

Statistics

Fall 2022

Lecture 10



Feb 19-8:47 AM

Class QZ 11:

Use the chart below

x	y
8	15
10	12
6	10
5	8

x → L1

y → L2

STAT → CALC 8:Lin Reg(a+bx) Xlist:L1 Ylist:L2

Find

$$a \approx 4.5$$

$$b = .9$$

$$r^2 = 48\%$$

$$r = .692$$

$$y \approx 4.5 + .9x$$

} Round to
1-decimal

whole%

3-decimals

Nov 7-8:13 AM

Suppose $n=10$, $\sum y=158$, $y \approx 6+3.2x$

Predict y when $x=4$

1) Assume r is significant
 Use Regression line
 $y \approx 6+3.2(4) = 6+12.8 = \boxed{18.8}$

2) Assume r is not significant.
 Use \bar{y}
 $\bar{y} = \frac{\sum y}{n} = \frac{158}{10} = \boxed{15.8}$

Nov 8-6:04 AM

Consider the chart below

QZ Score	Exam Score
8	85
6	70
7	80
9	92
10	95
5	65

Scatter Plot

Exam Score $\rightarrow y \rightarrow L2$
 QZ Score $\rightarrow x \rightarrow L1$

LinReg(a+bx) with L1 & L2

$a = 33.810$
 $b = 6.314$
 $r^2 = .982 \Rightarrow 98\%$
 $r = .991$

$\Rightarrow y \approx 34 + 6x$

Predict exam Score if QZ Score is 8.

1) Assume r is significant
 $y \approx 34 + 6x = 34 + 6(8) = 34 + 48 = \boxed{82}$

2) Assume r is not significant

$\bar{y} \approx 81$

SG9 ✓

VARS
 8: statistics
 5: \bar{y} Enter

Nov 8-6:08 AM

Introduction to Probabilities

SG 10-13

 $E \rightarrow$ desired event or outcome $P(E) \rightarrow$ Prob. that event E happens

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

Acceptable Answers:

- 1) Reduced fraction
- 2) Round to 3-decimal places
- 3) Scientific notation

Nov 8-6:19 AM

A box has 8 blue and 12 red balls.
we randomly select 1 ball,

$$1) P(\text{Blue}) = \frac{\text{Total Blue balls}}{\text{Total balls}} = \frac{8}{20} = \frac{2}{5} = .4$$

8 ÷ 20 [Math] [1: ▸ Frac] [Enter]

[Math] [2: ▸ Dec] [Enter]

$$2) P(\text{Red}) = \frac{12}{20} = \frac{3}{5} = .6$$

Nov 8-6:22 AM

A piggy bank has 10 nickels, 8 dimes, and 7 quarters.

If we randomly get one coin,

$$1) P(\text{Nickel}) = \frac{10}{25} = \frac{2}{5}$$

$$2) P(\text{Dime}) = \frac{8}{25} = .32$$

$$3) P(\text{Quarter}) = \frac{7}{25} = .28$$

$$4) P(\text{Dime or Quarter}) = \frac{8+7}{25} = \frac{15}{25} = \frac{3}{5} = .6$$

$$5) P(\text{Nickel and Dime}) = \frac{0}{25} = 0$$

Do not use \emptyset for zero.
undefined

Impossible event

Nov 8-6:27 AM

Some rules & Definitions:

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

2) Sum of all prob. is always 1.

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

$$4) P(E) = 0 \iff \text{Impossible event}$$

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

$$6) \bar{E} \Rightarrow E\text{-bar, } E\text{-Complement, Not } E$$

$$7) P(E) + P(\bar{E}) = 1 \Rightarrow P(\bar{E}) = 1 - P(E)$$

Complement Rule

Nov 8-6:34 AM

Suppose $P(E) = .025$

1) write $P(E)$ in reduced fraction.

$$.025 \quad \boxed{\text{Math}} \quad \boxed{1: \blacktriangleright \text{Frac}} \quad \boxed{\text{Enter}} \quad \frac{1}{40}$$

2) write $P(E)$ in Percentage.

$$.025 = \underbrace{.025}_{\text{red}} (100)\% = \boxed{2.5\%}$$

3) Find $P(\bar{E})$ in decimal and in reduced fraction.

$$P(\bar{E}) = 1 - P(E) = 1 - .025 = \boxed{.975}$$

$$.975 \quad \boxed{\text{Math}} \quad \boxed{1: \blacktriangleright \text{Frac}} \quad \boxed{\text{Enter}} \quad \frac{39}{40}$$

$$1 \boxed{-} 1 \boxed{\div} 40 \quad \boxed{\text{Math}} \quad \boxed{1: \blacktriangleright \text{Frac}} \quad \boxed{\text{Enter}} \quad \frac{39}{40}$$

Nov 8-6:41 AM

Suppose $P(A) = \frac{5}{8}$

1) write $P(A)$ in decimal.

$$5 \boxed{\div} 8 \quad \boxed{\text{enter}} \quad \boxed{.625}$$

2) write $P(A)$ in Percentage.

$$.625 \quad \boxed{\times} \quad 100\% = \boxed{62.5\%}$$

3) Find $P(\bar{A})$ in reduced fraction.

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

$$= 1 - \frac{5}{8} =$$

$$\boxed{\frac{3}{8}}$$

$$1 \boxed{-} 5 \boxed{\div} 8 \quad \boxed{\text{Math}} \\ \boxed{1: \blacktriangleright \text{Frac}} \quad \boxed{\text{Enter}}$$

Nov 8-6:46 AM

Consider all whole numbers from 1 to 16.

1 2 3 4 5 6 10 11 12 13 14
 15 16

Select **one number** $P(\text{Select 10 or 15})$

$$P(\text{Select 4}) = \frac{1}{16} = \frac{2}{16} = \frac{1}{8}$$

$$P(\text{Select below 4}) = \frac{3}{16} \quad P(\text{Select 10 and 15}) = \frac{0}{16} = 0$$

$$P(\text{Select at most 4}) = \frac{4}{16} = \frac{1}{4}$$

$$P(\text{Select at least 10}) = \frac{7}{16}$$

$$P(\text{Select below 3 or above 14}) = \frac{4}{16} = \frac{1}{4} = 0.25$$

$$P(\text{Select below 3 and above 14}) = \frac{0}{16} = 0$$

Impossible event

SG & 10 ✓

Nov 8-6:52 AM

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

Key word: OR

Single-Action Event

both
overlap

Given $P(A) = .3$, $P(B) = .6$, $P(A \text{ and } B) = .2$

$$P(\bar{A}) = 1 - P(A) = 1 - .3 = .7$$

$$P(\bar{B}) = 1 - P(B) = 1 - .6 = .4$$

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

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B) = .3 + .6 - .2 = .7$$

Nov 8-7:16 AM

$$P(\text{Coffee}) = .65$$

$$P(\text{Donut}) = .25$$

$$P(\text{Coffee and Donut}) = .15$$

$$P(\overline{\text{Coffee}}) = 1 - P(C) = 1 - .65 = \boxed{.35}$$

$$P(\overline{\text{Donut}}) = 1 - P(D) = 1 - .25 = \boxed{.75}$$

$$\begin{aligned} P(\text{Coffee OR Donut}) &= P(C) + P(D) - P(C \text{ and } D) \\ &= .65 + .25 - .15 = \boxed{.75} \end{aligned}$$

Nov 8-7:22 AM

Suppose $P(A) = .8$, $P(B) = .3$, $P(A \text{ or } B) = .9$

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

$$2) P(\overline{B}) = 1 - P(B) = 1 - .3 = \boxed{.7}$$

$$3) P(\overline{A \text{ or } B}) = 1 - P(A \text{ or } B) = 1 - .9 = \boxed{.1}$$

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

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

$$\boxed{.9} = .8 + .3 - P(A \text{ and } B)$$

$$P(A \text{ and } B) = .8 + .3 - .9 = \boxed{.2}$$

Nov 8-7:28 AM

Mutually Exclusive Events \leftrightarrow Disjointed events
 No overlap No overlap

If A and B are Mutually Exclusive Events, then $P(A \text{ and } B) = 0$

Ex: $P(A) = .45$, $P(B) = .35$, A & B are M.E.E.

$P(\bar{A}) = 1 - P(A) = 1 - .45 = \boxed{.55}$

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

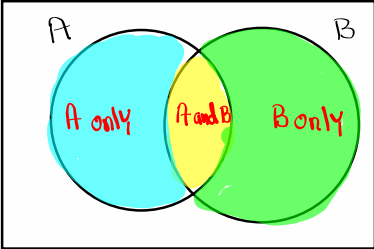
$P(A \text{ and } B) = \boxed{0}$ Since A & B are M.E.E.

$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$
 $= .45 + .35 - 0 = \boxed{.8}$

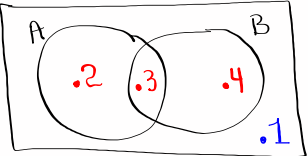
$P(\overline{A \text{ or } B}) = 1 - P(A \text{ or } B)$
 $= 1 - .8 = \boxed{.2}$

Nov 8-7:38 AM

Addition Rule with Venn Diagram



Total = 1



1) Is Total = 1? NO
 $1 - .9 = .1$

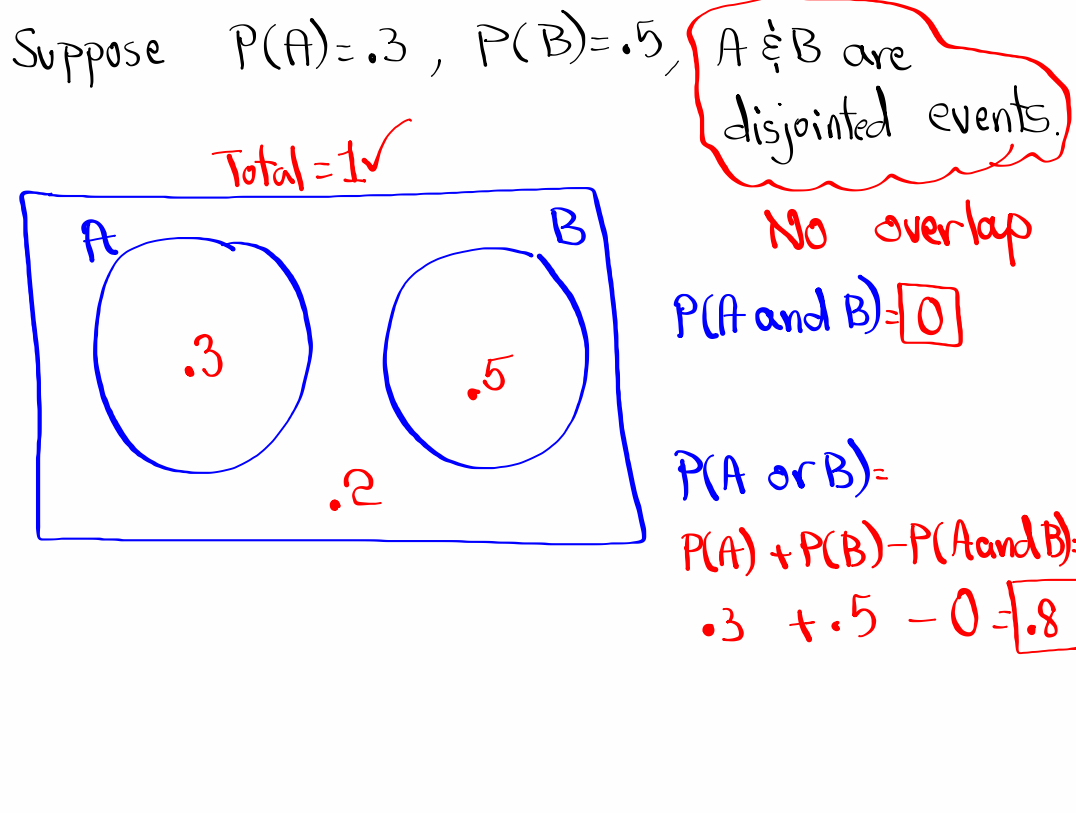
2) $P(A \text{ only}) = .2$
 $P(A) = .5$

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

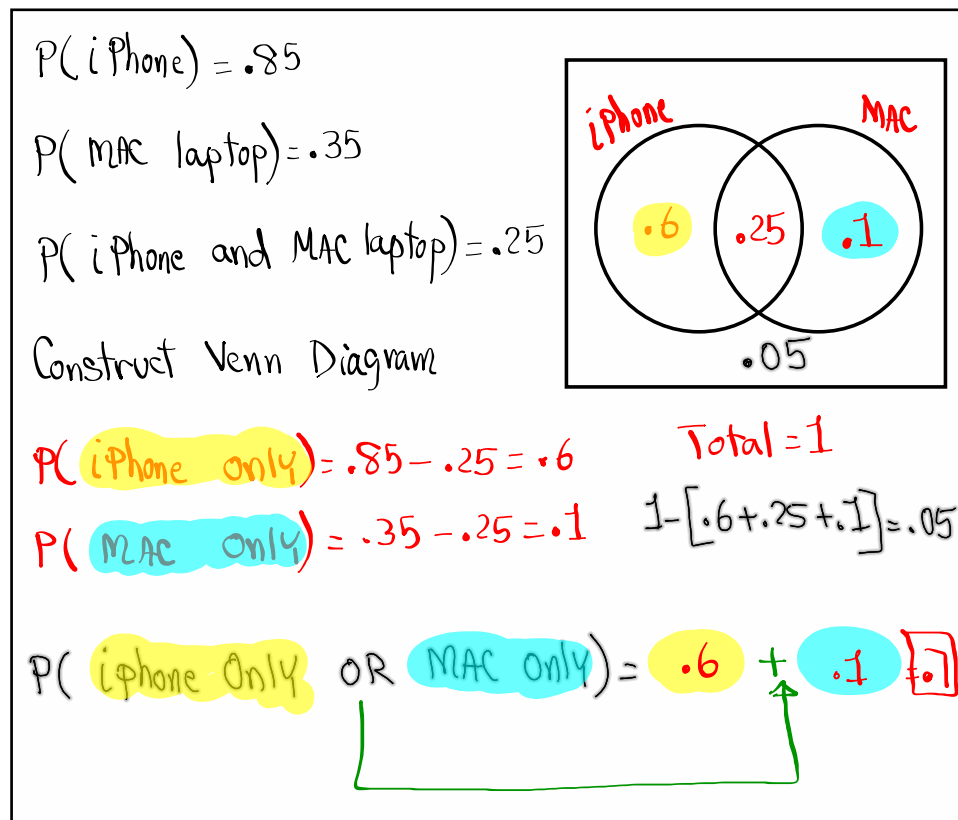
4) $P(A \text{ and } B) = .3$

5) $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$
 $= .5 + .7 - .3 = \boxed{.9}$

Nov 8-7:47 AM



Nov 8-7:55 AM



Nov 8-8:00 AM

Class QZ 12:

Given: $n = 8$, $y = 45 - 2.5x$, $\sum y = 280$

Predict y when $x = 4$ if

1) r is significant.

$$y = 45 - 2.5x = 45 - 2.5(4) = 45 - 10 = \boxed{35}$$

2) r is not significant. $\bar{y} = \frac{\sum y}{n} = \frac{280}{8} = \boxed{35}$

Nov 8-8:14 AM