Statistics

Lecture 2

Feb 19-8:47 AM

Consider the Sample below

$$2 \quad 4 \quad 4 \quad 10$$

1) $n = 4$

2) Range = Max − Min = $10 - 2 = 8$

3) Midrange = $\dfrac{\text{Max} + \text{Min}}{2} = \dfrac{10 + 2}{2} = \dfrac{12}{2} = 6$

4) Mode = 4

5) $\sum x = 2 + 4 + 4 + 10 = 20$ — Summation

6) $\sum x^2 = 2^2 + 4^2 + 4^2 + 10^2 = 136$

7) $\dfrac{\sum x}{n} = \dfrac{20}{4} = \boxed{5}$

8) $\dfrac{n \sum x^2 - (\sum x)^2}{n(n-1)} = \dfrac{4 \cdot 136 - 20^2}{4(4-1)}$

$$= \dfrac{144}{12} = \boxed{12}$$

9) $\sqrt{\text{Last answer}} = \sqrt{12} \approx \boxed{3.464}$

Mar 8-8:06 AM

I randomly selected 20 students and here are their ages

18	19	20	20	24
25	25	25	28	30
32	32	35	35	39
40	42	48	48	50

1) $n = \boxed{20}$

2) Range = Max − Min
   $= 50 − 18$
   $= \boxed{32}$

3) Midrange $= \dfrac{Max + Min}{2} = \dfrac{50 + 18}{2} = \dfrac{68}{2} = \boxed{34}$

4) Mode = 25

5) Make Stem Plot
   "Data must be Sorted"

Stem	Leaf
1	8 9
2	0 0 4 5 5 5 8
3	0 2 2 5 5 9
4	0 2 8 8
5	0

6) How many data elements are below 40? 15

7) what % of data elements are below 40?
   What percent of 20 is 15?
   ↑ Sample Size

   $\dfrac{15}{20} \cdot 100 = \boxed{75\%}$

   75% of data elements are below 40?

8) what is the 6th element on Stem Plot? $\boxed{25}$

9) find $\dfrac{9\text{th element} + 10\text{th element}}{2} = \dfrac{28 + 30}{2} = \boxed{29}$

Mar 8-8:16 AM

I like to organize this Sample into a freq. table.

To do this, I need class width.

$$\boxed{\text{Class width} = \dfrac{\text{Range}}{\#\text{ of classes}}}$$
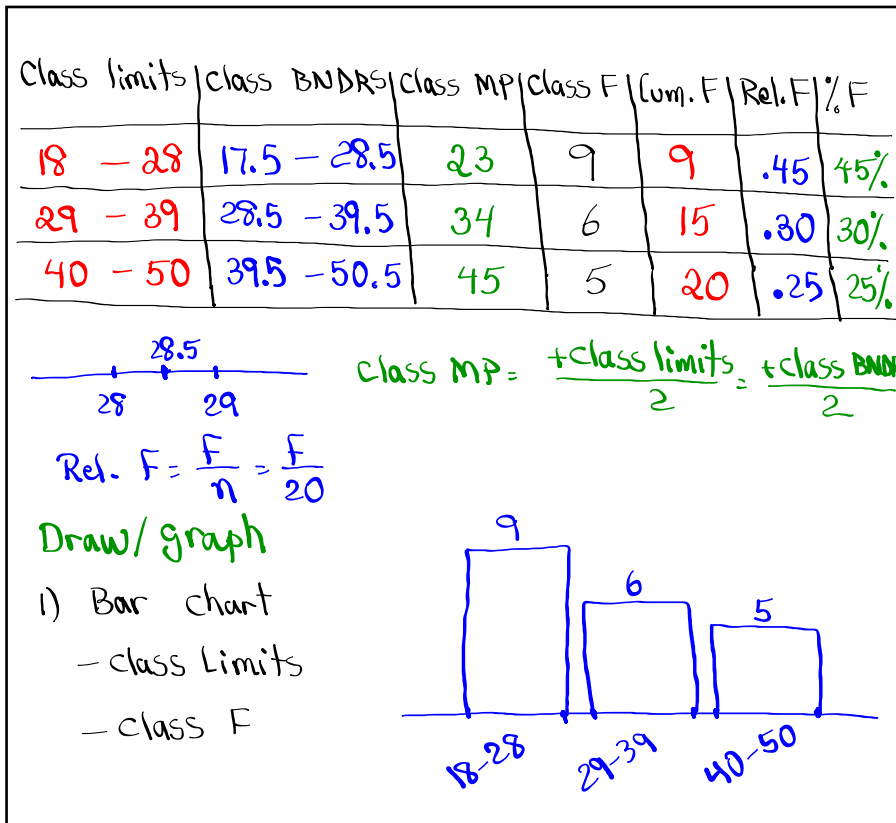
If decimal → Round-up

If whole # → Add 1

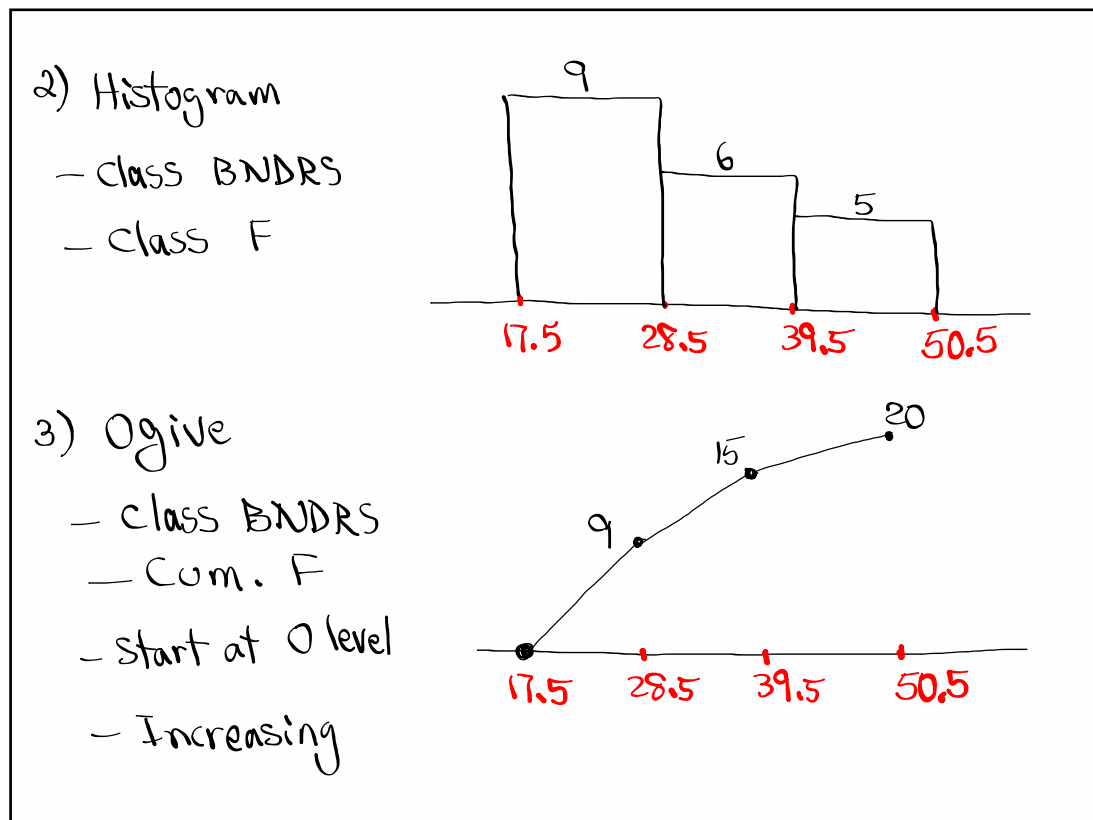I will give you # of classes

Let's find class width for 3 classes.

Class width $= \dfrac{\text{Range}}{3} = \dfrac{32}{3} = 10.\overline{6}$ $\boxed{CW = 11}$

Mar 8-8:32 AM

Class limits	Class BNDRS	Class MP	Class F	Cum. F	Rel. F	% F
18 — 28	17.5 – 28.5	23	9	9	.45	45%
29 — 39	28.5 – 39.5	34	6	15	.30	30%
40 — 50	39.5 – 50.5	45	5	20	.25	25%

28.5
28   29

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

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

Draw/graph

1) Bar chart
  – class Limits
  – class F

9

6

5

18-28   29-39   40-50

Mar 8-8:38 AM

2) Histogram
  – class BNDRS
  – Class F

9

6

5

17.5   28.5   39.5   50.5

3) Ogive
  – class BNDRS
  – Cum. F
  – Start at 0 level
  – Increasing

20
15
9

17.5   28.5   39.5   50.5

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

9   6   5

12   23   34   45   56
   −CW   +CW
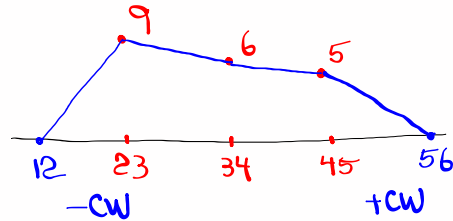
5) Pie chart
- Circle
- class limit or class MP to name each slice
- % F for size of each slice

45%

18−28

29−39   40−50

30%   25%
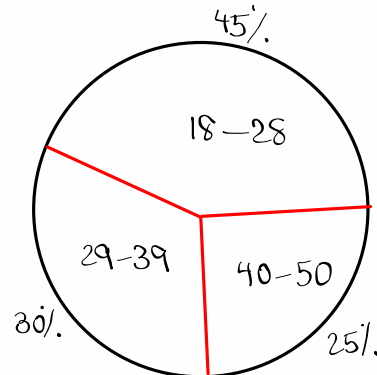
I randomly selected 25 exams, and here are the scores:

50	54	59	60	63
68	69	72	75	75
75	78	80	82	85
85	85	88	90	93
95	98	99	100	100

1) $n = 25$

2) Range $= 100 - 50 = 50$

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

4) Mode $= 75$ & 85
    Bimodal

5) Make Stem plot

```
5 | 0 4 9
6 | 0 3 8 9
7 | 2 5 5 5 8
8 | 0 2 5 5 5 8
9 | 0 3 5 8 9
10| 0 0
```

6) How many data elements are below 70? 7

7) What % of data elements are below 70?
$\frac{7}{25} \cdot 100 \Rightarrow \boxed{28\%}$

8) What is the 10th element? 75

9) Find $\frac{15\text{th element} + \text{Next element}}{2} = \frac{85 + 85}{2}$
$= \boxed{85}$

Let's make a freq. table with 4 classes.

$$\text{Class width} = \frac{\text{Range}}{\#\text{ of classes}} = \frac{50}{4} = 12.5$$

when decimal → Round-up

when whole # → Add 1

⇒ 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	7	11	.28	28%
76 – 88	75.5 – 88.5	82	7	18	.28	28%
89 – 101	88.5 – 101.5	95	7	25	.28	28%

62.5

62   63

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

$$\text{Rel. F} = \frac{f}{n} = \frac{f}{25}$$
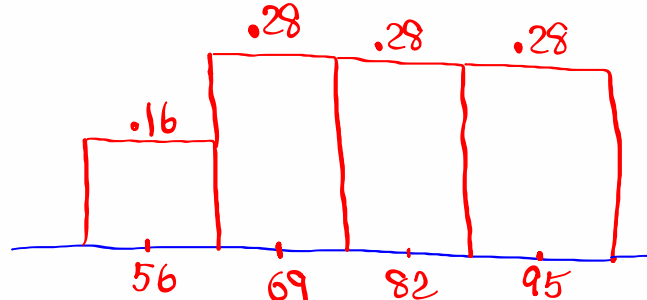
Mar 8-9:33 AM
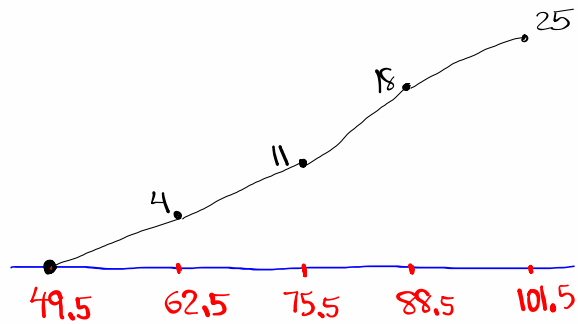
Bar chart

— Class limits

— Class F

4

7   7   7

50-62   63-75   76-88   89-101
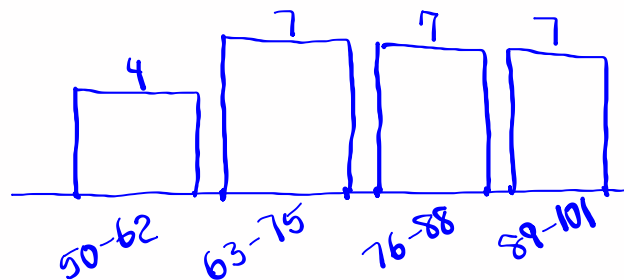
Histogram

— Class MP

— Rel. F.

.16   .28   .28   .28

56   69   82   95

Mar 8-9:46 AM

Ogive

- Class BNDRS

- Cum. F

- Start at 0 level

4, 11, 18, 25

49.5 62.5 75.5 88.5 101.5

Freq. Polygon

- Class MP

- Class F

- one extra MP on each side

- Start & Finish at 0 level

4

43 56 69 82 95 108

- CW   + CW
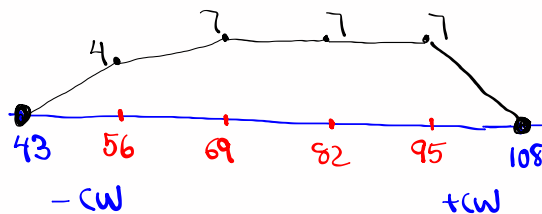
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Pie chart

- Circle

- class MP to name each slice

- % F for size of each slice

28%

69

56 16%

82

95

28%   28%

Mar 8-9:56 AM

6
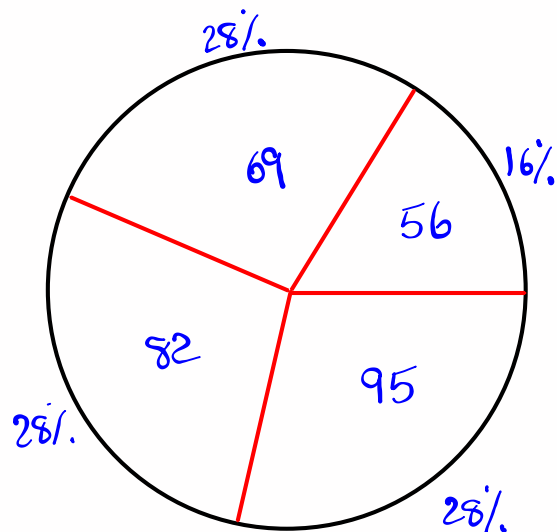
Consider the Stem Plot below

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

1) $n = 30$

2) Range $= 66 - 16 = 50$

3) Midrange $= \frac{66 + 16}{2} = 41$

4) Mode $= 30$

5) what % of data elements fall below 30?

$\frac{6}{n \to 30} \cdot 100 \Rightarrow 20\%$

6) find class width if we wish to have 5 classes.

$CW = \frac{Range}{5} = \frac{50}{5} = 10$

$CW = 11$
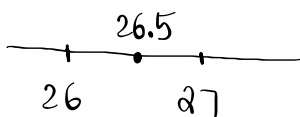
If decimal $\to$ Round-up

If whole $\to$ Add 1

Mar 8-10:00 AM

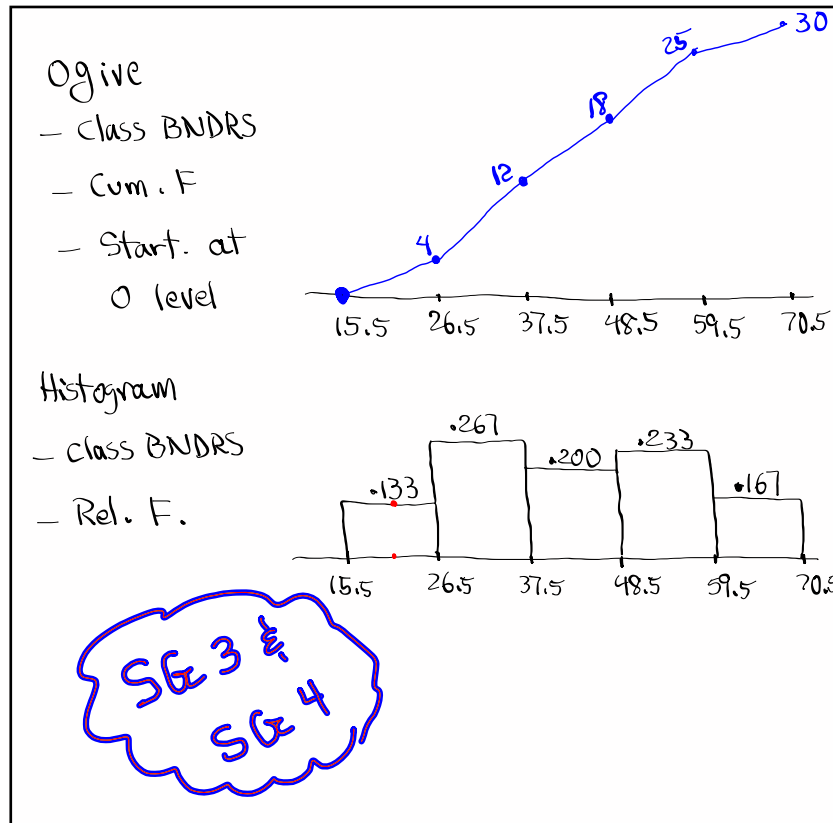| Class limits	class BNDRS	Class MP	class F	cum. F	Rel.F	% F
16 – 26	15.5 – 26.5	21	4	4	.133	13.3%
27 – 37	26.5 – 37.5	32	8	12	.267	26.7%
38 – 48	37.5 – 48.5	43	6	18	.200	20.0%
49 – 59	48.5 – 59.5	54	7	25	.233	23.3%
60 – 70	59.5 – 70.5	65	5	30	.167	16.7%

```
        26.5
  +----•--+----
 26     27
```

Rel. $F = \frac{f}{n} = \frac{f}{30}$

what % of data elements are between 27 & 59, inclusive?

$26.7\% + 20.0\% + 23.3\%$

$= 70\%$

Mar 8-10:09 AM

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

30
25
18
12
4

15.5 26.5 37.5 48.5 59.5 70.5

Histogram
- Class BNDRS
- Rel. F.

.267
.200 .233
.133   .167

15.5 26.5 37.5 48.5 59.5 70.5

SG 3 &
SG 4

Mar 8-10:29 AM

Consider the Sample below

2   3   4   4
5   5   7   10

1) $n = 8$

2) Range $= 8$

3) Midrange $= 6$

4) Mode $= 4$ & 5

5) $\sum x = 40$

6) $\sum x^2 = 244$

7) $\dfrac{\sum x}{n} = \dfrac{40}{8} = 5$

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

$= \dfrac{8 \cdot 244 - 40^2}{8(8-1)}$

$= \dfrac{352}{56} \approx \boxed{6.286}$

9) $\sqrt{\text{Last Answer}} = \sqrt{6.286}$

$\approx \boxed{2.507}$

Mar 8-10:41 AM

A Sample has a range of 40. Find class width for a freq. table if we wish to have

1) 3 classes $\quad CW = \dfrac{Range}{3} = \dfrac{40}{3} = 13.\overline{3}$

$$\boxed{CW = 14}$$

2) 4 Classes $\quad CW = \dfrac{Range}{4} = \dfrac{40}{4} = 10$

$$\boxed{CW = 11}$$

3) 5 Classes $\quad CW = \dfrac{Range}{5} = \dfrac{40}{5} = 8$

$$\boxed{CW = 9}$$

Mar 8-10:50 AM