Statistics

Lecture 8

Feb 19-8:47 AM

Given $P(A) = .55$, $P(B) = .45$, $P(A \text{ and } B) = .3$

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

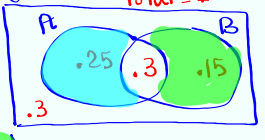
2) $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$
$= .55 + .45 - .3 = \boxed{.7}$

3) Construct Venn Diagram.

Total = 1

$.55 - .3 = \boxed{.25}$

$.45 - .3 = \boxed{.15}$



4) $P(A \text{ only} \text{ or } B \text{ only})$

$P(A \text{ only}) + P(B \text{ only}) = .25 + .15 = \boxed{.4}$

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

De Morgan's Law

$= 1 - .7 = \boxed{.3}$

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

$= 1 - P(A \text{ and } B) = 1 - .3$

$= \boxed{.7}$

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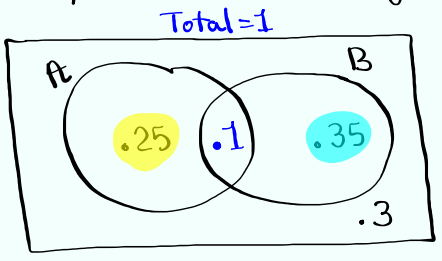
Complete the Venn Diagram below: 1 − .9 = .1



1) P(A) = .35

2) P(A only) = .25

3) P(A and B) = .1

4) P(A or B) = P(A) + P(B) − P(A and B)
= .35 + .45 − .1 = .7

5) P(A only or B only) = .25 + .35 = .6

6) P($\bar{A}$ and $\bar{B}$) = P($\overline{A \text{ or } B}$) = 1 − P(A or B)
De Morgan's Law
= 1 − .7 = .3

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

Mar 9-7:03 PM

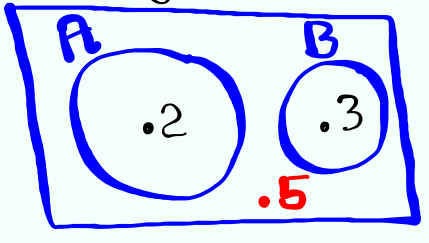
P(A) = .2 , P(B) = .3 , A & B are M.E.

M.E. = disjointed events = No overlap

1) P($\bar{B}$) = 1 − P(B) = .7

2) P(A or B) = P(A) + P(B) − P(A and B) P(A and B) = 0
= .2 + .3 − 0 = .5

3) Construct Venn Diagram.



Total = 1

Mar 9-7:16 PM

Consider a deck of cards with 40 cards, 10 face cards and 3 aces.

If we select one card,

1) $P(\text{face card}) = \frac{10}{40} = \boxed{\frac{1}{4}}$

2) $P(\text{Ace}) = \boxed{\frac{3}{40}}$

Find odds in favor of drawing

3) a face card

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

10 : 30

$\boxed{1:3}$

against 3:1

4) an ace

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

$\boxed{3:37}$

odds against

$\boxed{37:3}$

Mar 9-7:22 PM

Suppose odds in favor of event E are 1 : 49.

1) odds against event E.

$\boxed{49:1}$

2) $P(E) = \frac{1}{1+49} = \boxed{\frac{1}{50}}$

3) $P(\bar{E}) = \frac{49}{1+49} = \boxed{\frac{49}{50}}$

Mar 9-7:29 PM

Suppose $P(A) = .025$

1) $P(\overline{A}) = 1 - P(A) = .975$

2) odds in favor of event A.

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

$.025 : .975 \rightarrow 1:39$

.025 ÷ .975 Math 1:▶Frac Enter $\frac{1}{39}$

3) odds against event A.

39 : 1

Mar 9-7:32 PM

Multiplication Rule:

Keyword AND

↑

Doest not mean overlap

Multiple Action event

Draw 2 Cards

A → Ace

$\overline{A}$ → $\overline{Ace}$

A A $\overline{A}$ A

A $\overline{A}$ $\overline{A}$ $\overline{A}$

New Born babies

B → Boy

G → Girl

3 New born babies

B B B

B B G

B G B

B G G

G B B

G B G

G G B

G G G

A piggy bank has Some Nickels and Some Dimes

Take 2 Coins

N N D N

N D D D

Mar 9-7:37 PM

Case I: A & B are independent events

outcome of one event does not change the outcome of next event.

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

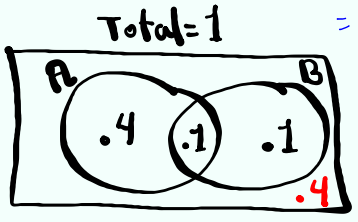
$P(A) = .5$, $P(B) = .2$

A & B are independent events

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

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

$= (.5)(.2) = .1$



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

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

→ Select 2 newborns

$P(\text{Both boys}) = P(B \text{ and } B)$

$= (.5)(.5) = .25$

$P(1 \text{ boy \& } 1 \text{ girl}) = P(BG \text{ or } GB)$

$= (.5)(.5) + (.5)(.5) = .25 + .25$

$= .5$

Mar 9-7:49 PM

toss a loaded coin 3 times

Suppose P(Land tails) = .4

T T T
T T H
T H T
⋮
H H H

P(All tails) = (.4)(.4)(.4)
= .064

P(All Heads) = (.6)(.6)(.6)
= .216

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Consider two separate standard deck of playing cards.

Draw one card from both.

Rare event
P(Two Aces) = $\frac{4}{52} \cdot \frac{4}{52} = \frac{1}{169} \approx .006$

4 ÷ 52 × 4 ÷ 52 Math 1: ▶Frac Enter

P(face from deck 1 and face from 2nd deck)

P(both face cards) = $\frac{12}{52} \cdot \frac{12}{52} = \frac{9}{169}$

Mar 9-7:57 PM

A piggy bank has 3 dimes and 5 quarters.

Take 2 coins. with replacement

DD
DQ
QD
QQ

} Sample Space: A complete list of all possible outcomes.

$P(\text{Two Dimes}) = \frac{3}{8} \cdot \frac{3}{8} = \boxed{\frac{9}{64}}$

$P(1D \& 1Q) = P(DQ \text{ or } QD) = 2 \cdot \frac{3}{8} \cdot \frac{5}{8} = \boxed{\frac{30}{64}}$

$P(\text{Two Quarters}) = \frac{5}{8} \cdot \frac{5}{8} = \boxed{\frac{25}{64}}$

Total	P(Total)
20¢	9/64
35¢	30/64
50¢	25/64

Clear all lists
Total → L1
P(Total) → L2
STAT ▸ CALC
1: 1-Var Stats

$\bar{x} = 38.75$
$S = S_x$ blank
$n = 7$ ← Total Prob.

List: L1
Freqlist: L2
Calculate

No Menu
L1, L2
Enter

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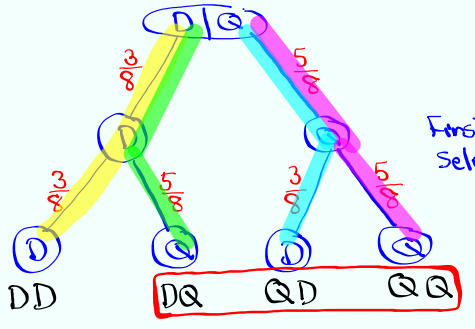
Redo last example using Tree Diagram



$P(DD) = \frac{3}{8} \cdot \frac{3}{8} = \frac{9}{64}$

$P(\text{at least 1 Q}) = 1 - P(\text{NO Q})$

$= 1 - P(DD)$

$= 1 - \frac{9}{64} = \boxed{\frac{55}{64}}$

1 − 9 ÷ 64 Math 1: ▸Frac Enter

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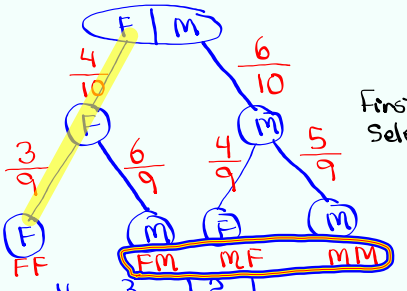
4 Females, 6 Males, Select 2 different people
No replacement

P(Both Females):



$P(2 \text{ females}) = \frac{4}{10} \cdot \frac{3}{9} = \frac{2}{15}$

$P(\text{at least 1 male}) = 1 - P(FF)$

Exam 1: SG 1-11

$= 1 - \frac{2}{15}$

SG 12 ✓

$= \frac{13}{15}$

Mar 9-8:28 PM

Class Qz 4

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

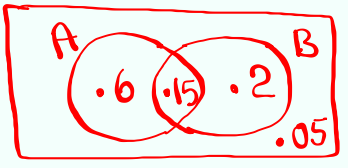
1) $P(\bar{A}) = 1 - .75 = .25$

3) Construct the Venn Diagram.

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

$= .75 + .35 - .15$

$= .95$



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