Statistics

Lecture 9

Feb 19-8:47 AM

Class Qz 4

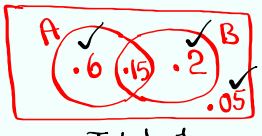
Given: $P(A) = .75$, $P(B) = .35$, $P(A \text{ and } B) = .15$ (overlap)

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

2) $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$
$= .75 + .35 - .15$
$= \boxed{.95}$ ✓

3) Construct the Venn Diagram.

$.75 - .15 = .6$
$.35 - .15 = .2$
$1 - .95 = .05$



Total = 1

$P(A \text{ only or } B \text{ only}) = .6 + .2 = \boxed{.8}$

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

DeMorgan's Law

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

Mar 9-5:40 PM

Suppose $P(A) = .075$

1) $P(\bar{A}) = 1 - .075 = .925$

.075 ÷ .925

Math 1:▶Frac Enter $\frac{3}{37}$

2) odds in favor of event A

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

$.075 : .925 \rightarrow 3:37$

3) odds against event A. $37:3$

Mar 11-7:00 PM

odds in favor of event A are

3 : 37

1) $P(A) = \frac{3}{3+37} = \frac{3}{40} = .075$

2) $P(\bar{A}) = \frac{37}{3+37} = \frac{37}{40} = .925$

From a standard deck of playing cards, find odds in favor of drawing face or ace card.

#(face or ace) : #(face or ace)

12 face

4 Aces

52 − 16 = 36

16 : 36

16 ÷ 36 Math 1:▶Frac Enter $\frac{4}{9}$

4 : 9

Mar 11-7:04 PM

Suppose $P(A) = .8$, $P(B) = .2$

A and B are independent events.

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

$= (.8)(.2) = \boxed{.16}$

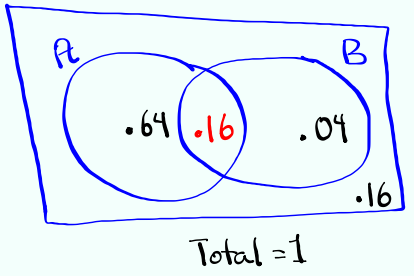
2) $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

$= .8 + .2 - .16 = \boxed{.84}$

3) Venn Diagram

$.8 - .16 = \boxed{.64}$

$.2 - .16 = .04$



Mar 11-7:10 PM

Suppose Prob. that any student has an iPhone is .7

I selected two randomly students.

$P(\text{Both have iPhone}) = (.7)(.7) = \boxed{.49}$

$P(\text{Neither one has iphone}) = (.3)(.3) = \boxed{.09}$

Sample Space $i\,i$ $i\,\bar{i}$ $\bar{i}\,i$ $\bar{i}\,\bar{i}$

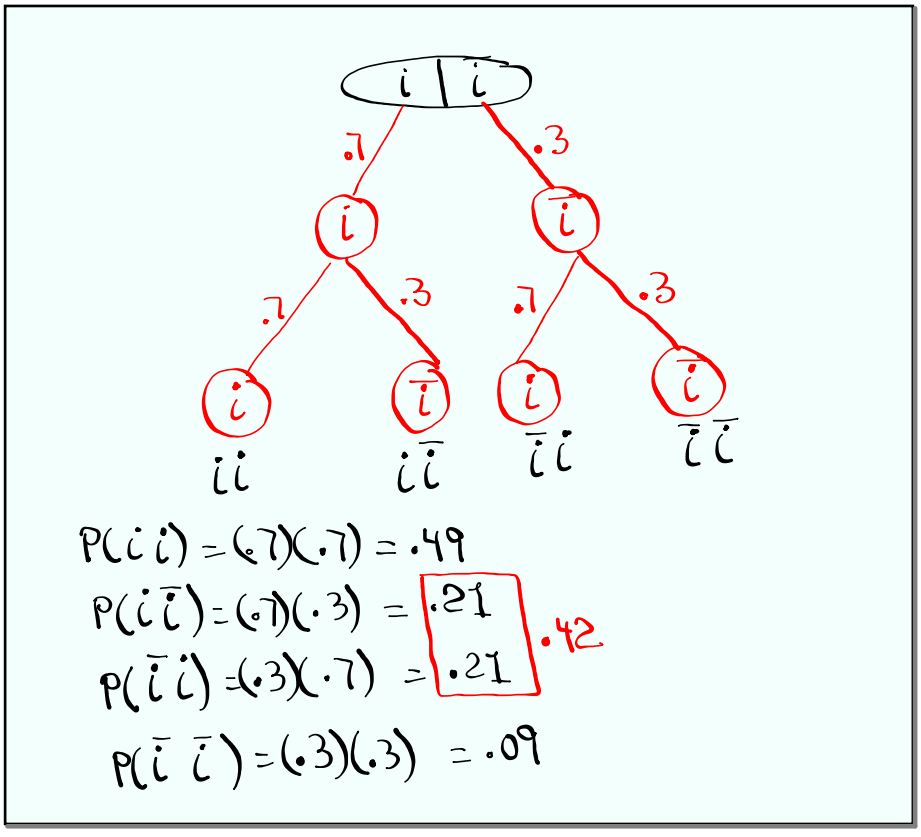
.49 ? .09

.42

$.49 + .09 = .58$

$1 - .58 = .42$

Mar 11-7:15 PM



$P(ii) = (.7)(.7) = .49$

$P(ii') = (.7)(.3) = .21$

$P(i'i) = (.3)(.7) = .21$ → .42

$P(i'i') = (.3)(.3) = .09$

Mar 11-7:20 PM

A box has 2 Red, 3 white, and 5 blue balls.
Take 2 balls with replacement

$P(\text{Both red}) = \frac{2}{10} \cdot \frac{2}{10} = \frac{4}{100} = .04$

$P(\text{Both white}) = \frac{3}{10} \cdot \frac{3}{10} = \frac{9}{100} = .09$

$P(\text{Both blue}) = \frac{5}{10} \cdot \frac{5}{10} = \frac{25}{100} = .25$

$P(\text{Both balls are Same Color}) = .04 + .09 + .25$
RR OR WW OR BB → .38

P(they are not Same Color)

$P(\overline{\text{Same Color}}) = 1 - P(\text{Same Color})$
$= 1 - .38 = .62$

Find odds in favor of having both Same Color.

.38 : .62 → 19 : 31

Mar 11-7:25 PM

Dependent Events

one outcome changes the prob. of next outcome

Draw 2 Cards without replacement

$$P(A \text{ and } B) = P(A) \cdot P(B|A)$$

Given

Draw 2 Cards
No replacement

$$P(\text{Both red}) = P(RR) = \frac{26}{52} \cdot \frac{25}{51} = \boxed{\frac{25}{102}}$$

$$P(\text{Both Face Cards}) = P(FF) = \frac{12}{52} \cdot \frac{11}{51} = \boxed{\frac{11}{221}}$$

Draw 3 Cards
No replacement

$$P(\text{All aces}) = \frac{4}{52} \cdot \frac{3}{51} \cdot \frac{2}{50} = \boxed{\frac{1}{5525}}$$

$$= 1.8 \times 10^{-4}$$

Mar 11-7:36 PM

3 females 7 males

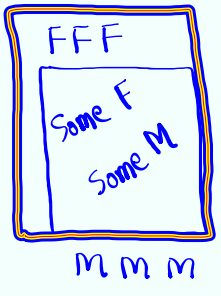
Select 3 people.

$$P(\text{All females}) = \frac{3}{10} \cdot \frac{2}{9} \cdot \frac{1}{8} = \boxed{\frac{1}{120}}$$

$$P(\text{all males}) = \frac{7}{10} \cdot \frac{6}{9} \cdot \frac{5}{8} = \boxed{\frac{7}{24}}$$

$$P(\text{all are Same gender}) = \frac{1}{120} + \frac{7}{24} = \boxed{\frac{3}{10}}$$

FFF OR MMM



P(at least 1 Female)

$= 1 - P(\text{All Males})$

Total Prob.

$= 1 - \frac{7}{24} = \boxed{\frac{17}{24}}$

Mar 11-7:46 PM

$$P(A \text{ and } B) = P(A) \cdot P(B|A)$$

$$P(B|A) = \frac{P(A \text{ and } B)}{P(A)}$$

Conditional Prob.

$P(A) = .5 \qquad P(B) = .4 \qquad P(A \text{ and } B) = .3$

$$P(B|A) = \frac{P(A \text{ and } B)}{P(A)} = \frac{.3}{.5} = .6$$

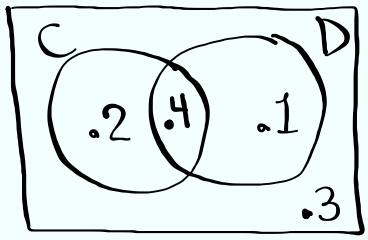
$$P(A|B) = \frac{P(A \text{ and } B)}{P(B)} = \frac{.3}{.4} = .75$$

Mar 11-7:53 PM

$P(\text{Coffee}) = .6$

$P(\text{Donut}) = .5$

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



Total = 1

$$P(\text{Donut}|\text{Coffee}) = \frac{P(C \text{ and } D)}{P(C)} = \frac{.4}{.6} = \frac{2}{3} = .667$$

$$P(\text{Coffee}|\text{Donut}) = \frac{P(C \text{ and } D)}{P(D)} = \frac{.4}{.5} = .8$$

Mar 11-7:58 PM

$P(\text{Shirt}) = .5$

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

$P(\text{Shirt} \mid \text{Pants}) = .75$

$P(\text{Shirt and Pants}) = ?$

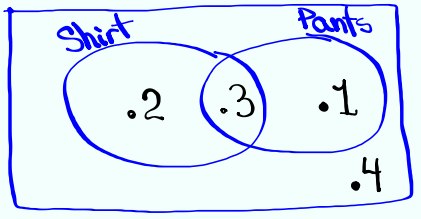
$P(\text{Shirt} \mid \text{Pants}) = \dfrac{P(\text{Shirt and Pants})}{P(\text{Pants})}$

$.75 = \dfrac{P(\text{Shirt and Pants})}{.4}$

Cross-Multiply

$P(\text{Shirt and Pants}) = .4(.75)$

$= \boxed{.3}$



$P(\text{Pants} \mid \text{Shirt}) = \dfrac{P(\text{Shirt \& Pants})}{P(\text{Shirt})} = \dfrac{.3}{.5} = \boxed{.6}$

Mar 11-8:03 PM

Complete the chart below

class limits	class MP	class F
20 – 30	25	4
31 – 41	36	6
42 – 52	47	10
53 – 63	58	5

+11, +11, +11

use class MP (L1) & class F (L2) to find

$\bar{x} = 43.04$

$S = 10.945$

$S^2 = \dfrac{11979}{100}$

Class MP → L1

Class F → L2

STAT → CALC

1:1-Var Stats

List: L1

FreqList: L2

Calculate

L1 , L2 enter

1

Mar 11-8:13 PM

Use the chart below

x	y
5	12
6	15
6	18
7	20
8	25

Find

1) $a \approx -9.1$

2) $b \approx 4.2$

} Round to 1-dec.

3) $r^2 \approx 95\%$

} whole %.

4) $r = .975$

} 3-dec.

$x \rightarrow L1$

$y \rightarrow L2$

STAT $\rightarrow$ CALC

8:LinReg(a+bx)

Mar 11-8:22 PM

Open notes Quiz

Class QZ 5

$P(A) = .3$ $P(B) = .5$ A & B are independent events

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

2) $P(A \text{ and } B) = P(A) \cdot P(B) = (.3)(.5) = .15$

3) $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B) = .3 + .5 - .15 = .65$

Mar 11-8:36 PM