

**Statistics
Lecture 9**



Feb 19-8:47 AM

Consider the chart below

x	y
3	8
4	11
5	12
5	15
6	15
8	20

$\sum x = 31$

$\sum x^2 = 175$

$n = 6$

clear all lists

Reset all lists

x → L1, y → L2

use **STAT** → **calc**

2:2-Var Stats

$\sum y = 81$

$\sum y^2 = 1179$

$\sum xy = 453$

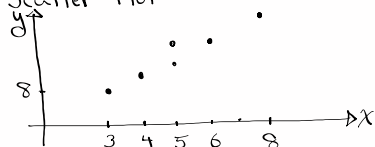
x list: L1

y list: L2

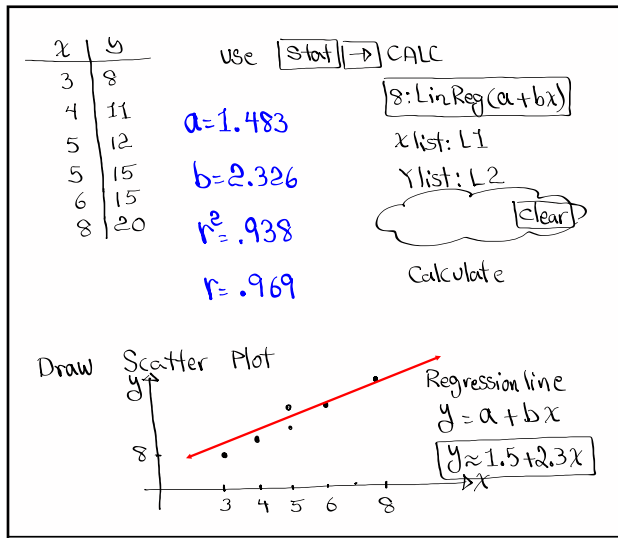
freq list: **clear**

Calculate

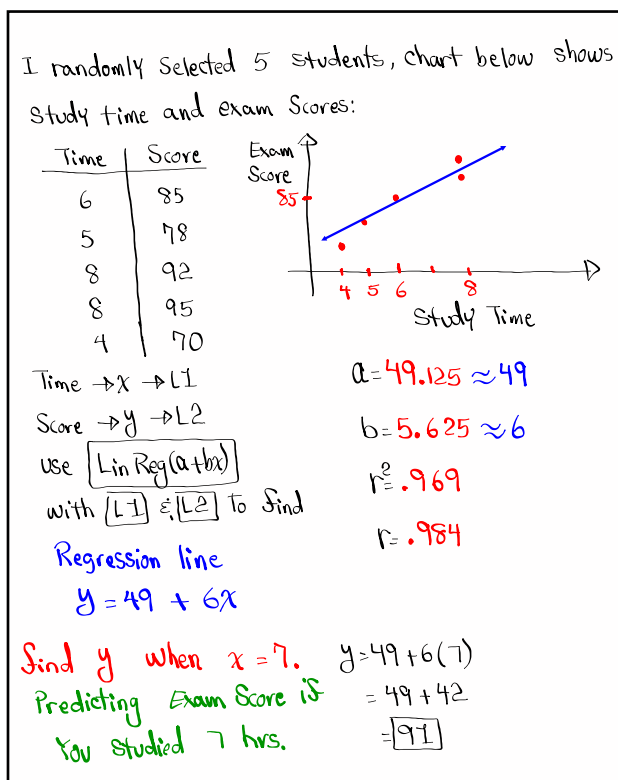
Draw Scatter Plot



Nov 6-7:25 AM



Nov 6-7:32 AM



Nov 6-7:37 AM

Formulas for $y = a + bx$ } Given:

$$a = \frac{\sum y \cdot \sum x^2 - \sum x \cdot \sum xy}{n \sum x^2 - (\sum x)^2}$$

$$b = \frac{n \sum xy - \sum x \cdot \sum y}{n \sum x^2 - (\sum x)^2}$$

$\sum x = 15, \sum x^2 = 55,$
 $n = 5, \sum y = 43,$
 $\sum y^2 = 391, \sum xy = 145$

$$a = \frac{43 \cdot 55 - 15 \cdot 145}{5 \cdot 55 - 15^2} = \frac{190}{50} = 3.8 \checkmark$$

$$b = \frac{5 \cdot 145 - 15 \cdot 43}{5 \cdot 55 - 15^2} = \frac{80}{50} = 1.6 \checkmark$$

$\Rightarrow y = 3.8 + 1.6x$

x	y
1	5
2	5
3	8
4	10
5	12

use LinReg(A+bx)
 with L1 & L2 to
 find
 $a = 3.8$
 $b = 1.6$
 $r^2 = .941$
 $r = .970$

\Rightarrow Linear Correlation is Significant.

Nov 6-7:46 AM

Linear Correlation Coefficient r

Correlation between two variables is an association between them

- $-1 \leq r \leq 1$
- r changes value if Sample contains outliers
- If r is close to ± 1 , the linear correlation is considered to be significant.
- If r is close to 0, not significant.

Nov 6-7:55 AM

Formula for r:

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

$$r = \frac{5 \cdot 145 - 15 \cdot 43}{\sqrt{5 \cdot 55 - 15^2} \cdot \sqrt{5 \cdot 391 - 43^2}}$$

$$= \frac{80}{\sqrt{50} \sqrt{136}} = \frac{80}{\sqrt{6800}}$$

$$= .970$$

Given:

$$\sum x = 15, \sum x^2 = 55,$$

$$n = 5, \sum y = 43,$$

$$\sum y^2 = 391, \sum xy = 145$$

Nov 6-8:02 AM

Now what about r^2 ?

r^2 is the Coefficient of determination

Always express in whole %.

r^2 tells us what % of Y-values are explained by X-values.

From last example

$$r^2 = .970^2 = .941 \approx 94\%$$

94% of Y-values are explained by X-values.

6% are unexplained.

VARs

15: Statistics → → EQ

↓

8: r^2

Enter Enter

$$r^2 = .94117 \dots$$

$$\approx 94\%$$

Nov 6-8:11 AM

use the chart below

x	y
1	10
2	8
4	8
5	5
8	10

1) Scatter Plot

2) $n=5$ $\sum x=20$ $\sum x^2=110$
 $\sum y=33$ $\sum y^2=257$ $\sum xy=99$

3) Find
 $a=11$
 $b=-1.1$
 $r^2=.926$
 $r=-.962$

$\rightarrow y = 11 - 1.1x$

\rightarrow Coef. of determination
 $r^2 \approx 93\%$
 93% of Y-values are explained by X-values.
 7% are unexplained

\downarrow
 Linear Correlation Coefficient
 is close to $-1 \Rightarrow$ It appears to be Significant.

Nov 6-8:17 AM

Class QZ 8

Consider the chart below

x	y
8	20
9	22
10	25
12	25
12	28

Find

- $a \approx 8$
- $b \approx 2$
- $r^2 \approx 82\%$
- $r \approx .907$

} Round to whole #
 } Round to whole %
 } 3-decimals

Nov 6-8:26 AM

Predict exam Score for Someone with
Quiz Score 7.

1) Assume r is Significant.

Use Regression line

$$y = 38 + 6x \quad y = 38 + 6(7) = \boxed{80}$$

2) Assume r is not Significant.

Use $\bar{y} = \boxed{85}$ ✓

$$\bar{y} = \frac{\sum y}{n} \quad \text{or} \quad \boxed{\text{VARS}} \boxed{5: \text{statistics}} \boxed{5: \bar{y}} \boxed{\text{Enter}}$$

Nov 6-9:20 AM

Given $n=6$, $\sum x=48$, $\sum x^2=402$,

$\sum y=510$, $\sum y^2=44050$, $\sum xy=4185$

Find $y = a + bx$, Round to whole #.

$$a = \frac{\sum y \cdot \sum x^2 - \sum x \cdot \sum xy}{n \sum x^2 - (\sum x)^2} = \frac{510 \cdot 402 - 48 \cdot 4185}{6 \cdot 402 - 48^2}$$

$$= \frac{4140}{108} = 38.\bar{3} \approx \boxed{38}$$

$$b = \frac{n \sum xy - \sum x \cdot \sum y}{n \sum x^2 - (\sum x)^2} = \frac{6 \cdot 4185 - 48 \cdot 510}{6 \cdot 402 - 48^2}$$

$$= \frac{630}{108} = 5.\bar{8} \approx \boxed{6}$$

$$\hat{y} = a + bx$$

$$\hat{y} \approx 38 + 6x$$

Nov 6-9:25 AM

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

$$r = \frac{6 \cdot 4185 - 48 \cdot 510}{\sqrt{6 \cdot 402 - 48^2} \cdot \sqrt{6 \cdot 4050 - 510^2}} = \frac{630}{\sqrt{108} \sqrt{4200}}$$

r is close to 1
Linear Correlation
Seems to be significant.

$$= \frac{630}{\sqrt{453600}} = .935$$

Find r^2 in whole%. $r^2 = .935^2 = .874 \dots$

Explain what that means $r^2 \approx 87\%$

About 87% of Y-values
are explained by X-values.

13% are unexplained.

SG 9 ✓

- 1) Page-Per-Page Contents required.
- 2) Keep Same Format as original file.

Work

Final Ans.
1) ↓

- 3) Submit as one file with pages in order.

Nov 6-9:35 AM