

Statistics Lecture 4



Feb 19-8:47 AM

Class QZ 3 (open notes)

use the Sample below

28	32	20	18
25	19	30	45
35	26	18	35
48	50	36	38

Find

- $\bar{x} = 31.4375 \approx 31$ } Round to whole
- $S = S_x = 10.405 \approx 10$
- $S^2 = \frac{9661}{80}$ } Reduced fraction

Clear all lists
 2nd + 4: clear all lists (Enter)

Store data elements in L1
 STAT Edit
 1: Edit

L1
28
32
...
38

do calculations
 STAT → CALC
 1: 1-VarStat
 List: L1
 FreqList: Clear
 Calculate

To find S^2
 VARS 5: Statistics 3: Sx χ^2 Math 1: → true
 Enter

Mar 13-10:54 AM

Complete the chart below

class limits	class MP	class F	Cum. F
17 - 25	21	6	6
26 - 34	30	10	16
35 - 43	39	15	31
44 - 52	48	9	40

- 1) 4 classes
- 2) $n = 40$
- 3) $CW = 9$

Find \bar{x} , S , and S^2 .

class MP \rightarrow L1

class F \rightarrow L2

STAT \rightarrow **CALC**

1:1-Var Stats

List: L1

Freq List: L2

Calculate

NO MENU

L1, L2

Enter

$\bar{x} = 36.075$

$S = S_x = 8.974$

$S^2 = \frac{41877}{520}$

Mar 20-8:11 AM

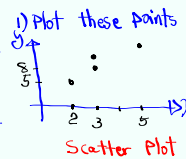
Working with ordered Pairs
(x,y)

(SG.9)

Consider the Sample below

(2,5), (3,8), (3,10), (5,12)

x	y	x ²	y ²	xy
2	5	4	25	10
3	8	9	64	24
3	10	9	100	30
5	12	25	144	60



x \rightarrow L1, y \rightarrow L2

STAT \rightarrow **CALC**

2:2-Var Stats

Xlist: L1

Ylist: L2

Sfreq List: **clear**

Calculate

$\sum x = 13$ $\sum y = 35$

$\sum x^2 = 47$ $\sum y^2 = 333$

$n = 4$ $\sum xy = 124$

STAT \rightarrow **CALC**

8:LinReg(a+bx)

Xlist: L1

Ylist: L2

clear

Calculate

$a = 1.737$

$b = 2.158$

$r^2 = .827$

$r = .909$

IF r & r² missing

End **0** **ddd...d**

\rightarrow Diagnostic On

Enter **Enter**

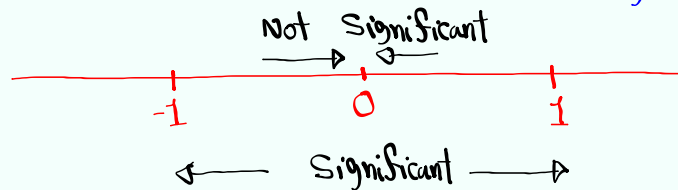
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$r \rightarrow$ Linear Correlation Coefficient

$$-1 \leq r \leq 1$$

when r is close to ± 1 ,
the linear correlation is significant.

when r is close to 0,
The linear correlation is not significant



From last example $r = .909$
it is close to 1 \Rightarrow Significant

Mar 20-8:37 AM

$r^2 \rightarrow$ Coefficient of determination

Always express as whole%

It tells us what% of y -values
are explained by x -values.

From last example $r^2 = .827$ ($\approx 83\%$)

83% of y -values are
explained by x -values.

Mar 20-8:41 AM

I randomly selected 5 students. chart below shows study time (hrs) & QZ Score (out of 10)

Time	Score
2	8
3	9
3	10
4	8
5	10

Scatter Plot

Regression Line
 $y = a + bx$
 $y \approx 7.7 + .4x$

Time $\rightarrow X \rightarrow L1$
 Score $\rightarrow Y \rightarrow L2$
 STAT \rightarrow CALC
 8: Lin Reg(a+bx)
 use L1 & L2

$a = 7.692 \approx 7.7$
 $b = .385 \approx .4$
 $r^2 = .192$
 $r = .439$

$r^2 \approx 19\%$ 19% of QZ Scores are explained by study time.
 $r = .439$ It is closer to 0, does not seem to be significant (by eye-Test)

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How to make predictions:

Given x -value, Predict Y

If r is significant \rightarrow use the regression Line

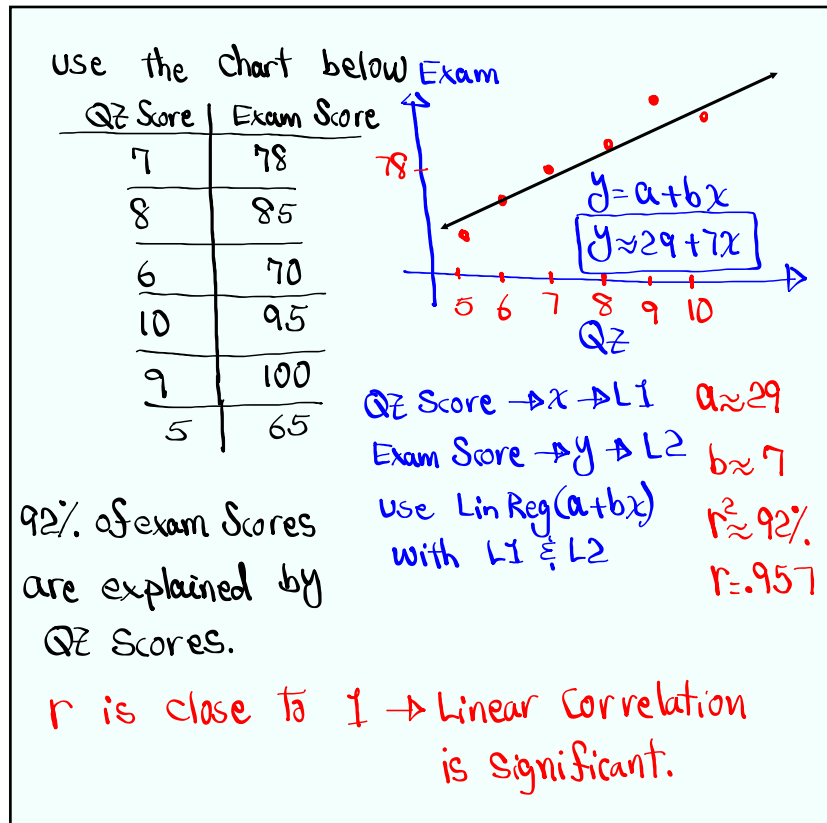
Plug in the x -value to find Y -value

If r is not significant \rightarrow use \bar{y}

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

$$\boxed{5: \bar{y}} \quad \boxed{\text{Enter}}$$

Mar 20-8:56 AM



Mar 20-9:12 AM

Predict exam Score if QZ Score was 8.

1) Assume r is significant
 use regression line
 $y \approx 29 + 7x \approx 29 + 7(8) \approx \boxed{85}$

2) Assume r is not significant.
 use \bar{y} VARS 5: Statistics 5: \bar{y}
Enter $\approx \boxed{82}$

Mar 20-9:20 AM

x	y
2	5
3	7
4	8
5	10

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

$\sum x = 14$ $\sum y = 30$
 $\sum x^2 = 54$ $\sum y^2 = 238$
 $n = 4$ $\sum xy = 113$

Regression line $y = a + bx$
 use LinReg (a+bx) to find

$a = 1.9 \checkmark$
 $b = 1.6 \checkmark$
 $r^2 = .985$
 $r = .992$

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$\sum x = 14$ $\sum y = 30$
 $\sum x^2 = 54$ $\sum y^2 = 238$
 $n = 4$ $\sum xy = 113$

How to find a & b using formula

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

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

$a = \frac{30 \cdot 54 - 14 \cdot 113}{4 \cdot 54 - 14^2} = \frac{38}{20} = 1.9$
 $b = \frac{4 \cdot 113 - 14 \cdot 30}{4 \cdot 54 - 14^2} = \frac{32}{20} = 1.6$

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$\sum x = 14$ $\sum y = 30$ formula for r
 $\sum x^2 = 54$ $\sum y^2 = 238$
 $n = 4$ $\sum xy = 113$

$$r = \frac{n \sum xy - \sum x \sum y}{\sqrt{n \sum x^2 - (\sum x)^2} \sqrt{n \sum y^2 - (\sum y)^2}} = \frac{4 \cdot 113 - 14 \cdot 30}{\sqrt{4 \cdot 54 - 14^2} \sqrt{4 \cdot 238 - 30^2}}$$

$$= \frac{32}{\sqrt{20} \sqrt{52}} = \frac{32}{\sqrt{1040}} = \boxed{.992}$$

32 $\frac{\square}{\square}$ \square end \square \square 1040 \square Enter SG 9 ✓

for $r^2 \approx (.992)^2 \approx .984$

Mar 20-9:35 AM

SG 10

Intro to Probabilities:

E → Desired event or outcome

P(E) → Prob. that E happens.

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

24 Students Select 1 student
 15 Females
 9 Males

$$P(\text{Select a Female}) = \frac{15}{24} = \boxed{\frac{5}{8}}$$

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A box has 7 red, 8 white, and 5 blue balls.

Select 1 ball,

$$P(\text{Red}) = \frac{7}{20} = .35$$

$$P(\text{white}) = \frac{8}{20} = \frac{2}{5} = .4$$

$$P(\text{Red or white}) = \frac{15}{20} = \frac{3}{4} = .75$$

$$P(\text{Red and white}) = \frac{0}{20} = 0$$

Acceptable Answers:

- 1) Reduced Fraction
- 2) Rounded to 3-dec. Places
- 3) Scientific Notation

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Some rules & terminologies:

- 1) $0 \leq P(E) \leq 1$
- 2) Sum of all probabilities is always 1.
- 3) $P(E) = 1 \iff$ Sure event
- 4) $P(E) = 0 \iff$ Impossible event
- 5) $0 < P(E) \leq .05 \iff$ Rare event

Standard deck of playing cards
52 Cards, 26 Red, 12 Face, 4 Aces.

Draw 1 Card,

$$P(\text{Ace}) = \frac{4}{52} = \frac{1}{13} = .077$$

$$P(\text{Red Ace}) = \frac{2}{52} = \frac{1}{26} = .038$$

← Rare event →

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

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

Ex. $P(\text{Rains today}) = .08$
 $P(\overline{\text{Rains today}}) = 1 - P(\text{Rains})$
 $= 1 - .08 = .92$

$P(A) = \frac{3}{17}$
 1) $P(A)$ in decimal $\rightarrow 3 \div 17 = .17647\dots$
 $\rightarrow .176$
 2) $P(\bar{A})$ in fraction $1 - P(A) = 1 - \frac{3}{17} = \frac{14}{17}$
 $1 - 3 \div 17$ Math
 1: \rightarrow frac
 Enter

Mar 20-10:01 AM

If we randomly select one person, find the prob. that he/she has a birthday

1) Today $\frac{1}{365}$

2) this week $\frac{1}{52}$

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

SG 10

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Addition Rule

SG 11

Keyword OR

Single Action Event

$$P(A \text{ or } B) = P(A) + P(B) - \underbrace{P(A \text{ and } B)}_{\text{both}}$$

$$\text{ex: } P(A) = .4, P(B) = .7, P(A \text{ and } B) = .2$$

$$P(\bar{A}) = 1 - P(A) = \boxed{.6}$$

$$P(\bar{B}) = 1 - P(B) = \boxed{.3}$$

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B) \\ = .4 + .7 - .2 = \boxed{.9}$$

$$P(\overline{A \text{ and } B}) = 1 - P(A \text{ and } B) = 1 - .2 = \boxed{.8}$$

$$P(\overline{A \text{ or } B}) = 1 - P(A \text{ or } B) = 1 - .9 = \boxed{.1}$$

Mar 20-10:27 AM

$$P(HB) = .65$$

$$P(FF) = .45$$

$$P(HB \text{ and } FF) = .25$$

$$1) P(\overline{HB}) = 1 - .65 = \boxed{.35}$$

$$2) P(HB \text{ or } FF) = P(HB) + P(FF) - P(HB \text{ and } FF) \\ = .65 + .45 - .25 = \boxed{.85}$$

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Using Venn Diagram

$$P(A) = .7$$

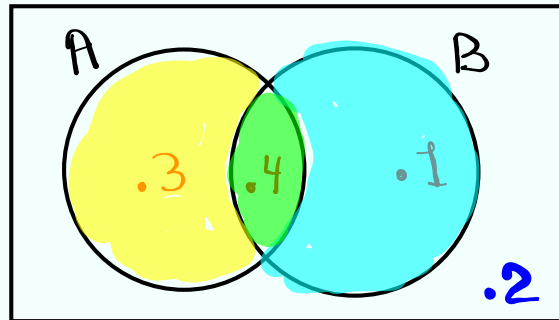
$$P(B) = .5$$

$$P(A \text{ and } B) = .4 \checkmark$$

$$P(A \text{ only}) = .7 - .4 = .3$$

$$P(B \text{ only}) = .5 - .4 = .1$$

$$P(A \text{ only or } B \text{ only}) = .3 + .1 = \boxed{.4}$$



$$\text{Total} = 1 \checkmark$$

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A and B are Mutually Exclusive Events.

Disjointed events

No overlap

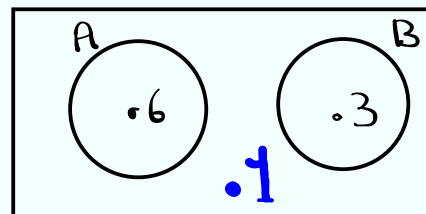
$$P(A \text{ and } B) = 0$$

$P(A) = .6$, $P(B) = .3$, A & B are M.E.E.

$$P(\bar{A}) = \boxed{.4}$$

$$P(A \text{ or } B) = \boxed{.9}$$

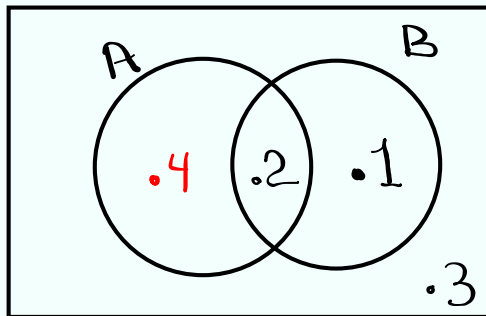
$$P(\overline{A \text{ or } B}) = \boxed{.1}$$



$$\text{Total} = 1$$

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Complete the Venn Diagram below



1) $P(A) = .6$

2) $P(A \text{ only}) = .4$

3) $P(A \text{ or } B) = .7$

4) $P(A \text{ and } B) = .2$

5) $P(\overline{A \text{ or } B}) = .3$

6) $P(\overline{A \text{ and } B}) = .8$

To complete SG 11,
You must watch
DeMorgan's Law video.

Mar 20-10:47 AM

Class QZ 4

use the chart below

x	y
4	14
5	18
7	20
8	26
10	30

Sind

1) $a = 3.825 \approx 4$ } Round to whole#

2) $b = 2.614 \approx 3$ }

3) $r^2 = .955 \approx 95\%$
 $\approx 96\%$ } whole %

4) $F = .977$ } 3-dec.

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