Statistics

Lecture 3

Feb 19-8:47 AM

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

4 classes

CW = 31 − 18 = $\boxed{13}$

SG 3 & SG 4

Complete the table below

class limits	Class BNDRS	Class MP	class F	Cum. F	Rel. F	% F
18 – 30	17.5 – 30.5	24	5	5	.208	20.8%
31 – 43	30.5 – 43.5	37	8	13	.333	33.3%
44 – 56	43.5 – 56.5	50	9	22	.375	37.5%
57 – 69	56.5 – 69.5	63	2	24	.083	8.3%

$n = 24$

$\text{Rel. F} = \frac{f}{n} = \frac{f}{24}$

what % of data fall within 31 & 56, inclusive?

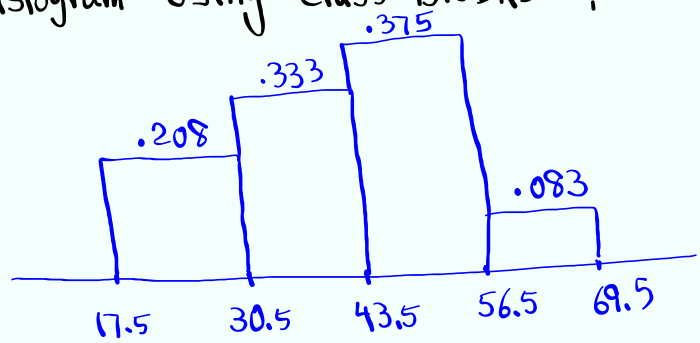
33.3% + 37.5%

= $\boxed{70.8\%}$

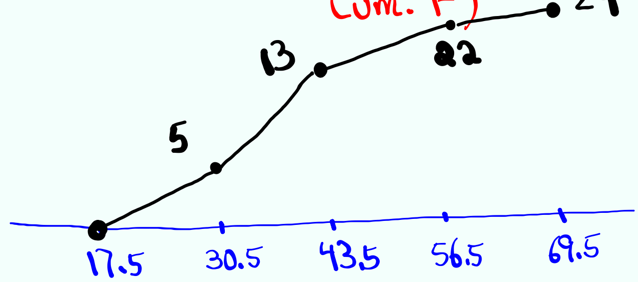
Round to whole % ≈ 71%

Sep 10-10:51 AM

Draw histogram using class BNDRS & Rel. F.



Draw ogive (Always use class BNDRS & Cum. F)



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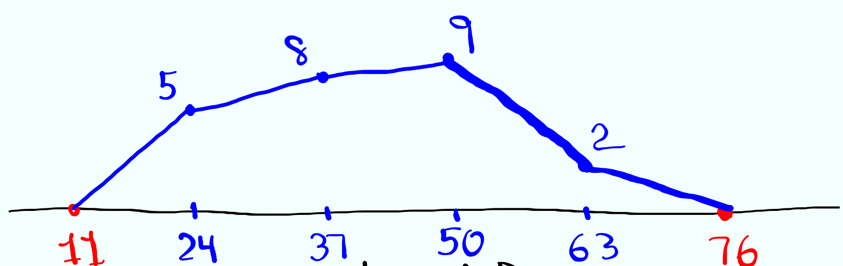
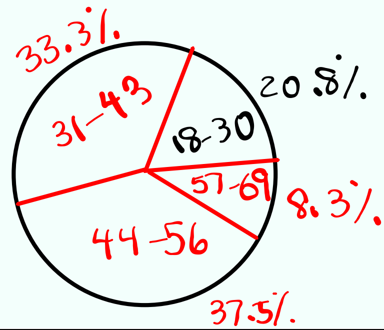
Freq. Polygon



Pie chart

- class limits
- % F



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Consider the Sample below

3 5 5 5 7

1) $n = 5$ 2) Range $= 7 - 3 = \boxed{4}$

3) Midrange $= \frac{7+3}{2} = 5$ 4) Mode $\boxed{5}$

5) Median (Data must be Sorted) $\boxed{5}$
→ Value in the middle

6) $\sum x = 3 + 5 + 5 + 5 + 7 = \boxed{25}$

7) $\sum x^2 = 3^2 + 5^2 + 5^2 + 5^2 + 7^2 = \boxed{133}$

Sample Mean (Average)

$\bar{x}$ → x-bar

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

Sample Variance
s^2

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

$s^2 = \frac{5 \cdot 133 - 25^2}{5(5-1)} = \frac{40}{20} = \boxed{2}$

Sample Standard deviation
s

$s = \sqrt{s^2} = \sqrt{2} \approx \boxed{1.414}$

Sep 10-11:15 AM

Consider the Sample below

1 3 3 3 5 5 5 9

$n = \boxed{8}$ Range $= 9 - 1 = \boxed{8}$

Midrange $= \frac{9+1}{2} = \boxed{5}$ Mode $\boxed{3 \ \& \ 5}$
Bimodal

Median
Is data Sorted? ✓
middle Value $\frac{3+5}{2} = \boxed{4}$

$\sum x = 1 + 3 + 3 + 3 + 5 + 5 + 5 + 9 = \boxed{34}$

$\sum x^2 = 1^2 + 3^2 + 3^2 + 3^2 + 5^2 + 5^2 + 5^2 + 9^2 = \boxed{184}$

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

$s^2 = \frac{n \cdot \sum x^2 - (\sum x)^2}{n(n-1)} = \frac{8 \cdot 184 - 34^2}{8(8-1)} = \frac{316}{56} \approx \boxed{5.643}$

$s = \sqrt{s^2} = \sqrt{5.643} \approx \boxed{2.375}$

Sep 10-11:28 AM

Given $n=10$ $\sum x=60$ $\sum x^2=360$

$$\bar{x}=\frac{\sum x}{n}=\frac{60}{10}=\boxed{6}$$ Mean

$$s^2=\frac{n\sum x^2-(\sum x)^2}{n(n-1)}=\frac{10\cdot 360-60^2}{10(10-1)}=\frac{0}{90}=\boxed{0}$$ Variance

$$S=\sqrt{s^2}=\sqrt{0}=\boxed{0}$$ Sample standard deviation

Ask google what it means when standard deviation is zero.

$$\boxed{\begin{matrix} s^2\geq 0 \\ s\geq 0 \end{matrix}}$$ Always

Sep 10-11:41 AM

whenever Mean, mode, and median are the Same, data distribution will be Symmetric and bell-shape looking.

Empirical Rule

About 68% of data elements are within $\bar{x}\pm S$

$$\boxed{\text{About 95\% of data elements are within } \bar{x}\pm 2S}$$

Usual Range

About 99.7% of data elements are within $\bar{x}\pm 3S$

Sep 10-12:02 PM

exam 1 had a symmetric dist. of Scores with $\bar{x} = 82$ and $S = 6$.

68% Range $\Rightarrow \bar{x} \pm S = 82 \pm 6$

$\Rightarrow$ $\boxed{76 \text{ to } 88}$

100% − 68% = 32%

32% ÷ 2 = 16%

16%   68%   16%

76   88

95% Range $\Rightarrow \bar{x} \pm 2S = 82 \pm 2(6) = 82 \pm 12$

$\Rightarrow$ $\boxed{70 \text{ to } 94}$

Usual Range

2.5%   95%   2.5%

Unusual   70   usual Range   94   Unusual

100% − 95% = 5%

5% ÷ 2 = $\boxed{2.5\%}$

what % of Scores were at least 70?

95% + 2.5% = $\boxed{97.5\%}$

Sep 10-12:07 PM

Z - Score   Always Round to 3-dec. Places

$$\boxed{Z = \frac{x - \bar{x}}{S}}$$

If $-2 \leq Z \leq 2 \Rightarrow$ data element is Usual.

If $Z < -2$ or $Z > 2 \Rightarrow$ data element is unusual.

unusual   usual   unusual

−2   0   2

Sep 10-12:16 PM

Exam 1 had $\bar{x} = 84$ and $S = 8$

Maria got 90 on exam 1.

Find its Z-Score.

$$Z = \frac{x - \bar{x}}{S} = \frac{90 - 84}{8} = \frac{6}{8} = \boxed{.75}$$

Since $-2 \leq Z \leq 2$ → Maria's exam score is usual.

Jose got 105 with bonus problem.

$$Z = \frac{x - \bar{x}}{S} = \frac{105 - 84}{8} = \frac{21}{8} = \boxed{2.625}$$

Since $Z > 2$ → Jose's score is unusual.

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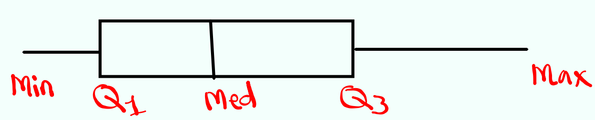
5 - Number Summary

Min $\quad Q_1 \quad$ Median $\quad Q_3 \quad$ Max

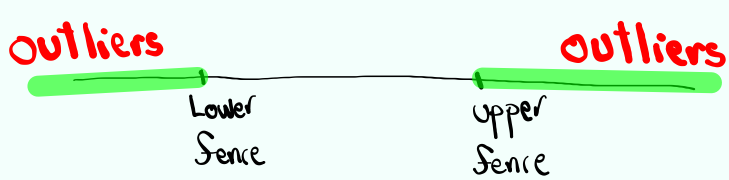
Draw Box Plot



IQR (Inter-Quartile-Range) $= Q_3 - Q_1$

Upper Fence $\quad Q_3 + 1.5\ IQR$

Lower Fence $\quad Q_1 - 1.5\ IQR$



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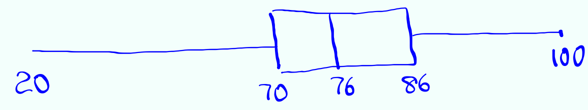
5-Number Summary of exam 1 Scores were

20	70	76	86	100
Min	Q_1	Med.	Q_3	Max

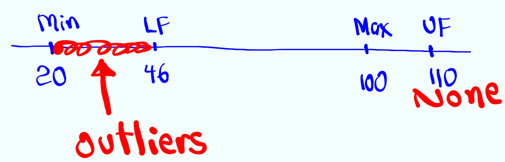
Box Plot



$IQR = Q_3 - Q_1 = 86 - 70 = 16$

upper fence $= Q_3 + 1.5\,IQR = 86 + 1.5(16) = \boxed{110}$

Lower fence $= Q_1 - 1.5\,IQR = 70 - 1.5(16) = \boxed{46}$



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