

**Math 227**  
**Spring 2021**  
**Lecture 6**



Class QZ 6

A Sample has a min. of 30 and max of 70.

$$1) \text{ Range} = \text{Max} - \text{Min} \\ = 70 - 30 = \boxed{40}$$

$$2) \text{ Midrange} = \frac{\text{Max} + \text{Min}}{2} \\ = \frac{70 + 30}{2} = \boxed{50}$$

3) Estimate S

$$S \approx \frac{\text{Range}}{4} = \frac{40}{4} = \boxed{10}$$

4) class width for  
 freq. table with 5  
 classes.

$$CW = \frac{\text{Range}}{5} = \frac{40}{5} = 8$$

$$\boxed{CW=9}$$

$n$  Sample Size       $\sum x$  Sum of data elements  
 $\bar{x}$  Sample Mean       $\sum x^2$  Sum of data elements<sup>2</sup>  
 $S^2$  Sample Variance  
 $S$  Sample Standard deviation

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

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

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

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

Given  $n = 5$ ,  $\sum x = 50$ ,  $\sum x^2 = 558$ ,  $\text{Min} = 5$ ,  $\text{Max} = 15$

$$\text{Range} = \text{Max} - \text{Min} = 15 - 5 = 10$$

$$\text{Midrange} = \frac{\text{Max} + \text{Min}}{2} = \frac{15 + 5}{2} = 10$$

$$\bar{x} = \frac{\sum x}{n} = \frac{50}{5} = 10$$

$$S^2 = \frac{n \sum x^2 - (\sum x)^2}{n(n-1)} = \frac{5 \cdot 558 - 50^2}{5(5-1)} = \frac{290}{20} = \frac{29}{2} = \boxed{14.5}$$

$$S = \sqrt{S^2} = \sqrt{14.5} = \boxed{3.808}$$

$$\text{Estimate } S \quad S \approx \frac{\text{Range}}{4} = \frac{10}{4} = \boxed{2.5}$$

Given  $n=10$ ,  $\sum x=150$ ,  $\sum x^2=2418$

Min=8, Max=22

Range =  $22-8 = 14$       Midrange =  $\frac{22+8}{2} = 15$

$\bar{x} = \frac{\sum x}{n} = \frac{150}{10} = 15$        $S^2 = \frac{n \sum x^2 - (\sum x)^2}{n(n-1)} = \frac{10 \cdot 2418 - 150^2}{10(10-1)}$

$= \frac{1680}{90} = \frac{168}{9} = \frac{56}{3}$

$S = \sqrt{S^2} = \sqrt{\frac{56}{3}}$

$= 4.320$

Estimate  $S \approx \frac{\text{Range}}{4} = \frac{14}{4} = \frac{7}{2} = 3.5$

what is standard deviation?

Standard deviation for any sample S

1) It is a non-negative numerical value  
 $S \geq 0$

2) It is a measure that indicates how data elements vary with respect to  $\bar{x}$ .

When S is small:

Data elements tend to be close to  $\bar{x}$ .

When S is big:

Data elements are more spread out from  $\bar{x}$ .

When S is zero:

All data elements are the same as  $\bar{x}$ .  $\Rightarrow$  NO Variation from  $\bar{x}$ .

Clear all lists:  $\boxed{2nd} \boxed{+} \boxed{4:} \boxed{Enter}$

Reset all lists:  $\boxed{STAT} \boxed{Edit} \boxed{Enter}$   
 $\boxed{5:}$

Store the following in L1 Find  
 10 10 10 10 10  $\bar{x}=10$   $S=0$

$\boxed{STAT} \rightarrow \boxed{CALC}$  List: L1  $\leftarrow \boxed{2nd} \boxed{1}$   
 $\boxed{1:1-Var\ stats}$  Freq List: Clear  $\frac{10}{10}$   
 $\boxed{Calculate}$

Go back to Your list, change the first 10 to 11

11 10 10 10 10  $\bar{x}=10.2$   
 $S=.447$

Find  $\bar{x}$  and S.

$\boxed{STAT} \rightarrow \boxed{CALC}$  List: L1  $\frac{11}{10 \ 10.2}$   
 $\boxed{1:1-Var\ Stats}$  Freq List: Clear  
 $\boxed{Calculate}$

Go back to Your list, change 11 to 20, then

Find  $\bar{x}$  & S.  $\bar{x}=12$

$S=4.472$   $\frac{10 \ 12 \ 20}{10 \ 10.2}$

20 10 10 10 10

Go back to Your list, change 20 to 100,

then compute  $\bar{x}$  & S.  $\bar{x}=28$   
 $S=40.249$

100 10 10 10 10  $\frac{100}{10 \ 28}$

$\frac{10 \ 28 \ 100}{10 \ 28}$

Clear all lists

Store the following test results in L1:

75	83	90	95	65	Find
100	80	79	70	92	$\bar{x} = 82.85$
88	60	68	86	94	$S = 11.811$
100	70	80	90	92	

Min = 60

$Q_1 = 72.5$

Med. = 84.5

$Q_3 = 92$

Max = 100

$n = 20$

Find  $S^2$  in reduced fraction

Vars 5: 3:

$\chi^2$  Math 1:

Enter  $S^2 = \frac{53011}{380}$

Min = 60

$Q_1 = 72.5$

Med. = 84.5

$Q_3 = 92$

Max = 100

5-Number Summary

Box Plot

$IQR = Q_3 - Q_1 = 19.5$

Upper Fence =  $Q_3 + 1.5(IQR) = 92 + 1.5(19.5) = 121.25$

Lower Fence =  $Q_1 - 1.5(IQR) = 72.5 - 1.5(19.5) = 43.25$

Our sample does not have any outlier.

LF Min Max UF

43.25 60 100 121.25

Sort the data

STAT Edit
L1  
2nd 1 Enter  
2: SortA

Make Stem Plot

Let's view L1

2nd 1 Enter  
 { 60 65 68 70 ... }  
     → → →  
     ← ← ←

6		058
7		0059
8		00368
9		002245
10		00

Find  $P_{30}$

30%	$P_{30}$	70%
-----		
77		

$L = \frac{30}{100} \cdot 20 = 6$   
 $P_{30} = \frac{6\text{th element} + \text{Next one}}{2} = \frac{75 + 79}{2} = \boxed{77}$

88%	$P_{88}$	12%
-----		
95		

$P_{88} = 18\text{th element}$

$P_{88} = 95$

$L = \frac{88}{100} \cdot 20 = 17.6$   
 $L = 18$

Find  $k$  such that  $P_k = 75$

25%	$P_{25}$	75%
-----		
75		

$k = \frac{B}{n} \cdot 100 = \frac{5}{20} \cdot 100 = 25$

Class QZ 7

Consider the sample below Find

28	32	18	20
35	40	42	25
38	19	29	36

$$\bar{x} = 30.\bar{16} = 30.167$$

$$s = 8.354$$

$s^2$  (Reduced fraction)

$$= \frac{2303}{33}$$

WORK ON  
SG 5-9

$\boxed{2nd} \boxed{0} \downarrow \downarrow \dots \downarrow \triangleright \text{Diagnostic On} \boxed{Enter} \boxed{Enter}$

Consider the chart below

x	y
1	4
2	10
3	10
5	18
5	21

$x \rightarrow L1, y \rightarrow L2$

quit  $\rightarrow \boxed{2nd} \boxed{Mode}$

clear the screen  $\Rightarrow \boxed{Clear}$

$\boxed{STAT} \rightarrow \boxed{CALC}$

$\boxed{8: LinReg(a+bx)}$

With Menu

Xlist: L1

Ylist: L2

$\boxed{2nd} \boxed{Clear}$

Calculate

No Menu

LinReg(a+bx)

L1, L2  $\boxed{enter}$

$\boxed{2nd} \boxed{1}$

$\boxed{2nd} \boxed{2}$

$\boxed{=}$

$$y = a + bx$$

$$a = .75$$

$$b = 3.703$$

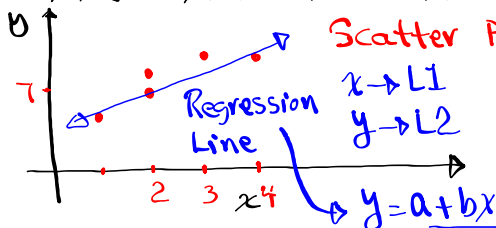
$$r^2 = .938$$

$$r = .968$$

Clear all lists.

Plot the following points

(2,7), (3,10), (4,10), (1,5), (2,8)



L1	L2
x	y
2	7
3	10
4	10
1	5
2	8

[STAT] → [CALC]

8: LinReg (a+bx)

with Menu

xlist: L1

Ylist: L2

clear

[calculate]

NO Menu

LinReg (a+bx)

L1, L2 [Enter]

[7]

$$y = 3.8 + 1.7x$$

$$a = 3.846$$

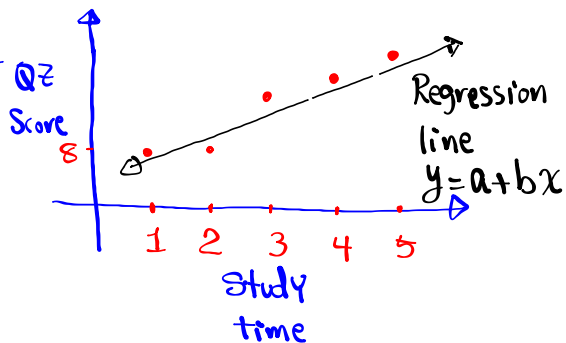
$$b = 1.731$$

$$r^2 = .865$$

$$r = .930$$

Study time | QZ Score

1	8
2	8
3	14
4	15
5	18



clear all lists, Study time → x → L1

QZ Score → y → L2

[STAT] → [CALC]

8: LinReg (a+bx)

$$a = 4.5$$

$$b = 2.7$$

$$\Rightarrow y = 4.5 + 2.7x$$

[2nd] [0] ↓ ↓ ... ↓ [Diagnostic On]  $r^2 = .920$

[Enter] [Enter]  $r = .959$



How to find  $\bar{x}$  &  $S$  of a grouped data:

class MP  $\rightarrow$  L1

class Freq  $\rightarrow$  L2

**STAT**  $\rightarrow$  **CALC**

**1: 1-var Stats**

With Menu | No Menu

(list: L1

L1, L2

freq list: L2

**enter**

Calculate

class QZ 8

Consider the chart below

class MP	class F	Find
13	5	$\bar{x} =$
20	8	$S =$
27	10	$n =$
34	2	

**VAR S**

5:

3:

**2<sup>2</sup>**

Math 1: Enter

$S^2$  (Reduced fraction)