Statistics
Spring 2023
Lecture 5

Feb 19-8:47 AM

Number of text messages sent/received from 5:00 to 8:00 pm by 40 randomly selected teenagers:
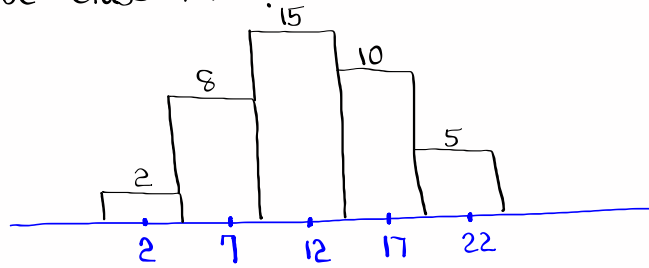
Class Limits	Class Midpoints	Frequency	Cum. Freq.	Rel. Freq.	% F
1 0 - 4	2	2	2	.050	5%
2 5 - 9	7	8	10	.200	20%
3 10 - 14	12	15	25	.375	37.5%
4 15 - 19	17	10	35	.250	25%
5 20 - 24	22	5	40	.125	12.5%

$n = 40$, $\sum f = 40$ $2 + 8 + 10 + 5 = 25$ 5 classes

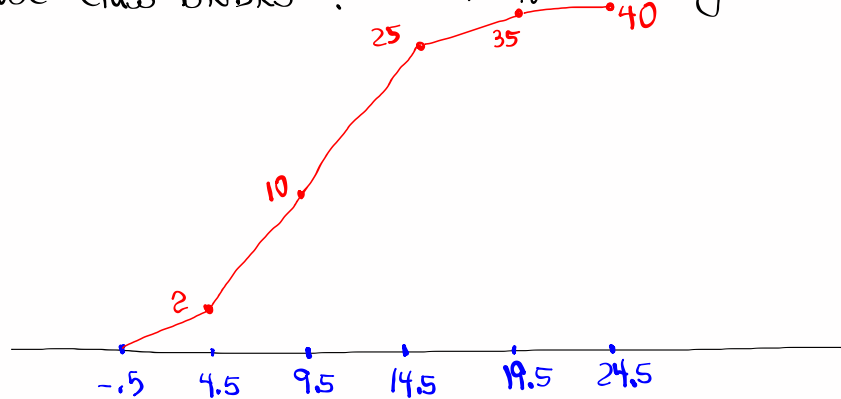$CW = 5$ Rel. $F = \dfrac{f}{n} = \dfrac{f}{40}$

what % of data are at least 5? $100\% - 5\% = 95\%$

what % of data are at most 19? $100\% - 12.5\% = 87.5\%$

what % of data are between 10 and 19?
$37.5\% + 25\% = 62.5\%$

Feb 13-6:28 AM

Use class MP & class F to draw histogram.
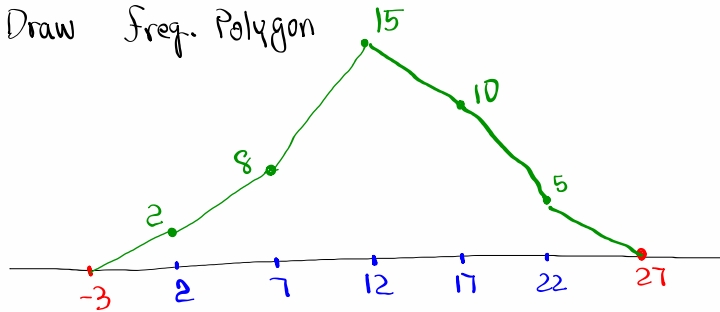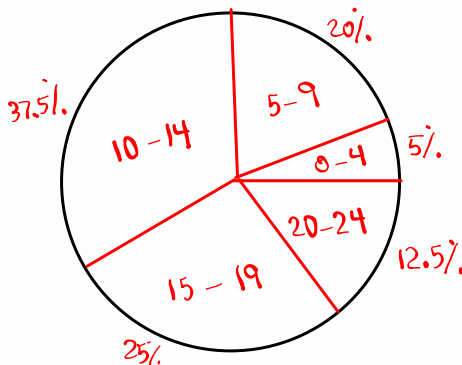

Use class BNDRS & Cum. F to draw ogive

Feb 13-7:29 AM

Draw Freq. Polygon

Use class limits & % F to draw Pie chart.

Feb 13-7:36 AM

The following sorted data is called Stem Plot.

```
1│8 9          ⟶ 18  19
2│0 1 4 5 5 8  ⟶ 20  21  24  25  25  8
3│0 2 3 5 5 5 9
4│0 2 6 8
5│0            ⟶ 50
```

1) $n = 20$ 2) Min. $= 18$ 3) Max $= 50$

4) Mode $= 35$ 5) Range $=$ Max $-$ Min $= 50 - 18 = \boxed{32}$ ✓

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

Find class width if we wish to have

7) 4 classes

$CW = \dfrac{\text{Range}}{\text{\# classes}}$ $CW = \dfrac{32}{4} = 8$ $\boxed{CW = 9}$

If whole # ⟹ Add 1

5) 5 classes

$CW = \dfrac{\text{Range}}{\text{\# classes}} = \dfrac{32}{5} = 6.4$ $\boxed{CW = 7}$

If decimal ⟹ Round-up

Consider the Sample below

2, 3, 4, 4, 8

1) $n = 5$

2) Range $= 8 - 2 = 6$

3) Midrange $= \dfrac{8 + 2}{2} = 5$

4) Mode $= 4$

5) $\sum x = 2 + 3 + 4 + 4 + 8 = 21$

6) Find $\dfrac{\sum x}{n} = \dfrac{21}{5} = 4.2$

7) $\sum x^2 = 2^2 + 3^2 + 4^2 + 4^2 + 8^2 = \boxed{109}$

8) Find $\dfrac{n \sum x^2 - (\sum x)^2}{n(n-1)} = \dfrac{5 \cdot 109 - 21^2}{5(5-1)}$

$= \dfrac{104}{20} = \boxed{5.2}$

9) Find $\sqrt{}$ of the last answer.

$\sqrt{5.2} \approx \boxed{2.280}$

Consider the Sample below

1   3   3   3   5   5   5   11

1) n $\boxed{8}$ 2) Range = $11-1 = \boxed{10}$ 3) Midrange = $\frac{11+1}{2} = \boxed{6}$

4) Mode = $3 \overset{\&}{\vdots} 5$ Bimodal

5) $\sum x = 1+3+3+3+5+5+5+11 = \boxed{36}$

6) $\frac{\sum x}{n} = \frac{36}{8} = \boxed{4.5}$

7) $\sum x^2 = 1^2+3^2+3^2+3^2+5^2+5^2+5^2+11^2 = \boxed{224}$

8) $\frac{n \sum x^2 - (\sum x)^2}{n(n-1)} = \frac{8 \cdot 224 - 36^2}{8(8-1)} = \frac{496}{56}$
$$\approx \boxed{8.857}$$

9) Take $\sqrt{}$ of last answer.

$$\sqrt{8.857} \approx \boxed{2.976}$$

Feb 13-8:02 AM

Mean $\longrightarrow$ Average

Mean of a Sample $\overline{x}$ "x-bar"

$\overline{x} = \frac{\sum x}{n}$ $\longleftarrow$ Sum of data elements
$\longleftarrow$ Sample Size

Consider the Sample below

2, 4, 8, 12, 18   1) $n = 5$

2) Range = 16   3) Midrange = 10

4) Mode = None   5) $\sum x = 2+4+8+12+18 = 44$

6) $\overline{x} = \frac{\sum x}{n} = \frac{44}{5} = 8.8$ Round to a whole #
$$\overline{x} \approx 9$$

Feb 13-8:12 AM

Variance of a Sample S^2

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

Consider the Sample below 1) $n=5$

4   4   4   4   4

2) $\sum x = 4+4+4+4+4 = \boxed{20}$

3) $\sum x^2 = 4^2+4^2+4^2+4^2+4^2 = \boxed{80}$

4) find $S^2 = \frac{n\sum x^2 - (\sum x)^2}{n(n-1)} = \frac{5 \cdot 80 - 20^2}{5(5-1)} = \frac{0}{20} = \boxed{0}$

No variance among data elements

5) find $\sqrt{S^2} = \sqrt{0} = 0$

Feb 13-8:18 AM

Consider the Sample below

1   2   2   3   3   4   4   5

1) $n = \boxed{8}$ 2) Range $= \boxed{4}$ 3) Midrange $= \boxed{3}$

4) Mode $= \boxed{2,3,4}$ 5) $\sum x = 1+2+2+3+3+4+4+5$
trimodal $= \boxed{24}$

6) $\bar{x} = \frac{\sum x}{n} = \frac{24}{8} = \boxed{3}$ 7) $\sum x^2 = 1^2+2^2+2^2+3^2+3^2+4^2+4^2+5^2$
$= \boxed{84}$

8) $S^2 = \frac{n\sum x^2 - (\sum x)^2}{n(n-1)} = \frac{8 \cdot 84 - 24^2}{8(8-1)} = \frac{96}{56}$
↑
Variance $\approx \boxed{1.714}$

9) $S = \sqrt{S^2} = \sqrt{1.714}$
↑ $\approx \boxed{1.309}$
Sample
Standard
Deviation

Feb 13-8:23 AM