Statistics

Lecture 3

Feb 19-8:47 AM

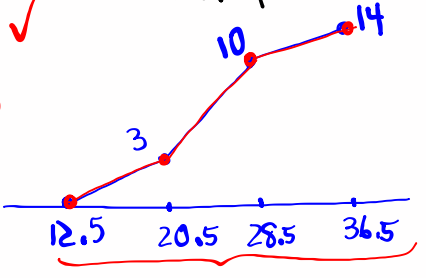
Class QZ 3

Complete the chart below

class BNDRS	class F	Cum. F
12.5 – 20.5	3	3
20.5 – 28.5	7	10
28.5 – 36.5	4	14

Draw ogive.

clearly label.



Sep 5-7:37 PM

Class QZ 4

Consider the Sample below → Sample Size

1	2	3	4
4	5	6	10

Find

1) $n = \boxed{8}$

2) $\sum x = 1+2+3+4+4+5+6+10$
$= \boxed{35}$

3) $\sum x^2 = 1^2+2^2+3^2+4^2+4^2+5^2+6^2+10^2$
$= \boxed{207}$

Sep 12-5:34 PM

$n \rightarrow$ Sample Size

SG 5-8

$x \rightarrow$ Data element

$\sum x \rightarrow$ Summation of data elements

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

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

ex: Consider the Sample below
2, 3, 3, 4, 8

$n = 5$ Range $= 8-2 = 6$ Midrange $= \frac{8+2}{2} = 5$

Mode $= 3$ $\sum x = 2+3+3+4+8 = 20$

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

Sep 12-7:09 PM

Consider the Sample below

2, 3, 4, 4, 5, 8, 8, 12

1) $n = \boxed{8}$

2) Range $= 12 - 2 = \boxed{10}$

3) Midrange $= \frac{12+2}{2} = \boxed{7}$

4) Mode $= \boxed{4 \text{ \& } 8}$ Bi modal

5) $\Sigma x = 2+3+4+4+5+8+8+12 = \boxed{46}$ ✓

6) $\bar{x} = \frac{\Sigma x}{n} = \frac{46}{8} = \boxed{5.75}$

Round To	Ans
whole	6
1-decimal	5.8

Sep 12-7:13 PM

$n \rightarrow$ Sample Size

$x \rightarrow$ Data element

$\Sigma x \rightarrow$ Summation of x.

$\Sigma x^2 \rightarrow$ Summation of x^2

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

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

$s^2 \rightarrow$ Sample Variance

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

OR

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

Consider the Sample below

1, 3, 3, 3, 5

$n = 5$ $\quad \Sigma x = 15$ $\quad \Sigma x^2 = 53$

$$\bar{x} = \frac{\Sigma x}{n} = \frac{15}{5} = \boxed{3}$$

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

Sep 12-7:18 PM

Consider the Sample below

1 2 4 4 6 9

$n = 6$ $\quad \Sigma x = 26$ $\quad \Sigma x^2 = 154$

Mode = 4 $\quad \bar{x} = \frac{\Sigma x}{n} = \frac{26}{6} = 4.\overline{3}$

whole 4

1-decimal 4.3

2-decimal 4.33

$$s^2 = \frac{n\Sigma x^2 - (\Sigma x)^2}{n(n-1)} = \frac{6 \cdot 154 - (26)^2}{6(6-1)} = \frac{248}{30} = 8.2\overline{6}$$

whole 8

1-Decimal 8.3

2- " 8.27

3- " 8.267

Sep 12-7:24 PM

$n \rightarrow$ Sample Size $\quad \bar{x} = \frac{\Sigma x}{n}$

$\bar{x} \rightarrow$ Sample Mean

$s^2 \rightarrow$ Sample Variance $\quad s^2 = \frac{n\Sigma x^2 - (\Sigma x)^2}{n(n-1)}$

$s \rightarrow$ Sample Standard deviation

$s = \sqrt{s^2}$

Suppose $n = 8$, $\Sigma x = 40$, $\Sigma x^2 = 262$

Min = 1 $\quad$ Max = 10

Range = Max − Min = 9

Midrange = $\frac{\text{Max} + \text{Min}}{2} = 5.5$

$\bar{x} = \frac{\Sigma x}{n} = \frac{40}{8} = 5$

$s^2 = \frac{n\Sigma x^2 - (\Sigma x)^2}{n(n-1)} = \frac{8 \cdot 262 - 40^2}{8(8-1)} = \frac{496}{56} \approx \boxed{8.857}$

$s = \sqrt{s^2} = \sqrt{8.857} \approx \boxed{2.976}$

Sep 12-7:30 PM

Consider the Sample below

2, 4, 4, 4, 6

$n = 5$ $\quad \Sigma x = 20$ $\quad \Sigma x^2 = 88$

Mode = 4 $\quad$ Range = 4 $\quad$ midrange = 4

$\bar{x} = \frac{\Sigma x}{n} = \frac{20}{5} = \boxed{4}$

$s^2 = \frac{n\Sigma x^2 - (\Sigma x)^2}{n(n-1)} = \frac{5 \cdot 88 - 20^2}{5(5-1)} = \frac{40}{20} = \boxed{2}$

$s = \sqrt{s^2} = \sqrt{2} \approx \boxed{1.414}$ 3-decimal

How to estimate s:

$s \approx \frac{\text{Range}}{4}$ The range rule-of-thumb

Sep 12-7:37 PM

Given $n = 8$ $\quad \Sigma x = 126$ $\quad \Sigma x^2 = 2094$

Min. = 10 $\quad$ Max = 22

Range = 22 − 10 = $\boxed{12}$ $\quad$ Midrange = $\frac{22+10}{2} = \boxed{16}$

$\bar{x} = \frac{\Sigma x}{n} = \frac{126}{8} = \boxed{15.75}$

$s^2 = \frac{n\Sigma x^2 - (\Sigma x)^2}{n(n-1)} = \frac{8 \cdot 2094 - 126^2}{8(8-1)} = \frac{876}{56}$

$= \boxed{15.643}$

$s = \sqrt{s^2} = \sqrt{15.643} \approx \boxed{3.955}$ ← Actural Value

Estimate s

$s \approx \frac{\text{Range}}{4} = \frac{12}{4} = \boxed{3}$ ← Estimated Value

On the Right-hand side of SG 5 – 8, make sure to watch the first 4 videos

Sep 12-7:44 PM

Empirical Rule

Data distribution is symmetric and Bell-Shape.

Mean = Mode = Median

About 68% of data fall within $\bar{x} \pm s$

About 95% " " " " $\bar{x} \pm 2s$

Usual Range

About 99.7% of " " " $\bar{x} \pm 3s$

Sep 12-8:01 PM

Assume a data dist. is symmetric with mean of 80 and standard deviation of 15. $\bar{x} = 80$, $s = 15$

By Empirical Rule

68% Range $\Rightarrow \bar{x} \pm s = 80 \pm 15 \Rightarrow$ 65 to 95

Usual Range $\Rightarrow \bar{x} \pm 2s = 80 \pm 2(15) \Rightarrow$ 50 to 110

95% Range

99.7% Range $\Rightarrow \bar{x} \pm 3s = 80 \pm 3(15) \Rightarrow$ 35 to 125

Sep 12-8:05 PM

I randomly selected 80 nurses, their mean age was 42 yrs and Standard dev. of 5 yrs. $\bar{x}=42$ $S=5$

Assume ages were symmetric & bell-shape dist.

68% Range $\Rightarrow \bar{x} \pm S \Rightarrow$ 37 to 47

95% Range $\Rightarrow \bar{x} \pm 2S \Rightarrow$ 32 to 52

Usual Range

How many of them had unusual age? 5% of 80

$.05(80) = 4$

95% usual

5% unusual

due to Symmetry

2 below 32

2 above 52

Sep 12-8:09 PM

Z – Score

Always round to 3-decimal places when needed.

Formula $Z = \dfrac{x-\bar{x}}{S}$

It is a method to standardize data elements.

If $-2 \le Z \le 2 \Rightarrow$ usual data

If $Z < -2$ or $Z > 2 \Rightarrow$ unusual

Sep 12-8:15 PM

A data set has $\bar{x} = 120$ & $S = 10$.

Find Z-Score for data element 138.

$$Z = \frac{x - \bar{x}}{S} = \frac{138 - 120}{10} = \frac{18}{10} = 1.8$$

usual data element

Find a data element with Z-Score of -2.5.

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

$$-2.5 = \frac{x - 120}{10}$$

Cross-Multiply

$$x - 120 = -2.5(10)$$

$$x - 120 = -25$$

$$x = 95$$

Sep 12-8:18 PM

Blanca got 88 on exam 1.

She got 78 on exam 2.

What exam did she perform better Compare to other people?

Exam 1: $\bar{x} = 85$, $S = 8$

$$Z = \frac{88 - 85}{8} = \frac{3}{8} = .375$$ usual

Exam 2: $\bar{x} = 70$, $S = 3$

$$Z = \frac{78 - 70}{3} = 2.667$$ unusual

Sep 12-8:23 PM

Lisa makes $4200 / month as a nurse

John makes $5000/ month as a handyman.

who does better? Lisa

$Z_{Lisa} = \frac{4200-2800}{500}$

$= \boxed{2.8}$ Unusual

Nurses: $\bar{x} = 2800$, $S = 500$

Handymen: $\bar{x} = 4500$, $S = 400$

$Z_{John} = \frac{5000-4500}{400} = \boxed{1.25}$ usual

SG 5 ✓

Exam 1: Sep. 23, 2023

8:00 – 12:00

Sep 12-8:27 PM

TI Instructions:

1) To clear the Screen [clear]

2) To quit [2nd] [MODE]

3) To clear all lists

[2nd] [+] [4: clear All lists] [Enter]

4) To reset all lists

[STAT] Edit [Enter]

5: Set up Editor

Sep 12-8:33 PM

How to store data elements in a list:

Store the following Sample in L1

List 1

8	2	10	15	5
6	20	1	10	8

STAT Edit

1:Edit

L1
8 enter
2 =
10 =
⋮
8 =

2nd Mode to quit

Clear clear Screen

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How to view the Content of a list:

2nd 1 (L1) Enter

{8 2 10 15 →→→ ←←←

How To Sort a list:

STAT Edit 2: SortA(2nd 1 (L1) Enter

Let's view L1 again

2nd 1 (L1) Enter {1 2 5 6 8 8...20}

Sep 12-8:42 PM

How to find $\bar{x}$ & s using TI:

STAT → CALC

1: 1-Var Stats

Menu
List: L1
FreqList:
Calculate

No Menu
L1 Enter
2nd 1

$\bar{x} = 8.5$

$s = s_x = 5.740$

How to find s^2:

VARS 5: Statistics 3: s_x x^2 Enter

$32.9\overline{4}$

MATH 1: ▶Frac Enter

$\frac{593}{18}$

To convert this to a reduced fraction

Sep 12-8:48 PM

Clear the Screen Clear

Clear all lists 2nd + 4: ClrAllLists Enter

Store the following in L1. STAT Edit 1: Edit

25	32	18	20	25
30	15	40	35	38

L1

25 Enter
32 "
18 "
⋮
38 "

quit 2nd Mode

Clear Screen Clear

Sort L1

STAT Edit 2: SortA(2nd 1 Enter

Sep 12-8:57 PM

Now view L1

2nd 1 Enter {15 18 20 25 25 ... 40}

Find $\bar{x}$ & S using L1.

STAT → CALC

1:1-Var Stats

Menu
List: L1
Freq List:
Calculate

No Menu
L1 Enter

$\bar{x} = 27.8$

$S = S_x = 8.587$

Find S^2

VARS 5: Statistics 3: S_x x^2 Enter

$73.7\overline{3}$

Convert to reduced fraction

MATH 1: ▶Frac Enter

$\frac{1106}{15}$

Sep 12-9:02 PM

Class QZ 5

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

Find

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

2) $S^2 = \frac{n\sum x^2 - (\sum x)^2}{n(n-1)} = \frac{10 \cdot 360 - 60^2}{10(10-1)} = \frac{3600-3600}{90} = \frac{0}{90} = \boxed{0}$

3) $S = \sqrt{S^2} = \sqrt{0} = \boxed{0}$

Sep 12-9:10 PM