Statistics
Fall 2022
Lecture 11

Feb 19-8:47 AM

Class Qz 12:

$y \approx a + bx$

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

Predict y when $x = 4$ if

1) r is Significant.

$y = 45 - 2.5x = 45 - 2.5(4) = 45 - 10 = 35$ ✓

2) r is not Significant. $\bar{y} = \frac{\Sigma y}{n} = \frac{280}{8} = 35$ ✓

Nov 8-8:14 AM

A four-sided fair die is numbered 1, 2, 3, and 4.

Roll it twice.

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

Sum of each outcome

2	3	4	5
3	4	5	6
4	5	6	7
5	6	7	8

Draw the histogram for Sum and Freq. of each Sum.

Sum → L1,

Freq. of each Sum → L2

L1	L2
2	1
3	2
4	3
⋮	4
8	⋮ 1

1-Var Stats
List: L1
FreqList: L2
Calculate

$\bar{x} = 5$

$S_x = 1.633$

$n = 16$

Find S^2 in reduced fraction

$S^2 = \frac{8}{3}$

Nov 9-6:04 AM

Sum of each outcome

2	3	4	5
3	4	5	6
4	5	6	7
5	6	7	8

$P(\text{Sum} = 1) = \frac{0}{16} = 0$

Impossible event

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

Sure event

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

$P(\text{Sum} = 3 \text{ or } \text{Sum} = 7) = \frac{4}{16} = \boxed{\frac{1}{4}}$

$P(\text{Sum} > 3) = \frac{13}{16}$

Nov 9-6:14 AM

Given $P(A) = .75$, $P(B) = .35$, $P(A \text{ and } B) = .2$

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

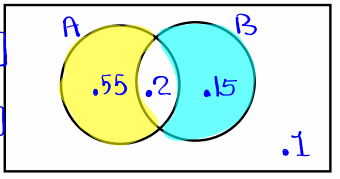
2) $P(\bar{B}) = 1 - P(B) = 1 - .35 = .65$

3) $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$
$= .75 + .35 - .2 = .9$

4) Construct Venn Diagram

$P(A \text{ only}) = .75 - .2 = .55$

$P(B \text{ only}) = .35 - .2 = .15$



$1 - [.55 + .2 + .15] = 1 - .9 = .1$ Total = 1

5) $P(A \text{ only OR } B \text{ only}) = .55 + .15 = .7$

Nov 9-6:19 AM

$P(A) = .55$ $P(B) = .25$ A & B are disjoint events.

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

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

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

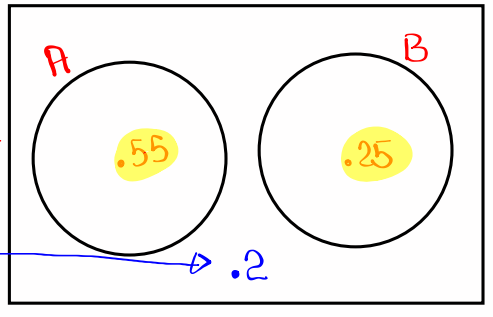
4) $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B) = .55 + .25 - 0 = .8$

5) Construct Venn Diagram.

Total = 1

$1 - [.55 + .25] =$

$1 - .8 = .2$



Nov 9-6:29 AM

De Morgan's Law:

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

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

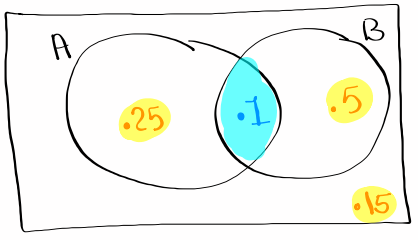
Suppose $P(A \text{ and } B) = .2$, $P(A \text{ or } B) = .7$

Find $P(\overline{A} \text{ and } \overline{B}) = P(\overline{A \text{ or } B}) = 1 - .7 = \boxed{.3}$

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

Nov 9-6:36 AM

Complete the Venn Diagram below:



Total = 1

$1 - [.25 + .5 + .15] = .1$

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

$P(A) = .25 + .1 = .35$

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

$P(A \text{ and } B) = .1$

$P(B) = .6$

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

$= .35 + .6 - .1 = \boxed{.85}$

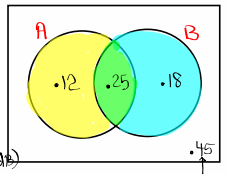
Use De Morgan's Law to find

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

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

Nov 9-6:41 AM

Make a Venn Diagram if
P(A only) = .12 , P(B only) = .18, and
P(A and B) = .25.



P(A) = .12 + .25 = .37

P(B) = .25 + .18 = .43

P(A or B) = P(A) + P(B) - P(A and B)
= .37 + .43 - .25 = .55

Total = 1
1 - [.12 + .25 + .18] = .45

Use DeMorgan's Law to find

$P(\overline{A} \text{ and } \overline{B}) = P(\overline{A \text{ or } B}) = 1 - P(A \text{ or } B) = 1 - .55 = .45$

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

SG 11 ✓

Exam 1: SG 1 - SG 11

Agenda for Thursday
1) Lecture from 6:00 - 6:50
2) Class Q2: 6:50 - 7:00
3) Exam 1: 7:00 - 8:45

Camera must be on, and you must be in the view of camera. You will not be recorded.
You have access to your notes, my lectures, and materials on my website.
Any work displayed not similar to my lecture is considered cheating, results in 0 for the exam, and will be reported to the dean of Student Services.

Nov 9-6:51 AM

Odds vs. Probabilities. SG 12

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

Always Simplify

Odds in favor of event E are

E happens : # $\overline{E}$ happens

There are 12 males and 28 Females.
Let E be the event of Selecting one male

$$P(E) = P(\text{Select one male}) = \frac{12 \text{ males}}{40 \text{ People}} = \frac{3}{10}$$

Odds in favor of event E are

Males : # $\overline{\text{Males}}$

12 : 28 ⇒ 3 : 7

12 : 28 Math 1: ▶Frac Enter $\frac{3}{7}$

Nov 9-7:26 AM

I flipped a coin 200 times.
It landed tails 125 times.

$P(\text{Land tails}) = \frac{125 \text{ tails}}{200 \text{ tosses}} = \frac{125}{200} = \boxed{\frac{5}{8}}$

odds in favor of landing tails are

tails : # fails

125 : 75 $\Rightarrow$ **5 : 3**

125 [:] 75 [Math] [1:▶Frac] [Enter] $\frac{5}{3}$

Odds in favor of event E are

a : b

odds against event E are

b : a

Nov 9-7:32 AM

Consider a full-deck of playing cards

52 Cards, 26 Reds, 12 face, 4 Aces

$P(\text{draw an Ace}) = \frac{4}{52} = \boxed{\frac{1}{13}}$

odds in favor of drawing an Ace

Aces : # Aces

4 : 48 $\rightarrow$ **1 : 12**

odds against drawing an Ace.

Reverse it

12 : 1

Nov 9-7:38 AM

How to find odds in favor of event E when P(E) is given:

$P(E) : P(\bar{E})$

Always reduce/simplify

Suppose $P(E) = .4$

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

2) odds in favor of event E.

$P(E) : P(\bar{E})$

$.4 : .6$ → $\boxed{2:3}$ (Reverse it)

3) odds against event E.

$\boxed{3:2}$

Nov 9-7:44 AM

Prob. that LA Dodgers win the world Series next year is .65. $P(W) = .65$

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

2) odds in favor of them to win WS.

$P(W) : P(\bar{W})$

$.65 : .35$ → $\boxed{13:7}$

3) odds against them to win WS.

Reverse it → $\boxed{7:13}$

Nov 9-7:49 AM

How to find $P(E)$ & $P(\overline{E})$ when odds in favor of E are $a:b$:

$$P(E) = \frac{a}{a+b} \quad \& \quad P(\overline{E}) = \frac{b}{a+b}$$

Suppose odds in favor of event E are $3:37$.

1) odds against event E. $\boxed{37:3}$

2) $P(E) = \frac{a}{a+b} = \frac{3}{3+37} = \boxed{\frac{3}{40}}$ 3) $P(\overline{E}) = \frac{b}{a+b} = \boxed{\frac{37}{40}}$

Nov 9-7:55 AM

A box has 2 quarters, 15 dimes, and 33 nickels.

1) odds in favor of selecting a quarter.

quarters : # quarters → $\boxed{1:24}$

$2:48$ → Reverse it

2) odds against selecting a quarter

$\boxed{24:1}$

3) P(Selecting a quarter)

$P(\text{Quarter}) = \frac{2}{2+48} = \frac{2}{50} = \boxed{\frac{1}{25}}$

4) P(not Selecting a quarter)

$P(\overline{\text{Quarter}}) = \frac{48}{2+48} = \frac{48}{50} = \boxed{\frac{24}{25}}$

You should be able to do First 2.5 pages of SG 12.

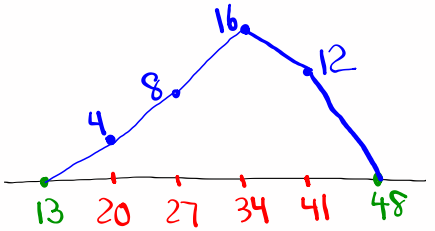
Nov 9-8:02 AM

Consider the freq. table below: CW = 7

class limits	class BNDRS	class MP	class F
17 – 23	16.5 – 23.5	20	4
24 – 30	23.5 – 30.5	27	8
31 – 37	30.5 – 37.5	34	16
38 – 44	37.5 – 44.5	41	12

Draw freq. Polygon

use class MP & class F to find



$\bar{x} = 33.3$ $n = 40$

$S = 6.7$ S^2 (Reduced fraction) $= \frac{8722}{195}$

Nov 9-8:09 AM

Consider the STEM Plot below

1	0 2 5
2	0 3 5 5 8
3	1 4 6 6 6 9
4	0 2 3 7 7
5	0 5

1) $n = 21$

2) Range $= 55 - 10 = 45$

3) Estimate $S \approx \frac{\text{Range}}{4} = \frac{45}{4} = 11.25$

4) Find P_{10}

$L = \frac{K}{100} \cdot n = \frac{10}{100} \cdot 21 = 2.1 \Rightarrow L = 3$ $\Rightarrow P_{10} =$ 3rd element

$P_{10} = 15$

5) Find K such that $P_K = 40$ (% Below)

$K = PR = \frac{B}{n} \cdot 100$

$K = \frac{14}{21} \cdot 100$

$= 66.6 \approx 67$ → Round to whole %.

$P_{67} = 40$

67 % | 33 %

$P_{67} = 40$

Nov 9-8:21 AM