Statistics

Lecture 11

Feb 19-8:47 AM

Given $P(A) = .125$

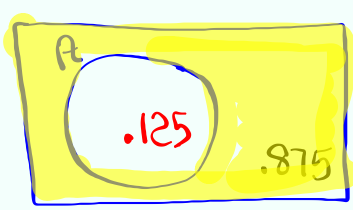
1) write $P(A)$ in reduced fraction $\boxed{\frac{1}{8}}$

$.125$ $\boxed{\text{MATH}}$ $\boxed{1: \blacktriangleright \text{Frac}}$ $\boxed{\text{Enter}}$

2) write $P(A)$ in % notation.

$.125(100\%) = \boxed{12.5\%}$

3) Construct Venn diagram



Total = 1

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

$= 1 - .125 = \boxed{.875}$

Oct 2-12:13 PM

Suppose

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

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

2) $P(\overline{B}) = 1 - P(B) = \boxed{.5}$

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

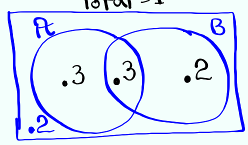
4) $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

$= .6 + .5 - .3 = \boxed{.8}$

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

6) Construct Venn Diagram

Total = 1



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

De Morgan's law $= \boxed{.2}$

8) $P(\overline{A} \text{ or } \overline{B}) = P(\overline{A \text{ and } B}) = \boxed{.7}$

Oct 2-12:20 PM

$P(A) = .15$

$P(B) = .6$

A & B are M.E.E.

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

2) $P(\overline{B}) = 1 - .6 = \boxed{.4}$

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

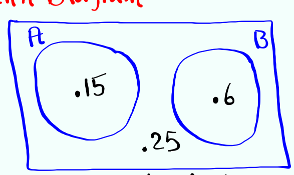
4) $P(\overline{A \text{ and } B}) = 1 - P(A \text{ and } B) = 1 - 0 = \boxed{1}$

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

$= .15 + .6 - 0 = \boxed{.75}$

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

7) Construct Venn Diagram



✓Total 1

Oct 2-12:31 PM

odds in favor of event E are 3:22.

1) odds against Event E

22 : 3

2) $P(E) = \frac{3}{3+22} = \boxed{\frac{3}{25}}$

3) $P(\bar{E}) = \frac{22}{3+22} = \boxed{\frac{22}{25}}$

Oct 2-12:40 PM

Suppose $P(E) = .24$

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

.24 : .76

$\boxed{6:19}$

1) $P(\bar{E}) = 1 - .24 = \boxed{.76}$

2) odds in favor of event E.

.24 $\boxed{\div}$ .76 $\boxed{\text{Math}}$ $\boxed{\text{1:}\blacktriangleright\text{Frac}}$ $\boxed{\text{Enter}}$

3) odds against event E.

$\boxed{19:6}$

Oct 2-12:43 PM

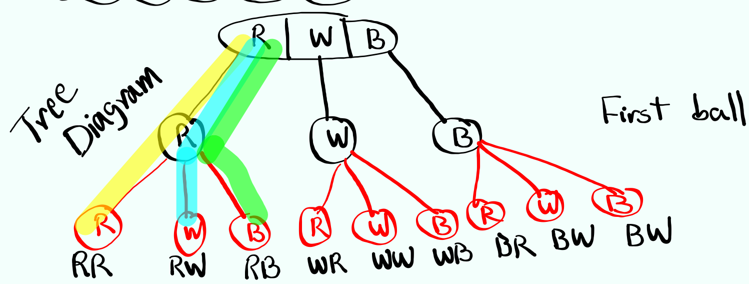
A box has 3 red, 7 white, and 10 blue balls.

Take 2 balls.

Sample Space

RR	RW	RB
WR	WW	WB
BR	BW	BB

Sample Space



Oct 2-12:48 PM

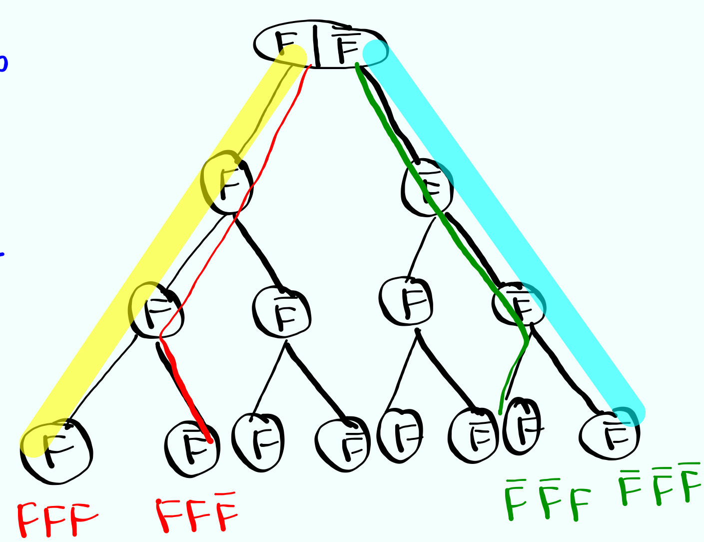
A full deck of Cards has 52 Cards, 12 face Cards.

Draw Tree Diagram

Draw 3 Cards

F → Face

$\bar{F}$ → Not face



Oct 2-12:53 PM

Multiplication Rule

Keyword AND

Multiple Action event

1) Independent Events → One outcome does not change the Prob. of next outcome.

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

A happens
then
B happens

Oct 2-12:59 PM

A fair coin is tossed twice.

$P(T) = .5$

$P(H) = .5$

$\underbrace{TT \quad TH \quad HT \quad HH}_{\text{Sample Space}}$

$P(\text{two tails}) = P(T) \cdot P(T)$

$= \frac{1}{2} \cdot \frac{1}{2} = \boxed{\frac{1}{4}}$

A full deck of playing cards has 52 cards and 4 aces.

Draw 2 cards with replacement.

$A\,A \quad A\,\bar{A} \quad \bar{A}\,A \quad \bar{A}\,\bar{A}$

$P(\text{Two Aces}) = P(A) \cdot P(A) = \frac{4}{52} \cdot \frac{4}{52} = \frac{1}{13} \cdot \frac{1}{13} = \boxed{\frac{1}{169}}$

$P(\text{No Aces}) = P(\bar{A}) \cdot P(\bar{A}) = \frac{48}{52} \cdot \frac{48}{52} = \frac{12}{13} \cdot \frac{12}{13} = \boxed{\frac{144}{169}}$

Oct 2-1:02 PM

A box has 3 red, 7 white, and 10 blue balls.

Take 2 balls with replacement.

Sample Space

RR	RW	RB
WR	WW	WB
BR	BW	BB

Sample Space

$P(\text{Both red}) = P(R) \cdot P(R) = \frac{3}{20} \cdot \frac{3}{20} = \frac{9}{400}$

$P(\text{Both white}) = P(W) \cdot P(W) = \frac{7}{20} \cdot \frac{7}{20} = \frac{49}{400}$

$P(\text{Both Blue}) = P(B) \cdot P(B) = \frac{10}{20} \cdot \frac{10}{20} = \frac{100}{400}$

$P(\text{Same Color}) = P(RR) + P(WW) + P(BB) =$

$\frac{9}{400} + \frac{49}{400} + \frac{100}{400} = \frac{158}{400}$

$= \boxed{\frac{79}{200}}$

Oct 2-12:48 PM

Multiplication Rule with Tree diagram

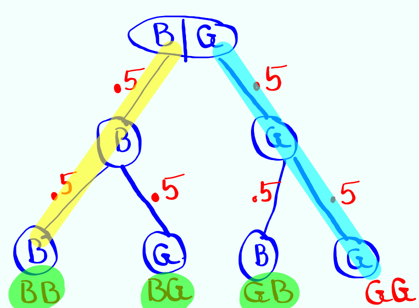
A Family with 2 kids

B → Boy

G → Girl

$P(B) = .5$

$P(G) = .5$



$P(\text{both are boys}) = (.5)(.5) = \boxed{.25}$

$P(\text{at least one boy}) = 1 - P(GG)$

Total Prob.

$= 1 - (.5)(.5)$

$= \boxed{.75}$

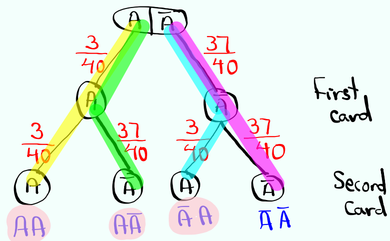
Oct 2-1:42 PM

A deck of Cards has 40 Cards, and 3 Aces.

Draw 2 Cards with replacement.

A → Ace

$\bar{A}$ → Not Ace



$P(AA) = \frac{3}{40} \cdot \frac{3}{40} = \frac{\boxed{9}}{1600}$

$P(A\bar{A}) = \frac{3}{40} \cdot \frac{37}{40} = \frac{\boxed{111}}{1600}$

$P(\bar{A}A) = \frac{37}{40} \cdot \frac{3}{40} = \frac{\boxed{111}}{1600}$

$P(\bar{A}\bar{A}) = \frac{37}{40} \cdot \frac{37}{40} = \frac{\boxed{1369}}{1600}$

Total is $\frac{\boxed{1600}}{1600} = 1$

P(at least one Ace) = 1 − P(No aces)

$= 1 - \frac{1369}{1600} = \boxed{\frac{231}{1600}}$

Oct 2-1:49 PM

4 Women, 6 Men, Select 2 people (No replacement)

W → Women

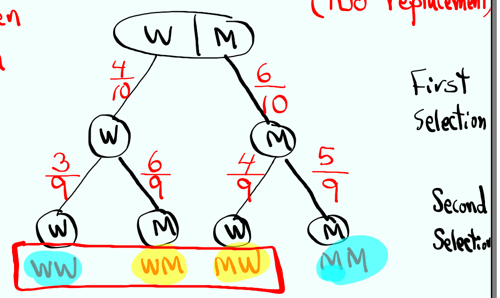
M → Men

WW

WM

MW

MM



$P(\text{2 women}) = \frac{4}{10} \cdot \frac{3}{9} = \frac{\boxed{12}}{90}$

$P(\text{exactly 1 woman}) = 2 \cdot \frac{4}{10} \cdot \frac{6}{9} = \frac{\boxed{48}}{90}$

$P(\text{No Women}) = \frac{6}{10} \cdot \frac{5}{9} = \frac{\boxed{30}}{90}$

P(at least 1 W) = 1 − P(No W)

$= 1 - \frac{30}{90} = \frac{60}{90} = \boxed{\frac{2}{3}}$

Oct 2-2:00 PM

A box has 4 dimes, 6 nickels.

Take 2 coins with replacement

Sample Space → DD → 20¢

DN
ND → 15¢

NN → 10¢

$P(10¢) = P(NN) = \frac{6}{10} \cdot \frac{6}{10} = \boxed{.36}$

$P(15¢) = P(ND \text{ or } DN) = 2 \cdot \frac{6}{10} \cdot \frac{4}{10} = \boxed{.48}$

$P(20¢) = P(DD) = \frac{4}{10} \cdot \frac{4}{10} = \boxed{.16}$

L1	L2
10	.36
15	.48
20	.16

$\bar{x} = 14$

S_x = blank

$n = 1$ ← Total Prob.

STAT Calc 1 – Var Stats L1 & L2

Oct 2-2:12 PM

Multiplication Rule

1) Independent events

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

2) Dependent events

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

Such that

Oct 2-2:22 PM

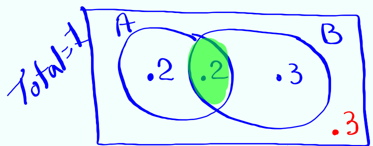
$P(A) = .4$

$P(B) = .5$

A & B are $\boxed{\text{independent events}}$

$P(A \text{ and } B) = P(A) \cdot P(B)$
$= (.4)(.5) = \boxed{.2}$

$.4 - .2 = .2$
$.5 - .2 = .3$



$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$
$= .4 + .5 - .2 = \boxed{.7}$

De Morgan's Law

$P(\bar{A} \text{ and } \bar{B}) = P(\overline{A \text{ or } B}) = .3$

$P(\bar{A} \text{ or } \bar{B}) = P(\overline{A \text{ and } B}) = .8$

Oct 2-2:25 PM

Roll a $\boxed{\text{fair die}}$ twice

(1,1) (1,2) - - - -(1,6)
(2,1) (2,2) - - - -(2,6)

(6,1) (6,2) - - -(6,6)

S&12

36 outcomes

$P(\text{Total} = 12) = P(6 \,\&\, 6) = \frac{1}{6} \cdot \frac{1}{6} = \boxed{\frac{1}{36}}$

$P(\text{Total} \le 3) = \frac{3}{36} = \frac{1}{12}$ $\quad \frac{3}{36} = \frac{1}{12}$

$P(\text{total} \le 3) = P((1,1) \,\&\, (1,2) \,\&\, (2,1)) = 3\left(\frac{1}{6} \cdot \frac{1}{6}\right)$

Oct 2-2:33 PM