Statistics

Lecture 5

Feb 19-8:47 AM

Class QZ 2

use the chart below

class MP	class F
10	9
15	12
20	4

Class MP → L1

class F → L2

STAT → CALC

1:1-Var Stats

Menu

List: L1

FreqList: L2

Calculate

No Menu

1-Var Stats

L1, L2

Enter

use class MP & class F to find

1) $\bar{x} = 14$

2) $S \approx 3.536 = 14$ } Round to whole #

3) $n = 25$

4) $S^2 = \frac{25}{2}$ } Reduced fraction

VARS

5: Statistic

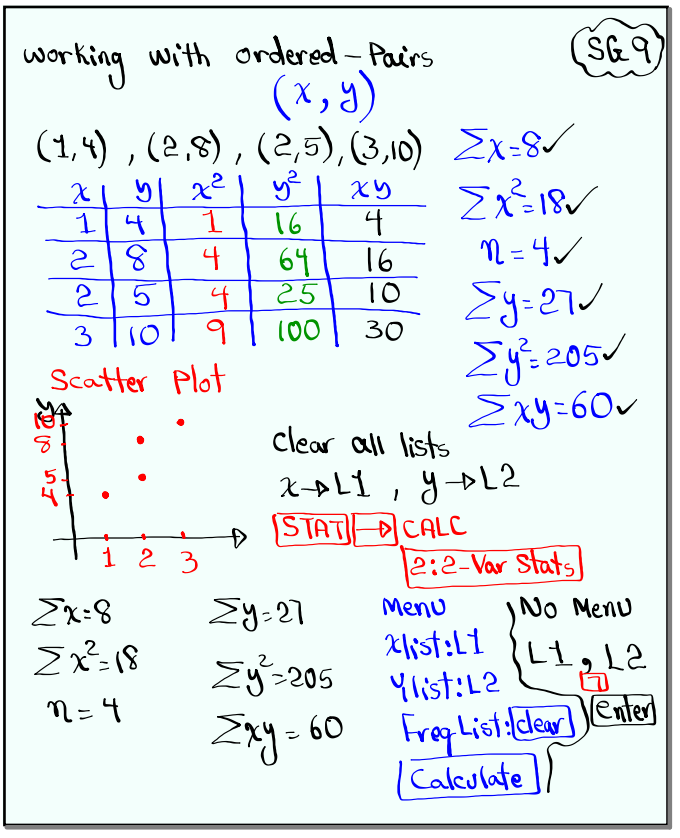
3: S_x

χ^2

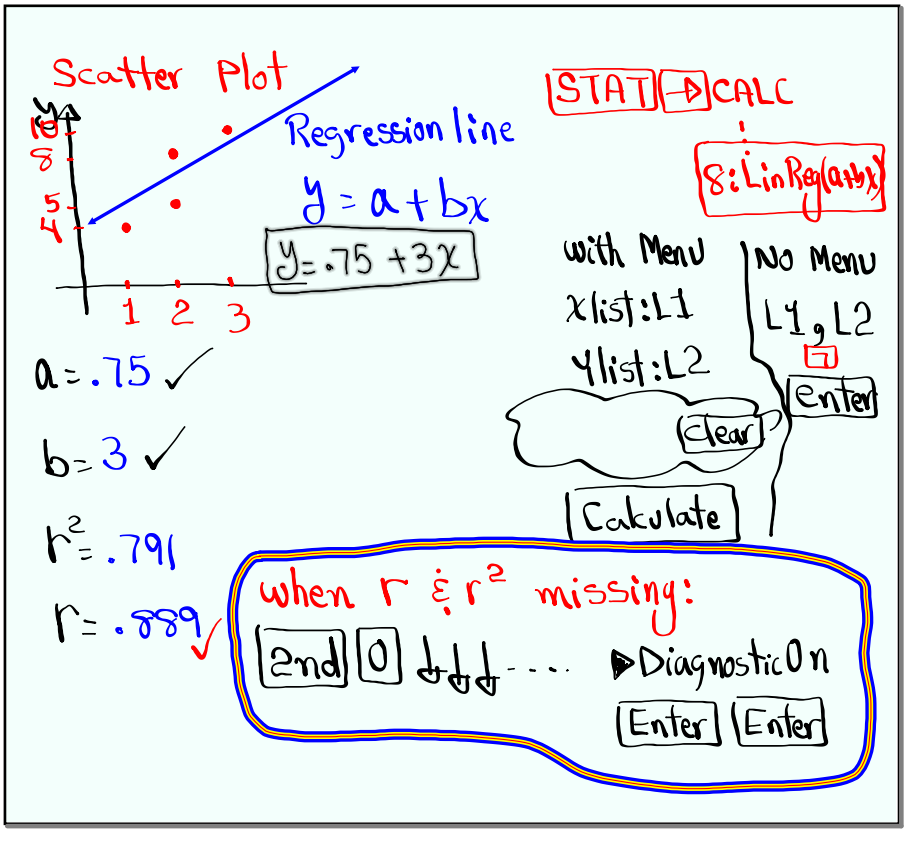
Math 1: ▸Frac

Enter

Sep 26-11:24 AM



Sep 26-11:44 AM



Sep 26-11:57 AM

$\Sigma x = 8$ $\quad \Sigma y = 27$ $\quad$ How to find a & b

$\Sigma x^2 = 18$ $\quad \Sigma y^2 = 205$ $\quad$ by formula:

$n = 4$ $\quad \Sigma xy = 60$

$$a = \frac{\Sigma y \Sigma x^2 - \Sigma x \Sigma xy}{n\Sigma x^2 - (\Sigma x)^2} = \frac{27 \cdot 18 - 8 \cdot 60}{4 \cdot 18 - 8^2} = \frac{6}{8} = \boxed{.75}$$

$$b = \frac{n\Sigma xy - \Sigma x \Sigma y}{n\Sigma x^2 - (\Sigma x)^2} = \frac{4 \cdot 60 - 8 \cdot 27}{4 \cdot 18 - 8^2} = \frac{24}{8} = \boxed{3}$$

Sep 26-12:04 PM

$r \rightarrow$ 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,
the linear correlation is not significant

Formula for r:

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

From Last example

$\Sigma x = 8$ $\quad \Sigma y = 27$

$\Sigma x^2 = 18$ $\quad \Sigma y^2 = 205$

$n = 4$ $\quad \Sigma xy = 60$

$$r = \frac{4 \cdot 60 - 8 \cdot 27}{\sqrt{4 \cdot 18 - 8^2} \cdot \sqrt{4 \cdot 205 - 27^2}} = \frac{24}{\sqrt{8} \cdot \sqrt{91}} = \frac{24}{\sqrt{728}} = \boxed{.889}$$

24 ÷ [2nd] [x^2] 728 [enter]

r is close to 1, Linear Correlation is Significant.

Sep 26-12:09 PM

r^2 (whole %) Coefficient of determination

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

from Last example

$r^2 = .889^2 = .790 \approx 79\%$

79% of y-values are explained by x-values.

Sep 26-12:20 PM

How to make predictions:

If r is significant,
use regression line to make predictions

If r is not significant,
use $\bar{y}$ as predicted value.

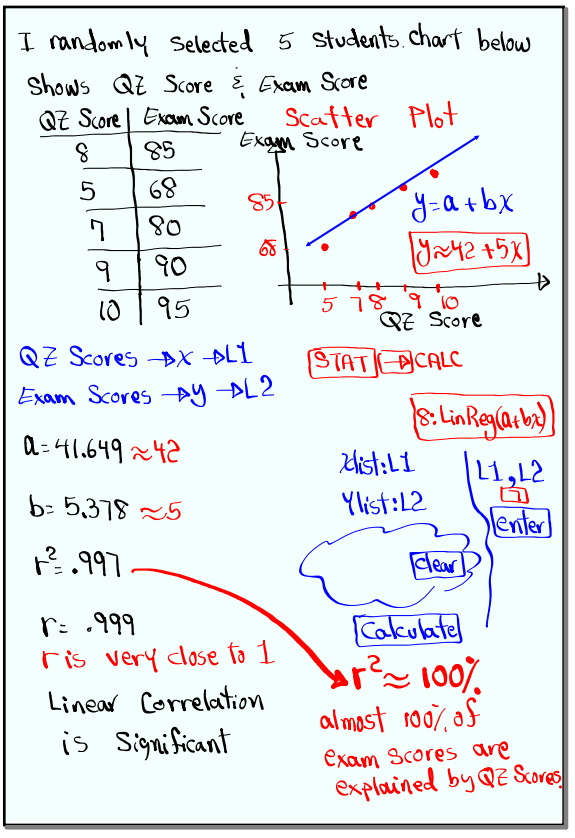
$\bar{y} = \frac{\Sigma y}{n}$ OR VARS

5: Statistics

5: $\bar{y}$ Enter

$\bar{y} = 6.75$

Sep 26-12:23 PM



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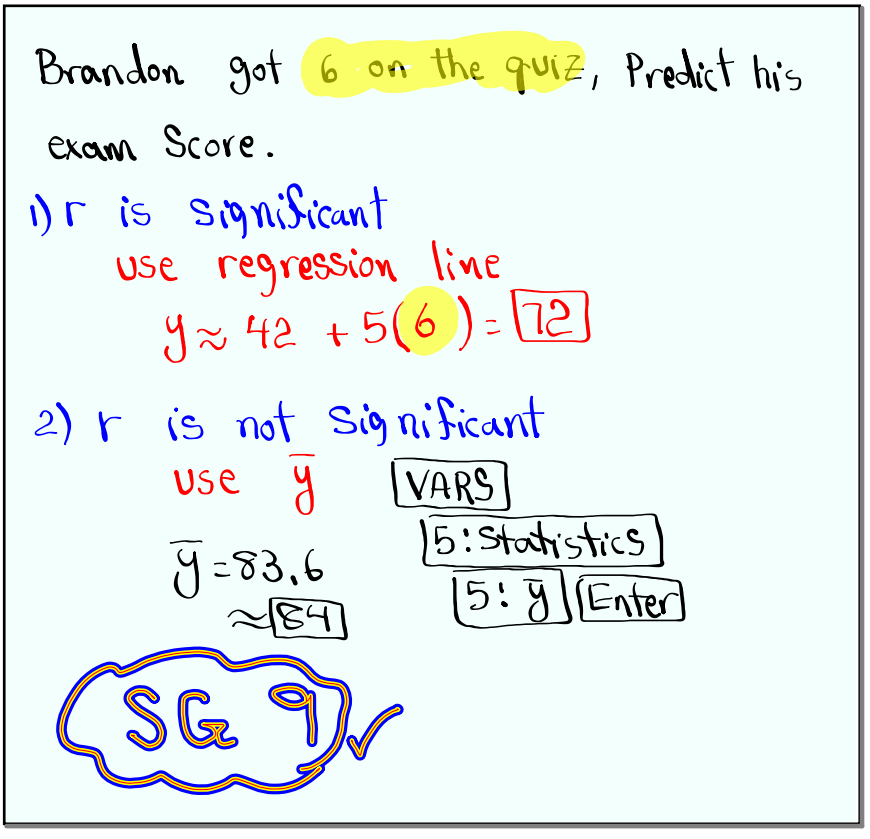

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SG 10

Intro. to probabilities:

E → desired event (outcome)

P(E) → Prob. that E happens

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

Acceptable answers:

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

10 Females, 15 Males, Select one person randomly

$$P(\text{one female}) = \frac{10 \text{ females}}{25 \text{ people}} = \frac{10}{25} = \boxed{\frac{2}{5}} = \boxed{.4}$$

Sep 26-1:01 PM

A standard deck of playing cards

52 Cards, 26 Red, 12 face, 4 Aces.

Select one Card

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

$$P(\text{face card}) = \frac{12}{52} = \frac{3}{13}$$

12 ÷ 52 [Math] [1:▶Frac] [Enter]

[Math] [2:▶Dec] [Enter] [.231]

$$P(\text{face or Ace}) = \frac{12+4}{52} = \frac{16}{52} = \boxed{\frac{4}{13}}$$

$$P(\text{face and Ace}) = \frac{0}{52} = \boxed{0}$$ Impossible event

Sep 26-1:06 PM

Consider the list below

1, 2, 3, 4, . . . , 30

I randomly select one number,

P(Selected 4) = $\frac{1}{30}$ = .033

P(Selected 4 or Below) = $\frac{4}{30}$ = .133 = $\frac{2}{15}$
1, 2, 3, 4

P(Selected 25 or above) = $\frac{6}{30}$ = $\frac{1}{5}$
25, 26, 27, 28, 29, 30

P(Selected below 4 or above 25) = $\frac{8}{30}$ = $\frac{4}{15}$
1, 2, 3 ; 26, 27, 28, 29, 30

P(Selected below 4 and above 25) = $\frac{0}{30}$ = 0

P(Selected an odd #) = $\frac{15}{30}$ = $\frac{1}{2}$
1, 3, 5, 7, 9
11, 13, 15, 17, 19, . . . , 29

Sep 26-1:13 PM

I Surveyed 110 Voters. I asked them are you voting Yes or No on Prop. 50.

	Yes	NO	Total
Republican	15	40	55
Democrats	50	5	55
Total	65	45	110

If one of these people randomly selected

P(Yes) = $\frac{65}{110}$ = $\frac{13}{22}$

P(Democrat) = $\frac{55}{110}$ = $\frac{1}{2}$

P(Yes or Democrat) = $\frac{70}{110}$ = $\frac{7}{11}$

P(Yes and democ.) = $\frac{50}{110}$ = $\frac{5}{11}$

Sep 26-1:20 PM

Some rules & Terminologies

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

2) $P(E) = 1 \iff$ Sure event

3) $P(E) = 0 \iff$ Impossible event

4) $0 < P(E) \le .05 \iff$ Rare event

If we randomly select one person,

P(he/she has a birthday today) = $\frac{1}{365}$ = .003

rare event

P(he/she has a birthday this month) = $\frac{1}{12}$ = .083

5) Sum of all prob. is always 1.

Not a rare event

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$\bar{E}$ → E-bar → Not E → E-Complement

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

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

Complement Rule

$P(\text{Rains}) = .2$

$P(\overline{\text{Rain}}) = 1 - P(\text{Rains}) = 1 - .2 = .8$

$P(\text{Coffee}) = .75$

$P(\overline{\text{Coffee}}) = 1 - .75 = .25$

Sep 26-1:34 PM

Given $P(A) = .025$

1) write in reduced fraction.

.025 Math 1:▸Frac Enter $\frac{1}{40}$

2) write in percent notation.

$.025(100)\% = 2.5\%$

3) $P(\bar{A}) = 1 - P(A)$

$= 1 - .025 = .975$

4) Reduce Fraction $\frac{P(A)}{P(\bar{A})} = \frac{.025}{.975} = \frac{1}{39}$

.025 ÷ .975 Math 1:▸Frac enter

SG 10 ✓

Sep 26-1:38 PM

Addition Rule SG 11

Key word OR

Single Action event

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

$P(A) = .8$, $P(B) = .6$, $P(A \text{ and } B) = .5$

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

$= .2$

2) $P(\bar{B}) = 1 - P(B)$

$= .4$

3) $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

↑ addition Rule

$= .8 + .6 - .5$

$= .9$

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$P(\text{Coffee}) = .7$

$P(\text{Donut}) = .4$

$P(\text{Coffee and Donut}) = .2$

$P(\overline{\text{Coffee}}) = 1 - .7 = \boxed{.3}$

$P(\overline{\text{Donut}}) = 1 - .4 = \boxed{.6}$

$P(\text{Coffee or Donut}) = P(C) + P(D) - P(C \text{ and } D)$

Addition Rule

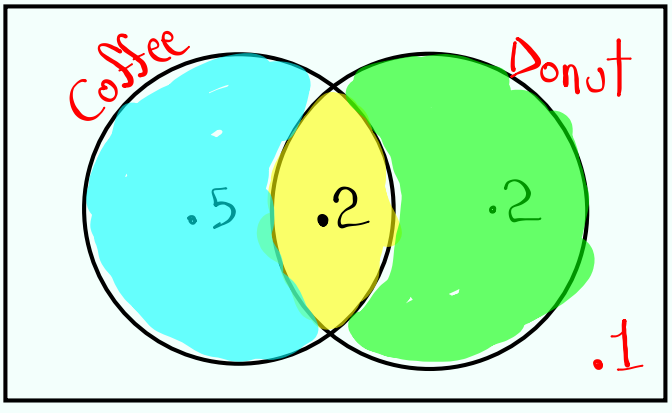
$= .7 + .4 - .2 = \boxed{.9}$

Sep 26-1:49 PM

Addition Rule with Venn Diagram.

$.7 - .2 = .5$

$.4 - .2 = .2$



Total = 1

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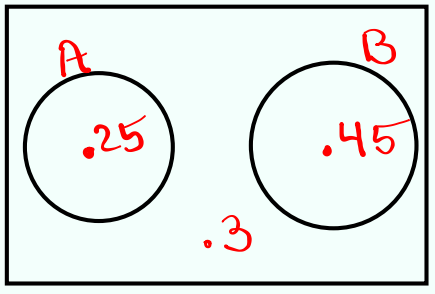
P(Get A) = .25

P(Get B) = .45

1) $P(\bar{A}) = 1 - .25 = .75$

2) $P(\bar{B}) = 1 - .45 = .55$

3) Construct Venn Diagram



Total = 1

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Mutually Exclusive Events

Disjointed events

NO overlap

P(A and B) = 0

P(A) = .65 P(B) = .25 A & B are M.E.E.

$P(\bar{A}) = 1 - .65 = .35$

P(A and B) = 0

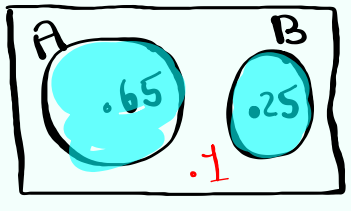
$P(\bar{B}) = 1 - .25 = .75$

P(A or B) =

P(A) + P(B) − P(A and B) =

.65 + .25 − 0 = .9

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



Total = 1

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A deck of cards has 40 cards,
25 red, 10 face, 3 aces.
one card drawn

1) $P(\text{Red}) = \frac{25}{40} = \frac{5}{8}$

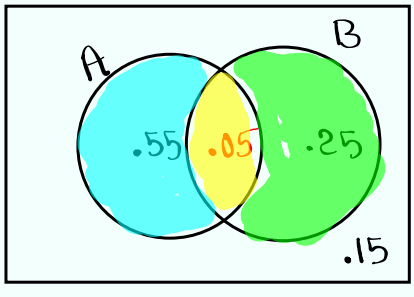
2) $P(\text{face}) = \frac{10}{40} = \frac{1}{4}$

3) $P(\text{face and ace}) = 0$

4) $P(\text{face or ace}) = P(\text{face}) + P(\text{ace}) - P(\text{face and ace})$
$= \frac{10}{40} + \frac{3}{40} - 0 = \frac{13}{40}$

Sep 26-2:08 PM

Complete the Venn diagram below



Total = 1

$P(A \text{ only}) = .55$

$P(A) = .6$

$P(B \text{ only}) = .25$

$P(B) = .3$

$P(A \text{ and } B) = .05$
overlap

$P(\overline{A \text{ and } B}) = 1 - .05 = .95$

$P(A \text{ or } B) = .55 + .05 + .25 = .85$

$P(A) + P(B) - P(A \text{ and } B)$
$= .6 + .3 - .05$
$= .85$

$P(\overline{A \text{ or } B}) = 1 - P(A \text{ or } B)$
$= 1 - .85 = .15$

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De Morgan's Law:

$P(\bar{A} \text{ or } \bar{B}) = P(\overline{A \text{ and } B})$

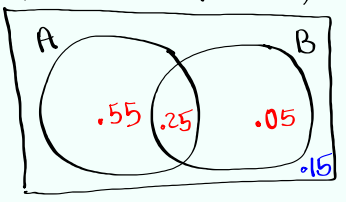
$P(\bar{A} \text{ and } \bar{B}) = P(\overline{A \text{ or } B})$

$P(A) = .8$ $P(B) = .3$ $P(A \text{ and } B) = .25$

Venn Diagram

$.8 - .25 = .55$

$.3 - .25 = .05$



Total = 1

$P(A \text{ or } B) = .85$

$P(\bar{A} \text{ and } \bar{B}) = P(\overline{A \text{ or } B}) = 1 - .85 = .15$

DeMorgan's Law

$P(\bar{A} \text{ or } \bar{B}) = P(\overline{A \text{ and } B}) = 1 - .25 = .75$

Sep 26-2:22 PM