Math 110
Winter 2021
Lecture 6

Class QZ 3

Consider the Sample below

18	12	20	10
15	10	18	25
16	19	20	15

Find

1) $\bar{x} = 16.5$

2) $S = 4.442$

} 3-decimals

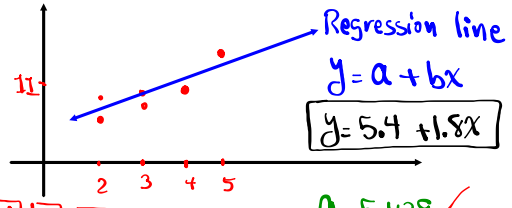
3) S^2 in reduced fraction $S^2 = \frac{217}{11}$

Consider the set of ordered pairs below

x	y
4	11
3	10
5	15
2	8
2	10
3	12

1) $n = 6$

2) Scatter Plot



1) clear all lists. 2nd + 4: Enter

2) Reset all lists. STAT Edit 5: Set up Editor Enter

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

STAT → CALC 8: LinReg(a+bx)

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

with Menu	No Menu
Xlist: L1	LinReg(a+bx)
Ylist: L2	L1, L2 enter
clear	↓
Calculate	

$a = 5.439$ ✓

$b = 1.756$ ✓

$r^2(\%) = 75\%$

$r = .868$

STAT → CALC 2: 2-Var Stats

with Menu	No Menu
Xlist: L1	L1, L2 enter
Ylist: L2	↓
FreqList: clear	
CALCulate	

$\Sigma x = 19$ $\Sigma x^2 = 67$ $\Sigma y = 66$ $\Sigma y^2 = 754$

$\Sigma xy = 221$ $n = 6$

$$a = \frac{\Sigma y \Sigma x^2 - \Sigma x \Sigma xy}{n\Sigma x^2 - (\Sigma x)^2} = \frac{66 \cdot 67 - 19 \cdot 221}{6 \cdot 67 - 19^2} = \frac{223}{41} = 5.439$$

$$b = \frac{n\Sigma xy - \Sigma x \Sigma y}{n\Sigma x^2 - (\Sigma x)^2} = \frac{6 \cdot 221 - 19 \cdot 66}{6 \cdot 67 - 19^2} = \frac{72}{41} = 1.756$$

r Linear Correlation Coefficient

1) $-1 \le r \le 1$

2) It is a numerical value that measures the strength of linear correlation for all ordered-pairs (x, y).

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

4) when r is close to $\pm 1 \Rightarrow$ Linear Correlation is Significant

when r is close to $0 \Rightarrow$ Linear Correlation is not Significant.

From Last example

$n=6$, $\Sigma x = 19$, $\Sigma x^2 = 67$, $\Sigma y = 66$, $\Sigma y^2 = 754$, $\Sigma xy = 221$

Find r

$$r = \frac{n\Sigma xy - (\Sigma x)(\Sigma y)}{\sqrt{n\Sigma x^2 - (\Sigma x)^2}\ \sqrt{n\Sigma y^2 - (\Sigma y)^2}} = \frac{6 \cdot 221 - 19 \cdot 66}{\sqrt{6 \cdot 67 - 19^2}\ \sqrt{6 \cdot 754 - 66^2}}$$

$$= \frac{72}{\sqrt{41}\ \sqrt{168}} = .868$$

$72 \div \sqrt{(41 * 168)}$ Enter

r is close to $1 \Rightarrow$ Linear Correlation is Significant.

r^2 Coefficient of Determination

1) write r^2 in %, whole %.

2) r^2(%) tell us what % of Y-values are explained by x-values.

• $.868^2 \approx 75\%$

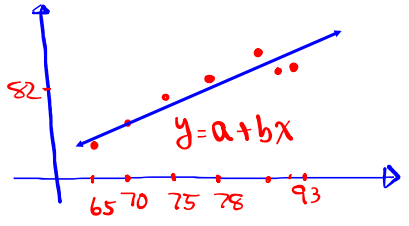
Using Last example, $r^2 \approx 75\%$

75% of the Y-values are explained by x-values.

Midterm exam	Final exam
75	82
78	85
93	90
70	75
65	70
92	90
88	95

1) $n=7$

2) Scatter Plot



Clear all lists

Midterm → X → L1

Final → Y → L2

STAT → CALC

8:

$a = 23.969$ $a \approx 24.0$

$b = .747$ $b \approx .7$

$\Rightarrow \hat{y} \approx 24 + .7x$

$r^2(\%) \approx 86\%$

$r = .927$

r is very close to 1 ⇒ Linear regression is Significant.

86% of final exam Scores are explained by midterm Scores.

How to make Predictions:

SG 10

If r is Significant

⇒ use the regression line

Plug in the x-value to predict the Y-value

If midterm = 85 $\quad y = 24 + .7(85) = 83.5$

$y \approx 84$

If r is not Significant

⇒ use $\bar{y}$, $\bar{y} = \frac{\Sigma y}{n}$ or $\bar{y} = 83.857$

$\bar{y} \approx 84$

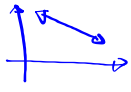
VARS | 5: | 5: | Enter

Temp.	Daily Sales
70°	$125
75°	$130
80°	$120
90°	$115
95°	$100
85°	$120
90°	$130
100°	$90

clear all lists

Temp → X → L1

Daily Sales → Y → L2



$a = 208.918$

$b = -1.082$

$r^2(\%) \approx 59\%$

$r = -.767$

⇒ $y \approx 209 - 1x$

59% of Sales are explained by temp.

r is close to -1

⇒ Linear Correlation is Significant.

Predict Sales if temp is 88°. $\quad y \approx 209 - 88$

$y = \$121$

Assume r is not Significant

use $\bar{y}$

VARS | 5:Statistics | 5: $\bar{y}$ | Enter $\quad$ 116.25

$\approx \$116$

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

Ch. 4 Intro to Probabilities

SE 11-14

E is the desired event (outcome).

P(E) is the prob. that E happens.

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

Final Ans:

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

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12 males & 18 Females in the class.

I randomly select one person,

$$P(\text{Select a Female}) = \frac{18 \text{ Females}}{30 \text{ people}} = \frac{18}{30} = \boxed{\frac{3}{5}} = \boxed{.6}$$

Standard deck of playing cards:
52 Cards, 26 Red, 12 Face, 4 Aces
Draw one Card,

12 ÷ 52 Math 1: enter

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

$$P(\text{Select a Face Card}) = \frac{12 \text{ Face}}{52 \text{ cards}} = \boxed{\frac{3}{13}} = \boxed{.231}$$

$$P(\text{Select an Ace}) = \frac{4 \text{ Aces}}{52 \text{ Cards}} = \boxed{\frac{1}{13}} = \boxed{.077}$$

$$P(\text{Select a red ace}) = \frac{2 \text{ Red Ace}}{52 \text{ Cards}} = \frac{1}{26} = \boxed{.038}$$

Some rules / Properties:

Important:

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

2) $\sum P(E) = 1$

3) If $P(E) = 1$ $\Leftrightarrow$ Sure event

4) If $P(E) = 0$ $\Leftrightarrow$ Impossible event

5) If $0 < P(E) \leq .05$ $\Leftrightarrow$ Rare event

I Surveyed 100 voters, Here is the result:

	Yes	NO	Total
Males	32	18	50
Females	15	35	50
Total	47	53	100

If we randomly Select one of these voters,

1) $P(\text{Male}) = \frac{50}{100} = .5$

2) $P(\text{Female}) = \frac{50}{100} = \frac{1}{2}$

3) $P(\text{Yes}) = \frac{47}{100} = .47$

4) $P(\text{Female or Yes}) = \frac{15+35+32}{100} = \frac{82}{100} = \frac{41}{50} = .82$

5) $P(\text{Female and Yes}) = \frac{15}{100} = \frac{3}{20} = .15$

Class QZ 4

A Sample has the following 5-Number Summary:

25, 68, 75, 88, 200

1) Draw Box Plot

2) IQR

3) Upper Fence

4) Lower Fence

5) Discuss outliers.