Statistics
Lecture 2

Feb 19-8:47 AM

I randomly Selected [20 exams] and here are the Scores: SG 3-4

58   62   65   69   70

72   75   75   75   78

80   82   86   88   90

91   95   98   100   100

1) Sample Size $n = 20$

2) Min. = 58, Max = 100

3) Range = Max − Min
$$= 100 - 58 = 42$$

4) Midrange = $\dfrac{Max + Min}{2}$
$$= \dfrac{100 + 58}{2} = 79$$
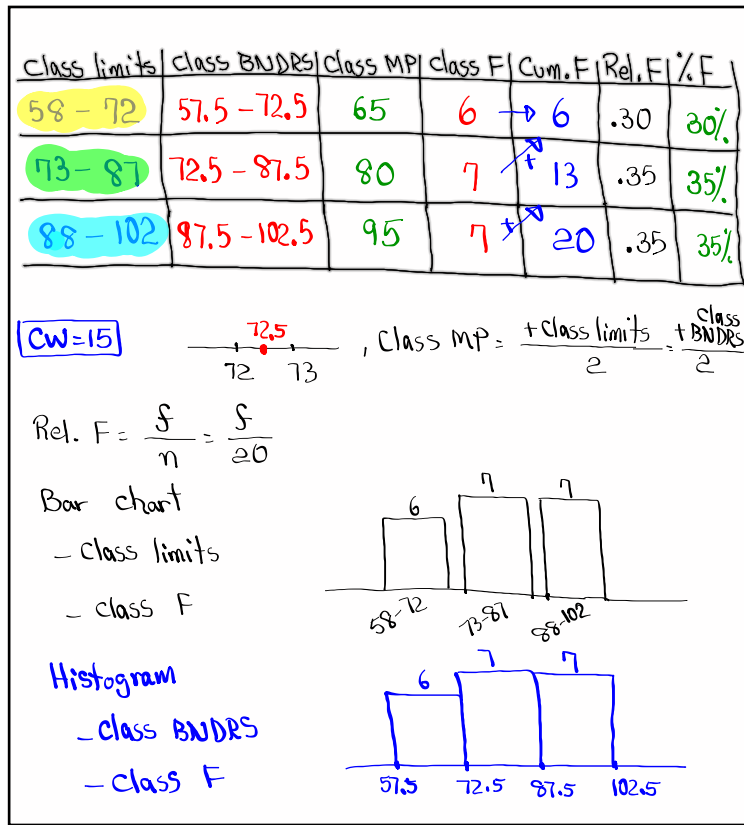
5) Mode = 75

6) STEM Plot (data must be Sorted)

```
 5 | 8
 6 | 259
 7 | 02 5558
 8 | 0268
 9 | 0158
10 | 0 0
```
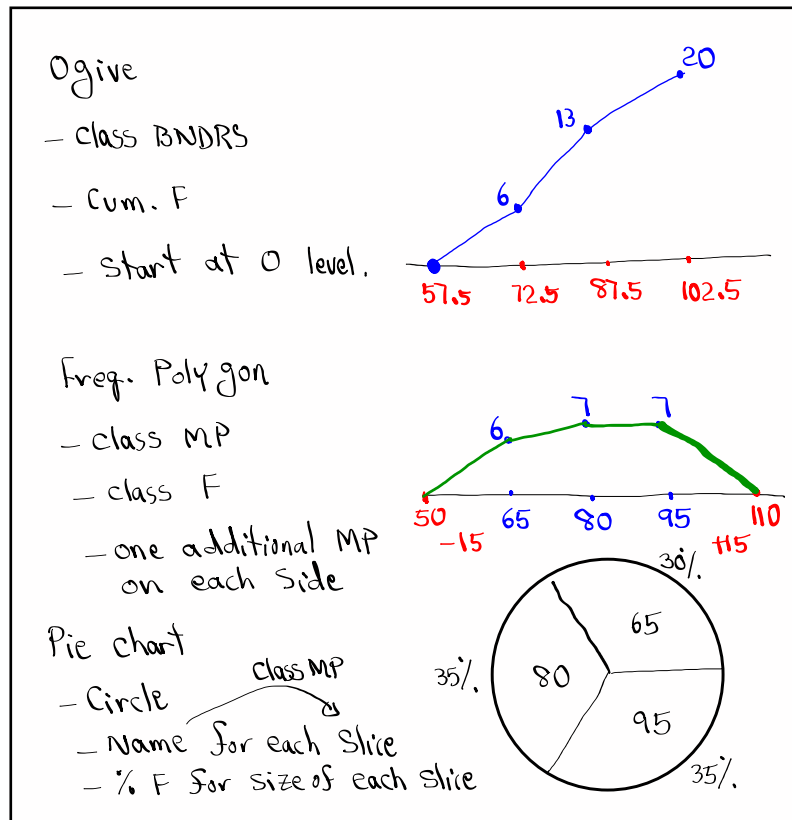
7) Make a freq. table with 3 classes.

Class width = $\dfrac{Range}{\text{\# of classes}} = \dfrac{42}{3} = 14$

If decimal ⇒ Round-up
If whole # ⇒ Add 1   ⇒ CW = 15

Feb 13-6:53 PM

Class limits	Class BNDRS	Class MP	Class F	Cum. F	Rel. F	% F
58 – 72	57.5 – 72.5	65	6 → 6	.30	30%
73 – 87	72.5 – 87.5	80	7	13	.35	35%
88 – 102	87.5 – 102.5	95	7	20	.35	35%

CW = 15

72.5 | 72   73

Class MP $= \dfrac{+ \text{Class limits}}{2} = \dfrac{+ \text{Class BNDRS}}{2}$

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

Bar chart
- Class limits
- class F

6   7   7

58-72   73-87   88-102

Histogram
- Class BNDRS
- Class F

6   7   7

57.5   72.5   87.5   102.5

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

6   13   20

57.5   72.5   87.5   102.5

Freq. Polygon
- class MP
- class F
- one additional MP on each side

6   7   7

50   65   80   95   110
-15   +15

Pie chart
- Circle — Class MP
- Name for each slice
- % F for size of each slice

30%   65
35%   80
95   35%

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I randomly selected 25 students, here are their ages

18	19	20	24	25
25	25	26	28	30
32	34	35	35	35
38	39	40	42	45
45	48	50	55	58

1) $n = 25$

2) Min. = 18, Max = 58

3) Range = Max − Min = $\boxed{40}$

4) Midrange = $\dfrac{Max + Min}{2}$ = $\boxed{38}$

5) Mode = 25 & 35   Bimodal

6) STEM Plot (Data must be Sorted)

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

7) How many data elements were below 30?
   9

8) What % of data elements are below 30?
   $\dfrac{9}{25} \cdot 100 = \boxed{36\%}$

9) Find class width if we wish to have 3 classes.

Since decimal ⇒ Round-up

$CW = \dfrac{Range}{\#\,classes} = \dfrac{40}{3} = 13.\overline{3}$ $\boxed{CW = 14}$

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Class limits	Class BNDRS	Class MP	Class F	Cum. F	Rel. F	% F
18 − 31	17.5 − 31.5	24.5	10 → 10	10	.40	40%
32 − 45	31.5 − 45.5	38.5	11 +↗ 21	21	.44	44%
46 − 59	45.5 − 59.5	52.5	4 +↗ 25	25	.16	16%

$\boxed{CW = 14}$

```
      31.5
  •----•----•
  31       32
```

Class MP = $\dfrac{+\,class\ limits}{2}$

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

Bar chart
 − class limits
 − class F

```
        11
   10  ┌──┐
  ┌──┐ │  │  4
  │  │ │  │ ┌──┐
  │  │ │  │ │  │
 18-31 32-45 46-59
```

Histogram
 − class MP
 − Rel. F.

```
      .44
  .4 ┌──┐
 ┌──┐│  │ .16
 │  ││  │┌──┐
 24.5 38.5 52.5
```

Feb 13-7:42 PM

Ogive
 — class BNDRS
 — Cum. F.

Freq. Polygon
 — Class MP
 — class F
 — extra MP, one on each side

Pie chart
 — Class MP
 — % F
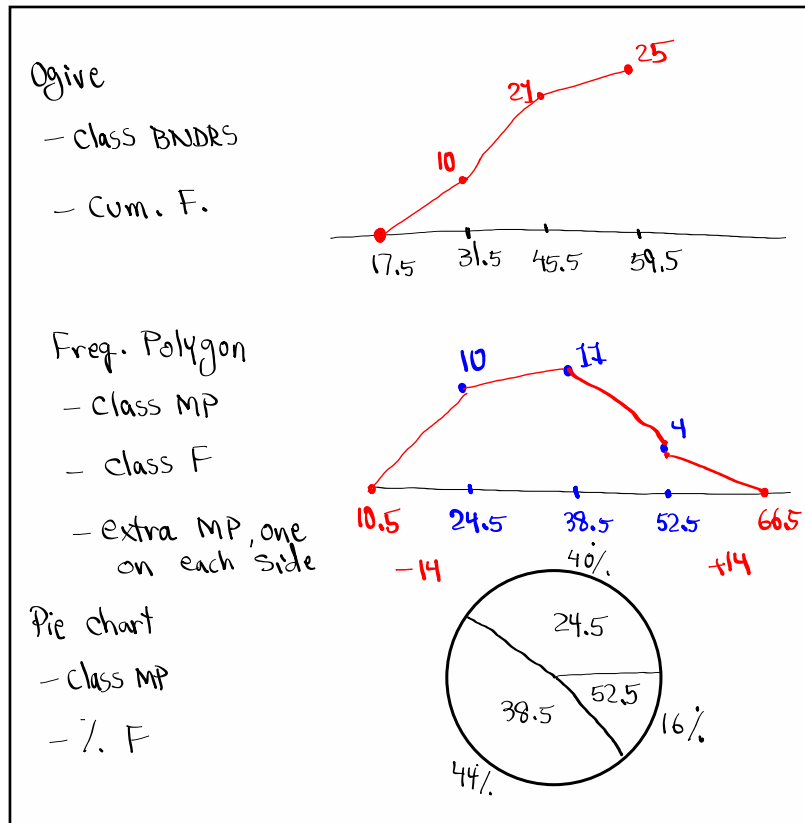
Feb 13-7:53 PM

Complete the Freq. table below

Class limits	Class BNDRS	Class MP	class F	Cum. F	Rel. F	% F
12 – 24	11.5 – 24.5	18	3	3	.086	8.6%
25 – 37	24.5 – 37.5	31	7	10	.200	20.0%
38 – 50	37.5 – 50.5	44	15	25	.429	42.9%
51 – 63	50.5 – 63.5	57	10	35	.286	28.6%

4 classes, CW = 25 – 12 = 13, $\dfrac{24.5}{24 \quad 25}$, Class MP: $\dfrac{\text{limits}}{2}$

n = 35   Rel. F = $\dfrac{f}{n} = \dfrac{f}{35}$
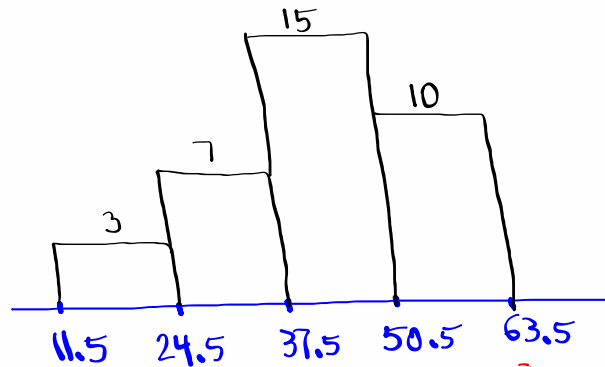
what % of data fall between 25 & 50?
20.0% + 42.9% ≈ 63%

what % of data are at least 25?
20.0% + 42.9% + 28.6% ≈ 91%

Feb 13-8:10 PM

Draw histogram
— class BNDRS
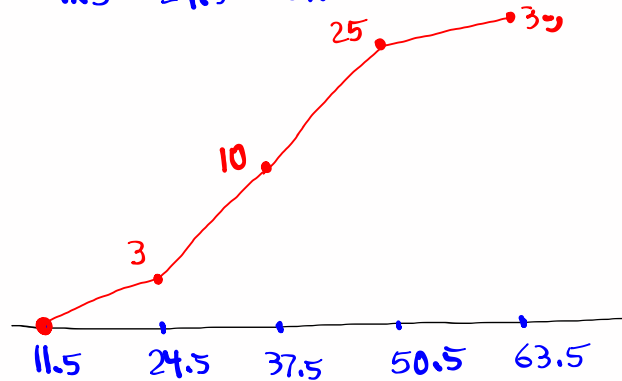— class F

Draw ogive
— Class BNDRS
— Cum. F.

SG 3 & 4

Feb 13-8:21 PM

Consider the Sample below

1   3   3   3   5

1) $n = 5$

2) Range $= 5 - 1 = 4$

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

4) Mode $= 3$

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

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

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

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

$= \frac{5 \cdot 53 - (15)^2}{5(5-1)}$

9) $\sqrt{\text{Last Ans}} = \sqrt{2} \approx \boxed{1.414}$

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

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$x \rightarrow$ Data element

$\sum x \rightarrow$ Sum of data elements

$n \rightarrow$ Sample Size

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

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

ex: Consider the Sample below

2   3   3   3   4   4   4   10

Range = $10 - 2 = \boxed{8}$

Midrange = $\frac{10+2}{2} = \boxed{6}$

Mode = 3 & 4   Bimodal

$n = 8$

$\sum x = 33$

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

$= \frac{33}{8}$

$= \boxed{4.125}$

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$x \rightarrow$ Data element

$\sum x \rightarrow$ Sum of data elements

$x^2 \rightarrow$ Data element^2

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

$\overline{x} \rightarrow$ x-bar   Sample Mean

$S^2 \rightarrow$ Sample Variance

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

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

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

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Consider the Sample below

  2, 4, 4, 5, 10

$\sum x = 25$ $\sum x^2 = 161$

$\overline{x} = \dfrac{\sum x}{n} = \dfrac{25}{5} = \boxed{5}$

$S^2 = \dfrac{n\sum x^2 - (\sum x)^2}{n(n-1)} = \dfrac{5 \cdot 161 - 25^2}{5(5-1)} = \dfrac{180}{20} = \boxed{9}$

$\sqrt{Last\ Ans} = \sqrt{9} = \boxed{3}$

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Given $n = 8$, $\sum x = 48$, $\sum x^2 = 288$

Find

$\overline{x} = \dfrac{\sum x}{n} = \dfrac{48}{8} = \boxed{6}$ $S^2 = \dfrac{n\sum x^2 - (\sum x)^2}{n(n-1)}$

$= \dfrac{8 \cdot 288 - 48^2}{8(8-1)}$

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

$\sqrt{last\ ans} = \sqrt{0} = \boxed{0}$

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$\overline{x}$ Sample Mean

S^2 Sample Variance

S Sample standard deviation

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

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

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

Given   1   2   4   4   9

$\sum x = 20$ $\sum x^2 = 118$ $n = 5$

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

$$S^2 = \frac{n\sum x^2 - (\sum x)^2}{n(n-1)} = \frac{5 \cdot 118 - 20^2}{5(5-1)}$$

Sample standard deviation

$$S = \sqrt{S^2} = \sqrt{9.5} = 3.082$$

$$= \frac{190}{20} = \frac{19}{2} = \boxed{9.5}$$

$$\approx \boxed{3}$$

Feb 13-9:04 PM

Class Qz 2

Complete the chart below, then draw ogive.

class BNDRS	Class F	Cum. F
21.5 – 31.5	3	3
31.5 – 41.5	10	13
41.5 – 51.5	7	20

Feb 13-9:12 PM