Statistics
Fall 2022
Lecture 9

Feb 19-8:47 AM

Class QZ 10

STAT → CALC
2: 2-Var Stats

Given the chart below

x	y
2	7
3	9
3	8
4	11
6	20

$x \to L1$, $y \to L2$

use 2-Var Stats with L1 & L2 to find

$\Sigma x = 18$
$\Sigma x^2 = 74$
$n = 5$
$\Sigma y = 55$
$\Sigma y^2 = 715$
$\Sigma xy = 229$

Menu:
Xlist: L1
Ylist: L2
Freqlist: clear
Calculate

No Menu
2-Var Stats
L1 , L2 enter
1
2nd 1 2nd 2

Nov 7-5:36 AM

$\Sigma x = 18$ $\quad \Sigma y = 55$ $\quad$ Equation of regression line $y = a + bx$

$\Sigma x^2 = 74$ $\quad \Sigma y^2 = 715$

$n = 5$ $\quad \Sigma xy = 229$

$$a = \frac{\Sigma y \cdot \Sigma x^2 - \Sigma x \cdot \Sigma xy}{n\Sigma x^2 - (\Sigma x)^2} = \frac{55 \cdot 74 - 18 \cdot 229}{5 \cdot 74 - 18^2} = \frac{-52}{46}$$

$$\approx \boxed{-1.130}$$

$$b = \frac{n\Sigma xy - \Sigma x \cdot \Sigma y}{n\Sigma x^2 - (\Sigma x)^2} = \frac{5 \cdot 229 - 18 \cdot 55}{5 \cdot 74 - 18^2} = \frac{155}{46}$$

$$\approx \boxed{3.370}$$

Regression line

$y = a + bx$

$\boxed{y \approx -1.130 + 3.370x}$

Nov 7-6:16 AM

x	y
2	7
3	9
3	8
4	11
6	20

$x \rightarrow L1$

$y \rightarrow L2$

STAT → CALC

8: LinReg(a+bx)

With Menu:

Xlist: L1

Ylist: L2

Clear

Calculate

No Menu:

LinReg(a+bx)

L1, L2 Enter

1

$a = -1.130$

$b = 3.370$

} Round to 3-decimals

$r^2 = .950 \approx 95\%$

} Round to whole %

$r = .974$

Since r is close to 1 ⇒ Linear Correlation is significant.

$r^2 \approx 95\%$ ← Coef. of determination

95% of Y-values are explained by x-values.

5% are unexplained.

Nov 7-6:23 AM

Study time	Exam Score
7	85
8	92
8	95
4	65
5	73
10	95

Study time $\to x \to L1$

Exam Score $\to y \to L2$

Find

$\Sigma x = 42$ $\quad \Sigma y = 505$

$\Sigma x^2 = 318$ $\quad \Sigma y^2 = 43293$

$n = 6$ $\quad \Sigma xy = 3666$

$$a = \frac{\Sigma y \cdot \Sigma x^2 - \Sigma x \cdot \Sigma xy}{n\Sigma x^2 - (\Sigma x)^2} = \frac{505 \cdot 318 - 42 \cdot 3666}{6 \cdot 318 - (42)^2} = \frac{6618}{144}$$

$$= 45.958 \approx 46$$

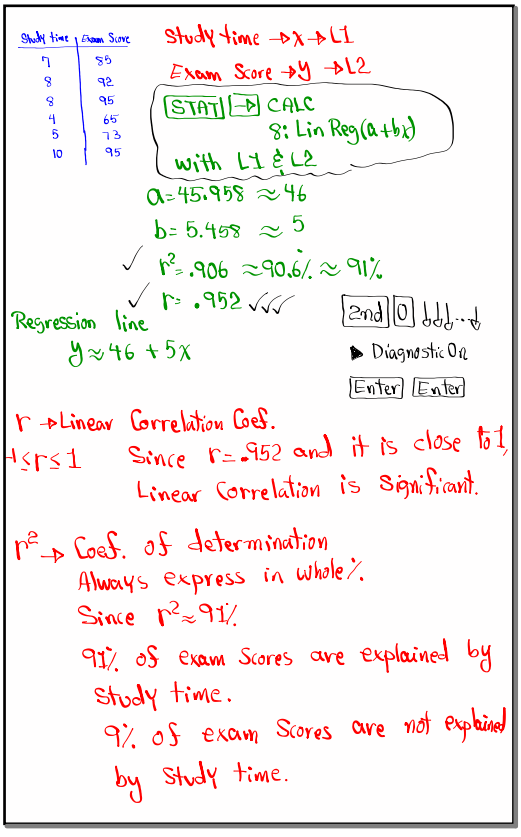
$$b = \frac{n\Sigma xy - \Sigma x \cdot \Sigma y}{n\Sigma x^2 - (\Sigma x)^2} = \frac{6 \cdot 3666 - 42 \cdot 505}{6 \cdot 318 - 42^2} = \frac{786}{144}$$

$$= 5.458 \approx 5$$

Regression line $y = a + bx$

$$\boxed{y \approx 46 + 5x}$$

Nov 7-6:30 AM



Nov 7-6:43 AM

What is the formula for r?

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

$\Sigma x = 42$ $\quad \Sigma y = 505$

$\Sigma x^2 = 318$ $\quad \Sigma y^2 = 43293$

$n = 6$ $\quad \Sigma xy = 3666$

$$r = \frac{6 \cdot 3666 - 42 \cdot 505}{\sqrt{6 \cdot 318 - 42^2}\ \sqrt{6 \cdot 43293 - 505^2}}$$

$$r = \frac{786}{\sqrt{144}\ \sqrt{4733}} = \frac{786}{\sqrt{681552}} = .952$$

Now find r^2

$r^2 = (.952)^2 \approx .906 \approx 91\%$

Nov 7-6:54 AM

Class QZ 9

Use the STEM Plot below

6	3 5 8
7	0 2 5 5 7
8	0 3 3 6 6 6 8
9	3 5 7 9
10	0

$n = 20$ ✓

Find

1) $P_{15} = \frac{3\text{rd} + 4\text{th}}{2}$

$L = \frac{15}{100} \cdot 20 = 3$

$= \frac{68 + 70}{2} = 69$ ✓

Median

2) $P_{50} = \frac{10\text{th} + 11\text{th}}{2} = \frac{83 + 83}{2}$

$L = \frac{50}{100} \cdot 20 = 10$

$= 83$ ✓

3) K Such that $P_K = 80$

$K = PR = \frac{B}{n} \cdot 100 = \frac{8}{20} \cdot 100 = 40$ ✓ (B: Below)

40% | 60%

$P_{40} = 80$

$P_{40} = 80$

Nov 3-8:16 AM

How to make predictions:

If r is Significant

Use the regression line

Plug in x-value, Simplify to get y-value

If r is not Significant

Use $\bar{y}$ as the prediction value.

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

Using last example,

Predict Exam Score for someone that studied 6 hrs

a) Assume r is Significant

$y = 46 + 5x = 46 + 5(6) = 46 + 30 = 76$

b) Assume r is not Significant.

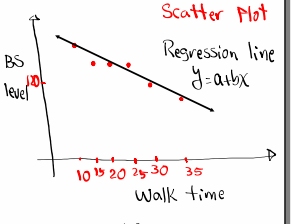
Use $\bar{y}$

$\bar{y} = \frac{\Sigma y}{n} = \frac{505}{6} \approx 84$ [VARS] [5: Statistics] [5: $\bar{y}$] [Enter] $\bar{y} \approx 84$

Nov 7-7:20 AM

Chart below shows my walking time (Minutes) and my next day blood sugar level

Walk	BS level
30	120
35	115
20	130
10	140
25	130
15	130



Walk → X → L1, BS level → y → L2

LinReg(a+bx) with L1 & L2

$a = 147.429 \approx 147.4$

$b = -.886 \approx -.9$

$\Rightarrow y \approx 147.4 - .9x$

$r^2 = .886 \approx 88.6\% \approx 89\%$

$r = -.941 = -.941$

Coef. of determination $r^2(\%) \approx 89\%$.

89% of my BS level are explained by walking time, day before.

11% are explained.

Linear Correlation Coef. $r = -.941$

It is close to $-1 \Rightarrow$ Linear Correlation is Significant.

Nov 7-7:28 AM

Predict my BS level if I walk 20 minutes the day before.

1) Assume r is Significant.

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

$\hat{y} = 147.4 - .9x = 147.4 - .9(20) = 129.4 \approx \boxed{129}$

2) Assume r is not Significant.

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

$= 127.5 \approx \boxed{128}$

SG 9 vvv

Nov 7-7:40 AM

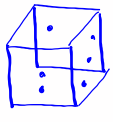
Introduction to probabilities: SG 10-13

If you flip a fair coin once,

⇒ You may get H or T.

$P(H) = \frac{1}{2}$, $P(T) = \frac{1}{2}$

If you roll a fair die once,



⇒ You may land 1, 2, 3, 4, 5, 6

$P(\text{land } 3) = \frac{1}{6}$

$P(\text{land } 1 \text{ or } 6) = \frac{2}{6} = \frac{1}{3}$

$P(\text{land an even number}) = \frac{3}{6} = \frac{1}{2}$

$P(\text{land } 3 \text{ and } 5) = \frac{0}{6} = \boxed{0}$ Do not use Ø for Zero.

Nov 7-7:47 AM

There are 20 students in a classroom.

12 Females & 8 Males.

Teacher Selects One Person.

P(He/She Selects One Female) = $\frac{12}{20} = \boxed{\frac{3}{5}}$ (12 = Females, 20 = Total)

12 ÷ 20 MATH 1:▶Frac Enter

P(He/She Selects one male) = $\frac{8}{20} = \boxed{\frac{2}{5}}$ (8 = Males, 20 = Total)

Nov 7-7:54 AM

A standard deck of playing cards has 52 cards, 26 Red, 12 face cards, and 4 Aces.

If I randomly draw one card,

P(Red Card) = $\frac{26}{52} = \boxed{\frac{1}{2}}$

P(face Card) = $\frac{12}{52} = \boxed{\frac{3}{13}}$

P(Ace Card) = $\frac{4}{52} = \boxed{\frac{1}{13}}$

P(Red face Card) = $\frac{6}{52} = \boxed{\frac{3}{26}}$

Nov 7-7:59 AM

I surveyed 100 students, and asked them if they have voted yet. here are the results:

	Yes	NO	Total
Males	15 ✓	25 ✓	40
Females	45 ✓	15	60
Total	60	40	100

If we randomly Select one of these students,

$P(\text{Male and Yes}) = \frac{15}{100} = \boxed{\frac{3}{20}}$

$P(\text{Male or Yes}) = \frac{15+25+45}{100} = \frac{85}{100} = \boxed{\frac{17}{20}}$

Nov 7-8:05 AM

Class QZ 11:

Use the chart below

x	y
8	15
10	12
6	10
5	8

Find

$a \approx 4.5$

$b = .9$

$r^2 = 48\%$

$r = .692$

} Round to 1-decimal

whole %

3-decimals

Nov 7-8:13 AM