

**Math 110**  
**Winter 2021**  
**Lecture 6**



Class Q7 3:

Consider the Sample below

78	62	80	84
100	90	75	70
65	88	96	92
68	55	80	

Find

1)  $\bar{x} = 78.867$

2)  $S = 13.114$

3)  $S^2$  in reduced fraction

$$S^2 = \frac{18058}{105}$$

} Round to  
3-decimals

Consider the table below:

x	y
5	4
4	8
4	6
3	10
2	10

1)  $n=5$ 

2) Scatter Plot



Clear all lists

Reset all lists

x  $\rightarrow$  L1, y  $\rightarrow$  L2STAT  $\rightarrow$  CALC  
8:

with MENU

xlist: L1

ylist: L2

Clear

Calculate

No MENU

L1, L2 Enter

7

 $a = 15.077$  $b = -2.077$  $r^2(\%) \approx 82\%$  $r = -.908$ 

$$\Rightarrow y = 15.1 - 2.1x$$

 $r$  is the linear  
Correlation Coefficient $-1 \leq r \leq 1$  $r^2(\%)$  is the Coef. of Determination $r^2(\%)$  tells us what % of Y-values

are explained by X-values.

Since  $r$  is close to 1 or -1  $\Rightarrow$  Significantwhen  $r$  is close to 0  $\Rightarrow$  not Significant. $r^2(\%) = 82\%$  82% of Y-values are explained by X-valuesSTAT  $\rightarrow$  CALC

2: 2-Var stats

xlist: L1

ylist: L2

freq list: Clear

Calculate

L1, L2  
enter

$$\sum x = 18$$

$$\sum y^2 = 316$$

$$\sum x^2 = 70$$

$$\sum xy = 126$$

$$\sum y = 38$$

$$n = 5$$

$$a = \frac{\sum y \sum x^2 - \sum x \sum xy}{n \sum x^2 - (\sum x)^2} = \frac{38 \cdot 70 - 18 \cdot 126}{5 \cdot 70 - 18^2} = \frac{392}{26} = 15.077$$

$$b = \frac{n \sum xy - \sum x \sum y}{n \sum x^2 - (\sum x)^2} = \frac{5 \cdot 126 - 18 \cdot 38}{5 \cdot 70 - 18^2} = \frac{-54}{26} = -2.077$$

## Linear Correlation Coefficient $r$

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

2) It is a numerical value that measures the strength of the linear correlation.

If  $r$  is close to  $\pm 1 \Rightarrow$  Linear Correlation is Significant

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

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

From last example

$n=5$  ,  $\sum x=18$  ,  $\sum x^2=70$  ,  $\sum y=38$  ,  $\sum y^2=316$  ,  $\sum xy=126$

$$r = \frac{n \sum xy - \sum x \sum y}{\sqrt{n \sum x^2 - (\sum x)^2} \sqrt{n \sum y^2 - (\sum y)^2}} = \frac{5 \cdot 126 - 18 \cdot 38}{\sqrt{5 \cdot 70 - 18^2} \sqrt{5 \cdot 316 - 38^2}}$$

$$= \frac{-54}{\sqrt{26} \sqrt{136}}$$

$-54 \div \sqrt{(26 \cdot 136)} \text{ Enter}$

$$= \boxed{-.908}$$

$r^2$  is the Coefficient of Determination.

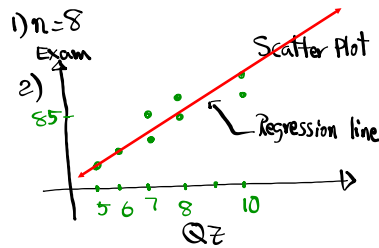
$r^2(\%) \approx 82\%$

$(-.908)^2 \uparrow$

82% of  $y$ -values are explained by  $x$ -values.

I randomly Selected 8 students.

QZ Scores	Exam Scores
8	85
10	92
10	98
7	77
6	70
7	90
5	68
8	90



QZ  $\rightarrow x \rightarrow PL1$   
Exam  $\rightarrow y \rightarrow PL2$

$$a = 41.834$$

$$b = 5.497$$

$$r^2(\%) = 79\%$$

$$r = .891$$

$$\Rightarrow y \approx 42 + 5x$$

$$r = .891$$

It is close to 1

$\Rightarrow$  Linear Correlation is Significant.

$$r^2(\%) = 79\%$$

79% of exam Scores are explained by QZ Scores.

How to make Predictions:

If  $r$  is Significant

Plug in the  $x$ -value to find  $y$ -value.

If Your QZ Score was 8

$$y = 42 + 5(8) \Rightarrow y = 82$$

If Your QZ Score was 6

$$y = 42 + 5(6) \Rightarrow y = 72$$

If  $r$  is not Significant

use  $\bar{y}$ ,  $\bar{y} = \frac{\sum y}{n}$  or

SG 10  
✓

$$\bar{y} = 83.75$$

$$\bar{y} \approx 84$$

VAR5 5: Stats 5:  $\bar{y}$  Enter



## Ch. 4 Intro to Probabilities SG 11-14

E → Desired event (outcome)

P(E) → Prob. that E happens

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

**Final Answer**

1) Reduced Fraction

2) Rounded to 3-decimals

3) Scientific Notation

Ex: 20 Students, 8 males, 12 Females.

$$P(\text{Select one Female}) = \frac{12 \text{ Females}}{20 \text{ Students}} = \frac{12}{20} = \boxed{\frac{3}{5}} = \boxed{.6}$$

Standard deck of playing Cards:

52 Cards, 26 Red, 12 Face, 4 Aces

one card is randomly drawn.

$$P(\text{Red}) = \frac{26 \text{ Red}}{52 \text{ Cards}} = \frac{26}{52} = \boxed{\frac{1}{2}} \quad P(\text{Face}) = \frac{12 \text{ Face}}{52 \text{ Cards}} = \frac{3}{13} = \boxed{.231}$$

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

$$P(\text{Red ace}) = \frac{2 \text{ Red aces}}{52 \text{ Cards}}$$

$$= \boxed{\frac{1}{26}} = \boxed{.038}$$

I randomly Selected Some voters that voted on Certain item.

	Yes	NO	Total
Republicans	48	12	60
Democrats	30	60	90
Total	78	72	150

If we randomly Select one of these voters,

$$P(\text{Republican}) = \frac{60}{150} = \frac{2}{5} = .4$$

$$P(\text{Yes}) = \frac{78}{150} = \frac{13}{25} = .52$$

$P(\text{Democrat or No})$

$P(\text{Democrat and No})$

$$= \frac{30 + 60 + 12}{150} = \frac{102}{150} = \frac{17}{25} = .68$$

$$= \frac{60}{150} = \frac{2}{5} = .4$$

$$P(\text{Yes and No}) = 0$$

Do not use  $\emptyset$  for 0.  
↑  
Not Zero.

Prob. Rules / Properties:

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

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

$$3) P(E) = 1 \Leftrightarrow \text{Sure event}$$

$$4) P(E) = 0 \Leftrightarrow \text{Impossible Event}$$

$$5) 0 < P(E) \leq .05 \Leftrightarrow \text{Rare event}$$

A Four-Sided Sair die is numbered 1, 2, 3, and 4.

Roll it twice

Sample Space (complete list of all possible outcomes):

1,1	1,2	1,3	1,4
2,1	2,2	2,3	2,4
3,1	3,2	3,3	3,4
4,1	4,2	4,3	4,4

$$P(\text{Sum} = 1) = 0$$

$$P(\text{Sum} = 4) = \frac{3}{16}$$

$$P(\text{Sum} \geq 6) = \frac{6}{16} = \boxed{\frac{3}{8}}$$

$$P(2 \leq \text{Sum} \leq 8) = \frac{16}{16} = 1$$

$$P(2 < \text{Sum} < 8) = \frac{14}{16} = \boxed{\frac{7}{8}} = \boxed{.875}$$

$E \rightarrow$  Desired Event

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

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

$$P(\text{Rains}) = .12 \quad .12 + .88 = 1$$

$$P(\overline{\text{Rain}}) = .88$$

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

$$P(\text{Pass}) = .7 \quad .7 + .3 = 1$$

Complement Rule

$$P(\overline{\text{Pass}}) = .3$$

Given  $P(E) = .25\%$  Sind  $P(\bar{E}) = 1 - P(E)$

$$.25\% = .25(.01) = .0025$$

$$\frac{1}{400}$$

$$= 1 - \frac{1}{400} = \boxed{\frac{399}{400}}$$

Class QZ 4

A Sample has the following

5 - Number Summary

25, 68, 75, 88, 200

3) Upper Fence

5) Discuss outliers

1) Draw Box Plot

2) IQR

4) Lower Fence