}$ $\quad$ Midrange = $\frac{7+3}{2} = \boxed{5}$

Mode (More info. needed)

$\bar{x} = \frac{\sum x}{n} = \frac{25}{5} = \boxed{5}$

$s^2 = \frac{n\sum x^2 - (\sum x)^2}{n(n-1)} = \frac{5 \cdot 133 - 25^2}{5(5-1)}$

$= \frac{40}{20} = \boxed{2}$

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

$\approx \boxed{1.414}$

Sep 9-9:08 PM