Statistics

Lecture 6

Feb 19-8:47 AM

Class Qz 1

Consider the Sample below

8	10	15	10	16
20	14	15	13	10

Find

1) $\bar{x} = 13.1 \approx \boxed{13}$

2) $S = 3.635 \approx \boxed{4}$

} Round to whole #

3) $S^2 = \frac{1189}{90}$ } Reduced fraction

Mar 2-6:42 PM

Complete the table below

class limits	class MP	class F
23 - 31	27	4
32 - 40	36	6
41 - 49	45	10
50 - 58	54	5

x9 x9 x9

Class MP → L1

Class F → L2

Use 1-Var Stats with L1 & L2 Find

1) $\bar{x} = 41.76$ $\approx \boxed{42}$

2) $S = 8.954$ $\approx \boxed{9}$

3) $S^2 = 80.19$ $= \boxed{\frac{8019}{100}}$

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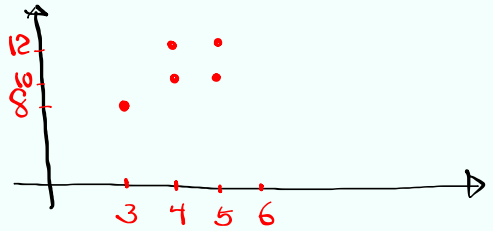
Consider the chart below

x	y
3	8
4	10
4	12
5	10
6	12

Scatter Plot



2nd [+] 4: ClearAllList Enter

x → L1
y → L2

STAT [→] CALC 2: 2-Var Stats

xlist: L1
ylist: L2
FreqList: clear
Calculate

NO Menu
L1, L2
[,]
Enter

$\Sigma x = 22$ $\Sigma y = 52$

$\Sigma x^2 = 102$ $\Sigma y^2 = 552$

$n = 5$ $\Sigma xy = 234$

Mar 2-7:10 PM

STAT → CALC

8:LinReg(a+bx)

Xlist: L1

Ylist: L2

clear

Calculate

No Menu

L1 , L2 Enter

7

a = 6

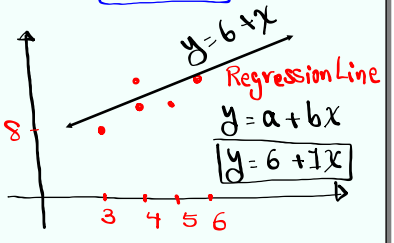
b = 1

r^2 = .464

r = .681

Linear Correlation Coefficient

$-1 \le r \le 1$



Coef. of determination (Always in whole %)

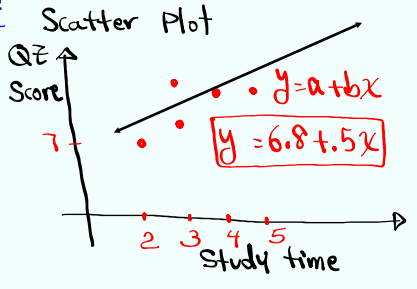
$r^2 \approx 46\%$

If r & r^2 missing:

2nd 0 ↓↓···↓ ▶Diagnostic On Enter Enter

Mar 2-7:20 PM

Study time	QZ Score
2	7
3	8
3	10
4	9
5	9



clear all lists

Study time → X → L1 , QZ Score → Y → L2

STAT → CALC

8:LinReg(a+bx)

Xlist: L1

Ylist: L2

clear

Calculate

No Menu

L1 , L2 Enter

7

a = 6.769 ≈ 6.8

b = .538 ≈ .5

r^2 = .290 ≈ 29%

r = .538

$-1 \le r \le 1$

Mar 2-7:31 PM

r^2 Coef. of determination

Always round to whole %.

It tells us what % of Y-values are explained by X-values

From Last example

29% of QZ Scores are explained by study time

Mar 2-7:41 PM

r Linear Correlation Coefficient

Always round to 3-decimal places

$-1 \leq r \leq 1$

When r is close to 1 or −1, the linear Correlation is Significant.

When r is close to 0, the linear Correlation is not Significant

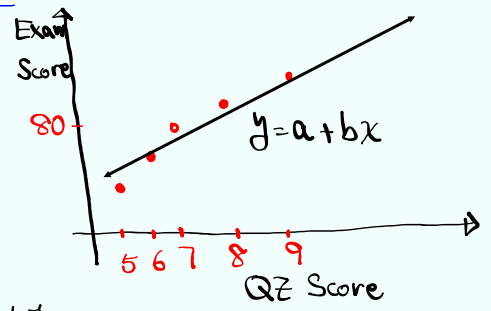
from last example → r = .538

it is closer to 1 than 0.

r is somewhat significant.

Mar 2-7:43 PM

Qz Score	Exam Score
7	80
8	85
5	55
9	95
6	75



Qz Scores → x → L1
Exam Scores → y → L2

use LinReg(a+bx) with L1 & L2

a = 15
b = 9
→ $y = 15 + 9x$

$r^2 = .920 \approx 92\%$ 92% of exam Scores are explained by Qz Scores.

$r = .959$ → close to 1 → Linear Correlation is Significant.

Mar 2-7:47 PM

How to make predictions:

If r is significant, use the regression line.

If r is not Significant, use $\bar{y}$

from Last example, Predict exam Score if I made 8 on the quiz.

Assume r is Significant

$y = 15 + 9(8) = 15 + 72 = 87$

Assume r is not significant

use $\bar{y}$

VARS | 5:Statistics | 5:$\bar{y}$ | Enter

$\bar{y} = 78$

Mar 2-7:54 PM

Use the chart below

x	y
1	4
2	7
3	8
5	10
6	10

Use **2-Var Stats** with L1 & L2 to find

$\Sigma x = 17$ $\Sigma y = 39$

$\Sigma x^2 = 75$ $\Sigma y^2 = 329$

$n = 5$ $\Sigma xy = 152$

Use LinReg(a+bx) with L1 & L2

$a = 3.965$ ✓ $r^2 = .882$ ✓

$b = 1.128$ ✓ $r = .939$ ✓

Mar 2-8:09 PM

How to find a & b using formulas:

$$a = \frac{\Sigma y \cdot \Sigma x^2 - \Sigma x \cdot \Sigma xy}{n\Sigma x^2 - (\Sigma x)^2} = \frac{39 \cdot 75 - 17 \cdot 152}{5 \cdot 75 - 17^2}$$

$$= \frac{341}{86} = 3.965$$

$$b = \frac{n\Sigma xy - \Sigma x \cdot \Sigma y}{n\Sigma x^2 - (\Sigma x)^2} \quad \frac{5 \cdot 152 - 17 \cdot 39}{5 \cdot 75 - 17^2} = \frac{97}{86} = 1.128$$

Mar 2-8:14 PM

Now formula for r:

$$r = \frac{n\Sigma xy - \Sigma x \cdot \Sigma y}{\sqrt{n\Sigma x^2 - (\Sigma x)^2}\ \sqrt{n\Sigma y^2 - (\Sigma y)^2}}$$

$$= \frac{5 \cdot 152 - 17 \cdot 39}{\sqrt{5 \cdot 75 - 17^2} \cdot \sqrt{5 \cdot 329 - 39^2}} = \frac{97}{\sqrt{86}\ \sqrt{124}}$$

$$= \frac{97}{\sqrt{10664}} = .939$$

97 ÷ [2nd] [x^2] 10664 [Enter]

For r^2

$$r^2 = .939^2 \approx .882$$

Mar 2-8:22 PM

Walk time	BS level
15	110
10	120
20	105
5	130
0	140
30	100

walk time → x → L1

BS level → y → L2

use LinReg(a+bx) with L1 & L2 to find

$a = 135.8$

$b = -1.4$

$r^2 \approx 92\%$

$r = -.961$

92% of my BS level are explained by how much I walk.

r is close to -1 → Significant

Mar 2-8:31 PM

Predict my BS level if I walk for 20 minutes.

1) r is Significant

use regression line

$\hat{y} \approx 135.8 - 1.4(20) \approx 107.8 \approx \boxed{108}$

2) r is not Significant

use $\bar{y} = \frac{\Sigma y}{n}$ $\quad 117.5 \approx \boxed{118}$

VARS | 5: Statistics | 5: $\bar{y}$ | Enter

SG 9 ✓

Mar 2-8:38 PM

Class Qz 2

use the chart below

x	y
2	7
3	10
4	12
2	10
5	15

Find

1) $a \approx 4.1$ } Round to 1-dec.

2) $b \approx 2.1$ } Round to 1-dec.

3) $r^2 \approx 85\%$ } whole %.

4) $r \approx .923$ } 3-dec.

Mar 2-8:42 PM