Statistics

Lecture 5

Feb 19-8:47 AM

In-Person QZ 4

Consider the Sample below

28	35	46	20
18	30	25	40
19	23	29	36
45	50	25	

Store in L1

STAT → CALC

1:1-VarStats

Find

$\bar{x} = 31.2\overline{6} \approx \boxed{31}$

$S = 10.306 \approx \boxed{10}$

} Round to whole #

$S^2 = \frac{11152}{105}$

} Reduced fraction

VARS

5: Statistics

3: S_x

x^2

MATH

1: ▶Frac

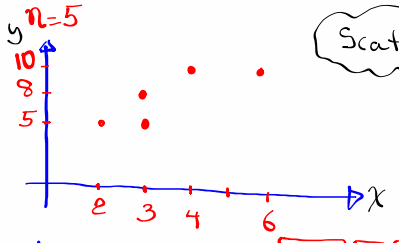
Enter

Mar 22-10:52 AM

Working with ordered-Pairs (x, y)

SG 9

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



Scatter Plot

Clear all lists: 2nd | + | 4:clearAllLists | Enter

Reset all lists: STAT | Edit | 5:SetupEditor | Enter

Store
x → L1
y → L2

STAT | → | CALC | 2:2-Var Stats

xlist: L1
Ylist: L2
freqList: Clear
Calculate

No Menu
L1, L2
enter

$\Sigma x = 18$
$\Sigma x^2 = 74$
$\Sigma y = 38$
$\Sigma y^2 = 314$
$\Sigma xy = 149$

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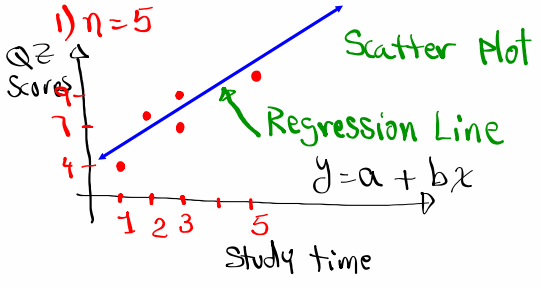
I randomly Selected 5 students, chart below shows Study time & Q2 Scores.

Time	Scores
3	7
3	9
1	4
2	8
5	10



Clear all lists, Time → x → L1, Score → y → L2
use 2-Var Stats with L1 & L2 to Find

$\Sigma x = 14$
$\Sigma y = 38$
$\Sigma x^2 = 48$
$\Sigma y^2 = 310$
$n = 5$
$\Sigma xy = 118$

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How to find eqn of regression line using TI:

$y = a + bx$

STAT → CALC

4: LinReg(ax+b)

8: Lin Reg(a+bx)

NO Menu

L1, L2 Enter

with Menu

Xlist: L1

Ylist: L2

clear

Calculate

$y = a + bx$

$a = 3.909 \approx 4$

$b = 1.318 \approx 1$

$\Rightarrow \boxed{y \approx 4 + x}$ Regression line

$r^2 = .721$

$r = .849$

If r^2 & r are missing, Do

2nd 0 ↓↓↓...↓ ▶Diagnostic On

Enter Enter

Mar 29-8:28 AM

Complete the chart below

x	y	x^2	y^2	xy
1	8	1	64	8
2	5	4	25	10
4	2	16	4	8
6	2	36	4	12

1) $n = 4$

2) $\Sigma x = 13$

$\Sigma x^2 = 57$

$\Sigma y = 17$

$\Sigma y^2 = 97$

$\Sigma xy = 38$

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

$a = 8.051 \approx 8.1$

$b = -1.169 \approx -1.2$

$r^2 = .815$

$r = -.903$

$\Rightarrow \boxed{y \approx 8.1 - 1.2x}$ Regression line

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r → Linear Correlation Coefficient

$-1 \le r \le 1$

when r is close to ± 1,
Linear Correlation is Significant

when r is close to 0,
Linear Correlation is not Significant

From last example
$r = -.903$ → It is close to -1, so Linear Correlation is Significant.

Mar 29-8:44 AM

r^2 → Coef. of determination
→ Always express as whole percent.

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

From last example $r^2 = .815 \rightarrow r^2 \approx 82\%$
82% of Y-values are explained by x-values
18% = unexplained.

From example on Study time & Quiz Scores:
$r^2 = .721 \rightarrow r^2 \approx 72\%$.
72% of Quiz Scores are explained by Study time.
28% are unexplained.

Mar 29-8:49 AM

Two branches of Statistics:

1) Descriptive

2) Inferential (Making predictions based on descriptive stat.)

How to predict Y-value for a given x-value.

1) use regression line when r is Significant.
Plug in x to find y.

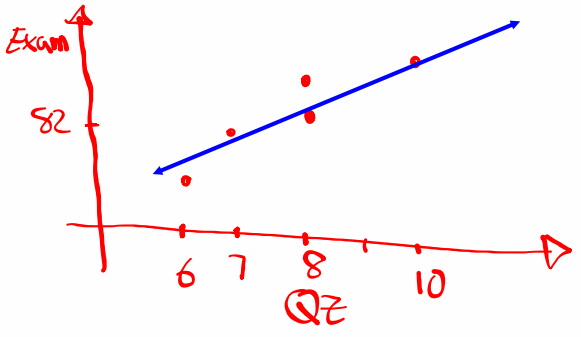
2) use $\bar{y}$ when r is not Significant

$\bar{y} = \frac{\Sigma y}{n}$ OR VARS
5: Statistics
5: $\bar{y}$
Enter

Mar 29-8:54 AM

Chart below shows QZ Scores & Exam Scores

QZ	Exam
7	82
8	85
8	90
6	70
10	95



QZ → X → L1
Exam → y → L2

LinReg(a+bx)
$a = 37.955 \approx 38$
$b = 5.955 \approx 6$
$r^2 = .874$
$r = .935$

Regression line
$y \approx 38 + 6x$

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$r^2 = .874 \rightarrow r^2 \approx 87\%$

87% of Exam Scores are explained by QZ Scores.

13% are unexplained.

$r = .935 \rightarrow$ r is close to 1, Linear Correlation is Significant

Predict exam Score for Someone with QZ-Score 6:

1) Assume r is Significant

use Regression Line $y = 38 + 6x$

$= 38 + 6(6) = 38 + 36 = \boxed{74}$

2) Assume r is not Significant.

use $\bar{y}$

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

$\bar{y} = 84.4 \approx \boxed{84}$

Mar 29-9:08 AM

Formulas for a & b:

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

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

$n = 5, \Sigma x = 39, \Sigma x^2 = 313$

$\Sigma y = 422, \Sigma y^2 = 35974$

$\Sigma xy = 3344$

$$a = \frac{422 \cdot 313 - 39 \cdot 3344}{5 \cdot 313 - 39^2} = \frac{1670}{44} \approx \boxed{37.955}$$

$$= \frac{5 \cdot 3344 - 39 \cdot 422}{5 \cdot 313 - 39^2} = \frac{262}{44} \approx \boxed{5.955}$$

Mar 29-9:15 AM

$n=5,\ \Sigma x=39,\ \Sigma x^2=313$

$\Sigma y=422,\ \Sigma y^2=35974$

$\Sigma xy=3344$

Now Formula for r:

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

$$=\frac{5\cdot 3344-39\cdot 422}{\sqrt{5\cdot 313-39^2}\ \sqrt{5\cdot 35974-422^2}}=\frac{262}{\sqrt{44}\ \sqrt{1786}}$$

$$=\frac{262}{\sqrt{78584}}\approx .935$$

SG 9 ✓

262 ÷ 2nd x^2 78584 Enter

Mar 29-9:22 AM