Statistics

Lecture 5

Feb 19-8:47 AM

Class Quiz 3

Consider the Sample below

28	32	25	30	18
40	38	20	17	33

Store this data in L1

1-Var Stats with L1 only.

Find

✓1) $\bar{x}$ = 28.1 = 28

✓2) S = 8.048 = 8

} Round to whole #

✓3) n = 10

✓4) S^2 = $\frac{1943}{30}$ } Reduced fraction

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

Sep 20-10:50 AM

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) Find class MP

2) # of classes [4]

3) class width [14]

4) Sample Size

$n = \Sigma f = [40]$

Class MP → L1, class F → L2

Use [1-Var Stats] with L1 & L2

to find

$\bar{x} = 47.65 \approx [48]$ } whole #

$S = 14.174 \approx [14]$ } whole #

$n = [40]$

$S^2 = \left[\frac{2009}{10}\right]$ } Reduced fraction

Sep 27-8:08 AM

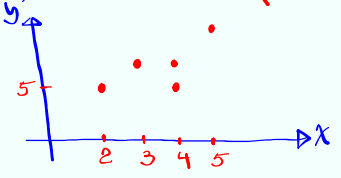
SG 9

Working with ordered-pairs (x, y)

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

1) $n = 5$

2) Plot these points (Scatter Plot)



x → L1, y → L2

[STAT] → CALC

[2: 2-Var Stats]

Menu

xlist: L1

ylist: L2

FreqList: [clear]

[Calculate]

NO Menu

L1, L2

[1]

[Enter]

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

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

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

Sep 27-8:18 AM

Complete the chart below

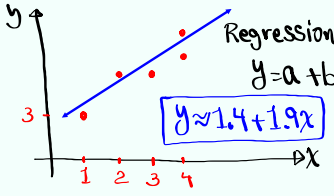
x	y	x^2	y^2	xy
1	3	1	9	3
2	6	4	36	12
3	6	9	36	18
4	8	16	64	32
4	10	16	100	40

1) $n = 5$

2) $x \to L1$, $y \to L2$
Use [2-Var Stats] with L1 & L2

$\Sigma x = 14$ $\Sigma y = 33$
$\Sigma x^2 = 46$ $\Sigma y^2 = 245$
$n = 5$ $\Sigma xy = 105$

3) Draw Scatter Plot



Regression line [STAT] ▶ CALC
$y = a + bx$
[8:LinReg(a+bx)]
$y \approx 1.4 + 1.9x$

Menu
xlist: L1
ylist: L2
[clear]
Calculate

No Menu
L1 , L2
[?]
Enter

$y = a + bx$
$a = 1.412$
$b = 1.853$
$r^2 = .858$
$r = .926$

Sep 27-8:26 AM

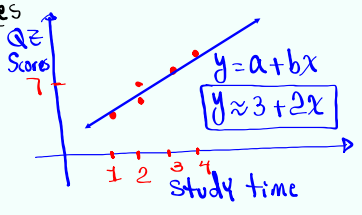
If r & r^2 are missing:

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

Now use LinReg(a+bx) with L1 & L2.

Consider the chart below

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



Study time → x → L1 , QZ Scores → y → L2

Use [2-Var Stats] with L1 & L2
$\Sigma x = 12$ $\Sigma y = 36$
$\Sigma x^2 = 34$ $\Sigma y^2 = 274$
$n = 5$ $\Sigma xy = 95$

Use LinReg(a+bx) with L1 & L2
$a = 3.231 \approx 3$
$b = 1.654 \approx 2$
$r^2 = .961$ $r = .980$

Sep 27-8:39 AM

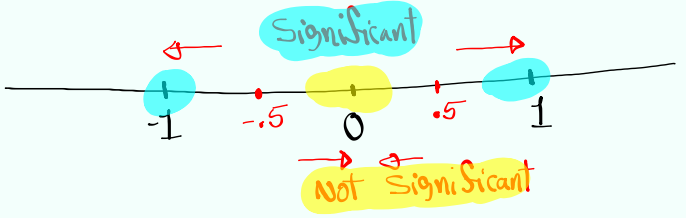
What is r?

r is linear Correlation Coefficient

$-1 \le r \le 1$

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

When r is close to 0,
Linear Correlation is not significant.



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What about r^2?

r^2 is the Coef. of determination

Always express as whole %

r^2 (in %) Tells us what percent of y-values are explained by x-values.

Last example $r^2 = .961 \approx 96\%$

96% of Quiz Scores are explained by study time.

4% are unexplained.

Sep 27-8:55 AM

Statistics have two branches

1) Descriptive 2) Inferential

How to make predictions:

If r is significant

Use Regression line

If r is not Significant

Use $\bar{y}$

From Last example

Predict Qz Score if I study 3 hrs for the Qz.

If r is Significant, Use regression line

$y \approx 3 + 2x$ $y \approx 3 + 2(3) \approx 9$

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

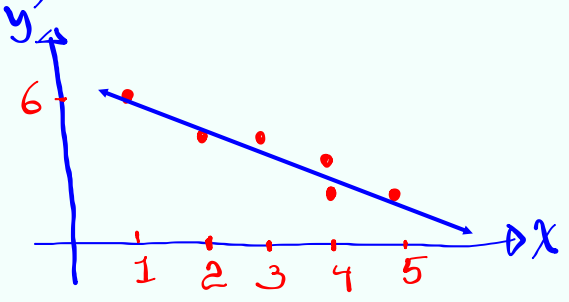
$\bar{y} = \frac{\sum y}{n} = \frac{36}{5} = 7.2$ VARS 5: Statistics 5: $\bar{y}$ Enter 7.2

Sep 27-9:00 AM

Consider the Sample below

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

1) Draw Scatter Plot



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

$\sum x = 19$ $\sum y = 21$

$\sum x^2 = 71$ $\sum y^2 = 85$

$n = 6$ $\sum xy = 56$

Sep 27-9:22 AM

How to find a & b using formula:

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

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

$$a = \frac{21 \cdot 71 - 19 \cdot 56}{6 \cdot 71 - 19^2} = \frac{427}{65} \approx \boxed{6.569} \approx 7$$

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

$$b = \frac{6 \cdot 56 - 19 \cdot 21}{6 \cdot 71 - 19^2} = \frac{-63}{65} \approx \boxed{-.969} \approx -1$$

$y \approx 7 - x$

Use LinReg(a+bx) with L1 & L2

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

r is close to −1, Linear Correlation appears to be Significant

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

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

Sep 27-9:28 AM

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

Now formula for r:

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

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

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

(−) 63 ÷ 2nd x^2 4485 Enter

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

Sep 27-9:39 AM

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 to find

$a \approx 36$ $r^2 \approx .955$

$b \approx 6.471$ $r \approx .977$

$y \approx 36 + 6x$

Coef. of determination $r^2 \approx 96\%$.

96% of exam scores are explained by Qz scores.

Linear correlation coef. $r = .977$ is close to 1, Linear correlation appears to be significant.

Sep 27-9:49 AM

Predict exam score for someone with Quiz Score 7.

1) Assume r is Significant

use regression line $y \approx 36 + 6x$

$= 36 + 6(7) = \boxed{78}$

2) Assume r is not Significant

use $\bar{y} = \boxed{80}$

VARS

5: Statistics

5: $\bar{y}$ Enter

SG 9 ✓

Sep 27-9:56 AM

Intro. to probabilities

$E \rightarrow$ Desired event (outcome)

$P(E) \rightarrow$ Prob. that E happens

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

16 Students
6 Males
10 Females

If we randomly select one person

$$P(\text{Female}) = \frac{10}{16} = \boxed{\frac{5}{8}} = \boxed{.625}$$

Sep 27-10:16 AM

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

Randomly take one coin,

$P(\text{Quarter}) = \boxed{\frac{3}{20}} = \boxed{.15}$

$P(\text{Dime or Nickel}) = \boxed{\frac{17}{20}} = \boxed{.85}$

$P(\text{Dime and Quarter}) = \frac{0}{20} = \boxed{0}$

Impossible event

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

Sure event

Sep 27-10:20 AM

$P(E) = 0$ ⟷ 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.

If we randomly select one card,

$P(\text{Red}) = \frac{26}{52} = .5$ $\quad P(\text{face}) = \frac{12}{52} \approx .231$

$P(\text{Red Ace}) = \frac{2}{52} = .038$ $\quad P(\text{Red or Black}) = \frac{52}{52} = 1$

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

Sep 27-10:26 AM

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 $\frac{1}{12} = .083$

Acceptable Form of answers

1) Reduced fraction

2) Rounded to 3-decimal places.

3) Scientific Notation

Sep 27-10:33 AM

$E \rightarrow$ Desired Event (outcome)

$P(E) \rightarrow$ Prob. that E happens

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

2) Sum of all prob. is always 1.

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

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

Given $P(E) = .04$, Find $P(\bar{E})$

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

Given $P(E) = \frac{3}{17}$, Find $P(\bar{E})$ in fraction.

$P(\bar{E}) = 1 - P(E)$
$= 1 - \frac{3}{17} = \frac{14}{17}$

1 − 3 ÷ 17 Math 1:▶Frac Enter

Sep 27-10:38 AM

Consider the numbers

1, 2, 3, 4, . . . , 36, 37, 38, 39, 40

Select one number,

$P(\text{Selection} < 5) = \frac{4}{40} = \frac{1}{10}$ $P(\text{Selection} \geq 35) = \frac{6}{40} = \frac{3}{20}$

$P(\text{Selection} < 5 \text{ and Selection} \geq 35) = \frac{0}{40} = 0$

$P(\text{Selection} < 5 \text{ OR Selection} \geq 35) = \frac{10}{40} = \frac{1}{4}$

$P(\text{Selection is even}) = \frac{20}{40} = \frac{1}{2}$

Sep 27-10:45 AM

I randomly selected 200 registered voters.

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

If we select one of these people,

$P(\text{Female}) = \frac{110}{200} = \boxed{\frac{11}{20}}$ $P(\text{Democrat}) = \frac{80}{200} = \boxed{\frac{2}{5}}$

$P(\text{Female and Democrat}) = \frac{60}{200} = \boxed{\frac{3}{10}}$

$P(\text{Female OR Democrat}) = \frac{130}{200} = \boxed{\frac{13}{20}}$

SG 10 ✓

Sep 27-10:50 AM