Statistics

Lecture 10

Feb 19-8:47 AM

Class QZ 6

$P(A) = .7$ $P(B) = .6$ $P(A \text{ and } B) = .4$

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

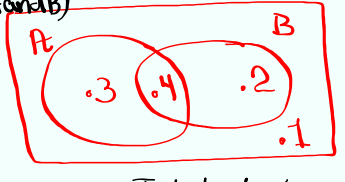
$= .3$ ✓

3) Construct Venn Diagram.

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

2) $P(A \text{ or } B) = .7 + .6 - .4$

$= .9$ ✓



Total = 1 ✓

$P(A \text{ only}) = .3$

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

$P(A \text{ only or } B \text{ only}) = .3 + .2 = .5$

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

De Morgan's Law

$P(\bar{A} \text{ or } \bar{B}) = P(\overline{A \text{ and } B}) = 1 - P(A \text{ and } B) = 1 - .4 = .6$

Mar 30-3:59 PM

$P(A) = .6 \qquad P(B) = .4$

A & B are independent events

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

2) $P(A \text{ and } B) = P(A) \cdot P(B) = (.6)(.4) = \boxed{.24}$

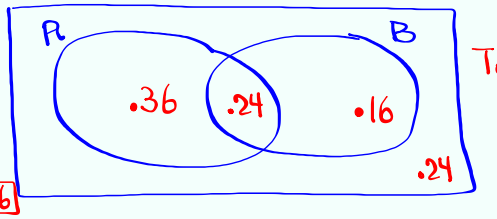
3) $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

$= .6 + .4 - .24 = \boxed{.76}$

4) Construct Venn Diagram

$P(A \text{ only}) = .6 - .24 = \boxed{.36}$

$P(B \text{ only}) = .4 - .24 = \boxed{.16}$



Apr 1-1:55 PM

A box has 4 Red & 6 Blue Balls.

Take 2 balls with replacement

$P(\text{Both red}) = \frac{4}{10} \cdot \frac{4}{10} = \boxed{.16}$

$P(\text{Both Blue}) = \frac{6}{10} \cdot \frac{6}{10} = \boxed{.36}$

$P(\text{Both are Same Color}) = P(RR \text{ or } BB)$

$= .16 + .36 = \boxed{.52}$

$P(\overline{\text{Same Color}}) = 1 - P(\text{Same Color}) = 1 - .52 = \boxed{.48}$

Sample Space: Complete list of all possible outcomes

- at least 1 R: RR, RB, BR
- BB

Total Prob.

$P(\text{at least 1 red}) = 1 - P(\text{No red}) = 1 - P(BB) = 1 - .36 = \boxed{.64}$

Apr 1-2:01 PM

2 females & 8 males

Select 2 people, No replacement

$P(\text{2 females}) = \frac{2}{10} \cdot \frac{1}{9} = \boxed{\frac{1}{45}}$

$P(\text{2 males}) = \frac{8}{10} \cdot \frac{7}{9} = \boxed{\frac{28}{45}}$

$P(\text{Same gender}) = P(\text{FF or MM}) = \frac{1}{45} + \frac{28}{45} = \boxed{\frac{29}{45}}$

$P(\overline{\text{Same gender}}) = 1 - P(\text{Same gender}) = 1 - \frac{29}{45} = \boxed{\frac{16}{45}}$

$P(\text{at least 1 male}) = 1 - P(\text{No male})$

$= 1 - P(FF)$

$= 1 - \frac{1}{45} = \boxed{\frac{44}{45}}$

Sample Space

FF

FM

MF

MM

at least 1 male

Total Prob.

Apr 1-2:09 PM

A standard deck of playing cards has 52 cards & 4 Aces.

Draw 2 Cards

No replacement

Focus of Ace and $\bar{A}$ce

Sample Space

Tree Diagram

First Draw

Second Draw

$\frac{4}{52}$ A, $\frac{48}{52}$ $\bar{A}$

$\frac{3}{51}$ A, $\frac{48}{51}$ $\bar{A}$, $\frac{4}{51}$ A, $\frac{47}{51}$ $\bar{A}$

AA, A$\bar{A}$, $\bar{A}$A, $\bar{A}\bar{A}$

$P(\text{2 Aces}) = P(AA) = \frac{4}{52} \cdot \frac{3}{51} = \boxed{\frac{1}{221}}$ ✓

$P(\text{1 Ace}) = P(A\bar{A} \text{ or } \bar{A}A) = 2 \cdot \frac{4}{52} \cdot \frac{48}{51} = \boxed{\frac{32}{221}}$ ✓

$P(\text{No Aces}) = P(\bar{A}\bar{A}) = \frac{48}{52} \cdot \frac{47}{51} = \boxed{\frac{188}{221}}$ ✓

$P(\text{at least 1 ace}) = 1 - P(\text{No Aces})$

$= 1 - \frac{188}{221} = \boxed{\frac{33}{221}}$

Apr 1-2:19 PM

# Aces	P(# Aces)
2	$\frac{1}{221}$
1	$\frac{32}{221}$
0	$\frac{188}{221}$

Clear all lists

Aces → L1

P(# Aces) → L2

STAT → CALC

1: 1-Var Stats

List: L1

FreqList: L2

Calculate

$\bar{x} = .154$

S_x = Blank

$n = 1$ ← Total prob.

Apr 1-2:31 PM

A box has 12 red, 18 white, and 20 Blue balls.

1) P(selecting 1 Red Ball) $= \frac{12}{50} = .24$

2) odds in favor of selecting 1 red ball.

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

12 : 38 → 6 : 19

Divide by 2

3) odd against selecting a red ball.

19 : 6

Apr 1-2:37 PM

Suppose odds in favor of event E are 4 : 21.

1) odds against E $\boxed{21:4}$

2) $P(E) = \frac{4}{4+21} = \boxed{\frac{4}{25}}$

3) $P(\bar{E}) = \frac{21}{4+21} = \boxed{\frac{21}{25}}$

Apr 1-2:42 PM

Suppose $P(E) = .2$

1) $P(\bar{E}) = 1 - P(E) = \boxed{.8}$

2) odds in favor of event E.

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

$.2 : .8$ → $\boxed{1:4}$

3) odds against event E. $\boxed{4:1}$

SG 12 ✓

Apr 1-2:45 PM

Multiplication Rule

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

A happens then B happens

Given

If we isolate $P(B|A)$,

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

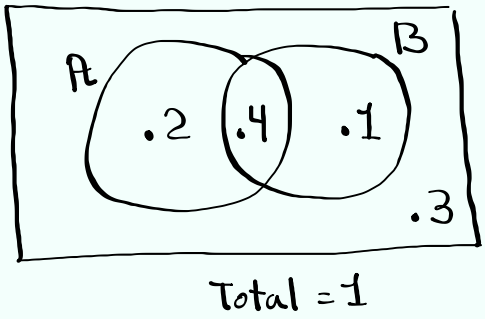
Conditional Prob.

Apr 1-3:03 PM

$P(A) = .6$

$P(B) = .5$

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



Total = 1

$$P(B|A) = \frac{P(A \text{ and } B)}{P(A)} = \frac{.4}{.6} = \frac{2}{3} \approx .667$$

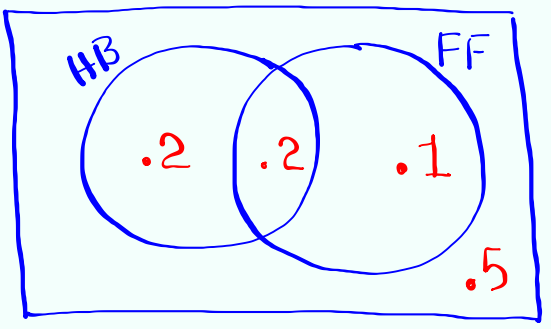
$$P(A|B) = \frac{P(A \text{ and } B)}{P(B)} = \frac{.4}{.5} = \frac{4}{5} = .8$$

Apr 1-3:07 PM

$P(HB) = .4$

$P(FF) = .3$

$P(HB \text{ and } FF) = .2$



Total = 1

$$P(FF \mid HB) = \frac{P(HB \text{ and } FF)}{P(HB)} = \frac{.2}{.4} = \frac{1}{2} = .5$$

$$P(HB \mid FF) = \frac{P(HB \text{ and } FF)}{P(FF)} = \frac{.2}{.3} = .667$$

Apr 1-3:11 PM

$P(A) = .6$

$P(B) = .5$ ✓

$P(A \mid B) = .8$

1) $P(\overline{A}) = 1 - P(A) = .4$

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

? Are they independent? NO

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

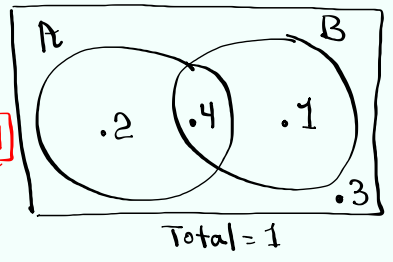
$$.8 = \frac{P(A \text{ and } B)}{.5}$$

Cross-Multiply

$P(A \text{ and } B) = (.8)(.5) = .4$

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

$$= \frac{.4}{.6} = \frac{2}{3} = .667$$ ✓



Apr 1-3:18 PM

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

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

$P(\text{Math} \mid \text{English}) = .8$

$P(\text{Math and English})$

$.5 - .48 = .02$

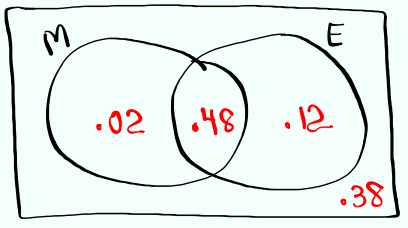
$.6 - .48 = .12$

$$P(M \mid E) = \frac{P(M \text{ and } E)}{P(E)}$$

$$.8 = \frac{P(M \text{ and } E)}{.6}$$

Cross-Multiply $P(M \text{ and } E) = .48$

$$P(\text{English} \mid \text{Math}) = \frac{P(M \text{ and } E)}{P(M)} = \frac{.48}{.5} = .96$$



Total = 1

Apr 1-3:28 PM

6 Females and 4 males were hired.

Company needs 5 morning shift,
3 afternoon shift, and
2 grave yard shift.

$P(\text{at least 1 Female in afternoon shift})$

$= 1 - P(\text{No Females})$

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

$$= 1 - \frac{4}{10} \cdot \frac{3}{9} \cdot \frac{2}{8} = \frac{29}{30}$$

$P(\text{at least 1 male in the afternoon shift})$

$= 1 - P(\text{No males})$

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

$$= 1 - \frac{6}{10} \cdot \frac{5}{9} \cdot \frac{4}{8} = \frac{5}{6}$$

Apr 1-3:35 PM

P(at least 1 male in graveyard shift)

$= 1 - P(\text{No males})$

$= 1 - P(\text{all Females})$

$= 1 - \frac{6}{10} \cdot \frac{5}{9} = \boxed{\frac{2}{3}}$

P(at least 1 female in graveyard shift)

$= 1 - P(\text{No Females})$

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

$= 1 - \frac{4}{10} \cdot \frac{3}{9} = \boxed{\frac{13}{15}}$

SG 13

Apr 1-3:43 PM

Next week

1) is spring break → No classes

2) I will hold my office hours.

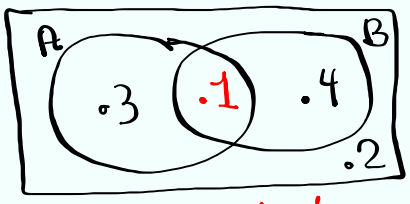
3) Exam 1 is April 10 - 11.
Starts Friday at 12:00 noon
Stops Saturday at 6:00 PM.
You have one attempt with Limited time (2 hrs)
Submit like study guides
1 file, Pages in order, Portrait style.

Look for Quiz tab, then exam 1
Follow instructions.

Apr 1-3:52 PM

Class QZ 7

1) Complete the Venn Diagram below



Total = 1

1) $P(A) = .4$

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

3) $P(A|B) = \frac{P(A \text{ and } B)}{P(B)} = \frac{.1}{.5} = \frac{1}{5} = .2$

Apr 1-3:58 PM