Statistics

Lecture 5

Feb 19-8:47 AM

Class Quiz 3:

Consider the Sample below

58	62	75	83	97
100	70	68	72	88

Store the data in L1

STAT → CALC

1: 1-Var Stats

Menu

List: L1

FreqList: Clear

Calculate

No Menu

L1

Enter

VARS | 5: Statistics | 3: S_x | x^2 | MATH | 1: ▶Frac | Enter

Find

1) $\bar{x} = 77.3 \approx 77$ } Round to whole #

2) $S = 14.260 \approx 14$ } Round to whole #

3) $n = 10$

4) $S^2 = \frac{18301}{90}$ } Reduced Fraction

Sep 20-2:25 PM

Consider the chart below:

class limits	class MP	class F
17 – 30	23.5	6
31 – 44	37.5	9
45 – 58	51.5	15
59 – 72	65.5	10

+14, +14, +14

1) # of classes 4

2) class width 14

3) Sample Size $n = \Sigma f = 40$

4) class MP

5) clear All lists

class MP → L1, class F → L2

STAT → CALC

1: 1-Var Stats

Menu: List: L1, FreqList: L2, Calculate

No Menu: L1, L2, Enter

7

$\bar{x} = 47.65 \approx 48$

$S = 14.174 \approx 14$

Round to whole #

$n = 40$ ✓

$S^2 = \frac{2009}{10}$

Reduced fraction

Sep 27-11:39 AM

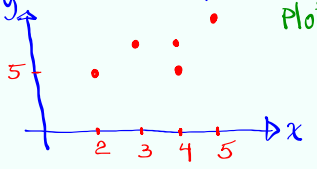
Working with ordered-Pairs (x, y)

SG9

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

1) $n = 5$

2) Plot these pts Scatter Plot



Clear all lists

x → L1, y → L2

STAT → CALC

2: 2-Var Stats

Menu: xlist: L1, Ylist: L2, FreqList: clear, Calculate

No Menu: L1, L2, Enter

7

$\Sigma x = 18$ $\Sigma y = 36$

$\Sigma x^2 = 70$ $\Sigma y^2 = 278$

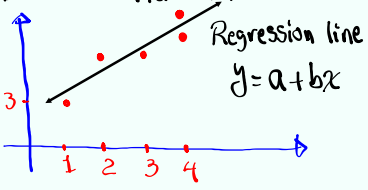
$n = 5$ $\Sigma xy = 136$

Sep 27-11:51 AM

Complete the Chart below

x	y	x^2	y^2	xy
1	3	1	9	3
2	6	4	36	12
3	6	9	36	18
4	8	16	64	32
4	10	16	100	40

Draw Scatter Plot



$y = a + bx$

$a = 1.412$

$b = 1.853$

$r^2 = .858$

$r = .926$

1) $n = 5$

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

Use [2-Var Stats] with L1 & L2

$\Sigma x = 14$ $\Sigma y = 33$

$\Sigma x^2 = 46$ $\Sigma y^2 = 245$

$n = 5$ $\Sigma xy = 105$

[STAT] → [CALC]

[8: LinReg(a+bx)]

Menu
Xlist: L1
Ylist: L2
Clear
Calculate

No Menu
L1, L2
[ ]
Enter

Sep 27-11:59 AM

If r & r^2 are missing,

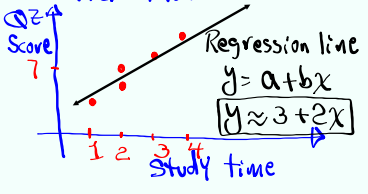
[2nd] [0] ↓ ↓ ↓ ... ↓ ▶ Diagnostic On [Enter] [Enter]

Now repeat the last step to get a, b, r^2, and r.

Consider the Chart below

Study time	QZ Scores
2	7
2	6
1	5
3	8
4	10

Scatter Plot



Clear all lists

study time → x → L1

QZ Score → y → L2

Use Lin Reg(a+bx) with L1 & L2

$a = 3.231 \approx 3$

$b = 1.654 \approx 2$

$r^2 = .961$ $r = .980$

Sep 27-12:12 PM

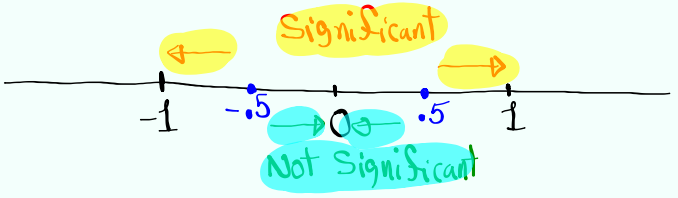
what is r?

r is Linear Correlation Coefficient

$-1 \le r \le 1$

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

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



Sep 27-12:22 PM

what about r^2?

r^2 is Coefficient of determination

Express r^2 as whole %

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

From last example

$r^2 = .961 \rightarrow r^2 \approx 96\%$

96% of QZ Scores are explained by study time.

Sep 27-12:27 PM

Statistics

Two Branches

1) Descriptive 2) Inferential

How to make predictions:

If r is Significant,
use regression line

If r is not Significant,
use $\bar{y}$ $\bar{y} = \frac{\Sigma y}{n}$, VARS 5: Statistics 5: $\bar{y}$ Enter

From last example,
Predict Q2 Score if
Study time is 3 hrs

If r is significant
$y = 3 + 2x$
$y \approx 3 + 2(3) \approx 9$

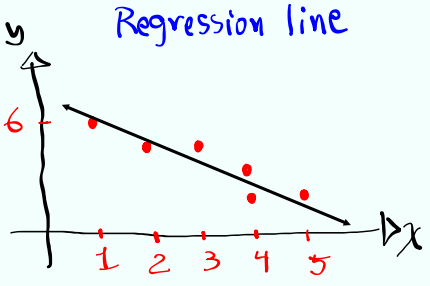
If r is not Significant
use $\bar{y} = 7.2 \approx 7$

Sep 27-12:32 PM

Consider the Chart below

x	y
1	6
2	4
3	4
4	3
4	2
5	2

1) Draw Scatter plot & Regression line



$x \to L1$, $y \to L2$
use 2-Var Stats
with L1 & L2

$\Sigma x = 19$ $\Sigma y = 21$
$\Sigma x^2 = 71$ $\Sigma y^2 = 85$
$n = 6$ $\Sigma xy = 56$

Use LinReg(a+bx)
with L1 & L2

$a = 6.569$
$b = -.969$
$r^2 = .885$ $r = -.941$

Sep 27-12:39 PM

How to find a & b:

$\Sigma x = 19$ $\quad \Sigma y = 21$

$\Sigma x^2 = 71$ $\quad \Sigma y^2 = 85$

$n = 6$ $\quad \Sigma xy = 56$

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

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

$$a = \frac{21 \cdot 71 - 19 \cdot 56}{6 \cdot 71 - 19^2} = \frac{427}{65} \approx \boxed{6.569}$$

$$b = \frac{6 \cdot 56 - 19 \cdot 21}{6 \cdot 71 - 19^2} = \frac{-63}{65} \approx \boxed{-.969}$$

Sep 27-1:05 PM

$\Sigma x = 19$ $\quad \Sigma y = 21$

$\Sigma x^2 = 71$ $\quad \Sigma y^2 = 85$

$n = 6$ $\quad \Sigma xy = 56$

Now formula for r:

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

$$r = \frac{6 \cdot 56 - 19 \cdot 21}{\sqrt{6 \cdot 71 - 19^2}\sqrt{6 \cdot 85 - 21^2}} = \frac{-63}{\sqrt{65}\sqrt{69}}$$

$$= \frac{-63}{\sqrt{4485}} = \boxed{-.941}$$

63 ÷ 2nd x^2 4485 Enter

r is close to -1, Linear Correlation appears to be significant.

$r^2 = (-.941)^2 = .885$

$r^2 \approx 89\%$

89% of Y-values are explained by x-values.

Sep 27-1:13 PM

Consider the chart below

Qz Score	Exam Score
7	82
8	85
8	90
6	75
5	68

Qz Score → X → L1

Exam Score → Y → L2

use LinReg(a+bx) with L1 & L2

a = 36 r^2 = .955

b = 6.471 ≈ 6 r = .977

$y \approx 36 + 6x$

r = .977

It is close to 1

Linear Correlation appears to be significant.

r^2(%) ≈ 96%

Coef. of determination

96% of exam scores are explained by Qz Scores.

Sep 27-1:21 PM

Intro. to Probabilities

SG 10

E → Desired Event (outcome)

P(E) → Prob. that E happens

28 students

10 Males

18 Females

Radomly Select one Student

$P(\text{Male}) = \frac{10}{28} = \frac{5}{14}$

$$P(E) = \frac{\text{Total \# of all desired outcomes}}{\text{Total \# of all outcomes}}$$

Sep 27-1:38 PM

A piggy bank has 3 quarters, 7 dimes, and 10 nickels.

Randomly take one coin.

$P(\text{Quarter}) = \frac{3}{20}$

$P(\text{Nickel}) = \frac{10}{20} = \frac{1}{2} = .5$

$P(\text{Quarter and Dime}) = \frac{0}{20} = 0$ — Impossible event

$P(\text{Quarter, dime, or nickel}) = \frac{20}{20} = 1$ — Sure event

Sep 27-1:42 PM

$P(E) = 0$ ⟷ Impossible Event

$P(E) = 1$ ⟷ Sure event

$0 < P(E) \leq .05$ ⟷ Rare event

A full-deck of playing cards has 52 cards, 26 Red, 12 Face, and 4 Aces.

Draw one Card

$P(\text{Red}) = \frac{26}{52} = \frac{1}{2} = .5$

$P(\text{Face}) = \frac{12}{52} = .231$

Rare: $P(\text{Red Ace}) = \frac{2}{52} = .038$

Sure: $P(\text{Red or Black}) = \frac{52}{52} = 1$

Impossible: $P(\text{Red and Black}) = \frac{0}{52} = 0$

Sep 27-1:48 PM

Randomly select one person, find the prob. that he/she has a birthday

1) Today $\frac{1}{365} = .003$

2) this week $\frac{1}{52} = .019$

3) This month $\frac{1}{12}$

Acceptable Form of Answers

1) Reduced fraction

2) Rounded to 3-decimal places

3) Scientific Notation

Sep 27-1:56 PM

$E \rightarrow$ Desired Event

$\bar{E} \rightarrow$ E-bar, Not E, E-Complement

$$P(E) + P(\bar{E}) = 1$$

Complement Rule

$$P(\bar{E}) = 1 - P(E)$$

Suppose $P(E) = .04$ $\quad P(\bar{E}) = 1 - P(E) = 1 - .04 = .96$

" $P(E) = \frac{2}{17}$ $\quad P(\bar{E}) = 1 - P(E) = 1 - \frac{2}{17} = \frac{15}{17}$

1 [−] 2 [÷] 17 [Math] [▶Frac] [Enter]

Sep 27-2:02 PM

Consider the numbers below

1 2 3 4 . . . . 30 31 32 33 34 35

Select one number,

$P(\text{Selection} < 5) = \frac{4}{35}$

$P(\text{Selection} \geq 31) = \frac{5}{35} = \frac{1}{7}$

$P(\text{Selection is an even \#}) = \frac{17}{35}$

$0 \leq P(E) \leq 1$

Sum of all prob. is always 1.

Sep 27-2:07 PM

I randomly selected 200 registered voters.

	Dem.	Rep.	Ind.	Total
Females	60	35	15	110
Males	20	55	15	90
Total	80	90	30	200

Let's select one randomly

$P(\text{Female}) = \frac{110}{200} = \frac{11}{20}$

$P(\text{Dem.}) = \frac{80}{200} = \frac{2}{5}$

$P(\text{Female and Dem.}) = \frac{60}{200} = .3$

$P(\text{Female OR Dem.}) = \frac{130}{200} = .65$

$P(\text{Dem. and Rep.}) = \frac{0}{200} = 0$

Sep 27-2:12 PM

Use the chart below

	class MP	class F
L1	18	4
	25	7
	32	9
	39	5

L2

Find

$\bar{x} = 29.2$

$s = 7$

s^2 (Red. Frac.) $= 49$

Sep 27-2:21 PM

Predict exam score for someone who got 7 on the quiz.

If r is significant $\Rightarrow$ use regression line

$y \approx 36 + 6x$

$\approx 36 + 6(7) = 78$

If r is not significant $\Rightarrow$ use $\bar{y}$

$\bar{y} = 80$

VARS

5: Statistics

5: $\bar{y}$ Enter

SG 9

Sep 27-1:28 PM