Statistics

Lecture 6

Feb 19-8:47 AM

Given $P(A) = .125$

1) Give $P(A)$ in percent notation.

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

2) Give $P(A)$ in reduced fraction.

$.125$ $\boxed{\text{Math}}$ $\boxed{1: \blacktriangleright \text{Frac}}$ $\boxed{\frac{1}{8}}$

3) Find $P(\bar{A}) = 1 - P(A) = 1 - .125 = \boxed{.875}$

Complement Rule

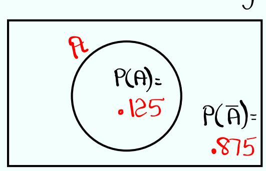
4) Find the ratio of $P(A)$ to $P(\bar{A})$ in reduced form.

Ratio of a to b $\rightarrow \frac{a}{b}$

$\frac{P(A)}{P(\bar{A})} = \frac{.125}{.875} = \boxed{\frac{1}{7}}$

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

5) Construct Venn Diagram.



Total $= 1$ ✓

Oct 3-11:39 AM

Given $P(A) = .8$ $P(B) = .5$ $P(A \text{ and } B) = .35$

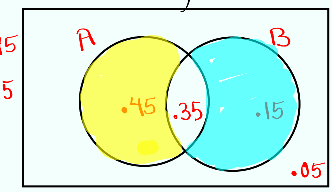
1) $P(\bar{A}) = 1 - P(A) = 1 - .8 = \boxed{.2}$

2) $P(\overline{A \text{ and } B}) = 1 - P(A \text{ and } B) = 1 - .35 = \boxed{.65}$

3) Construct Venn Diagram.

$.8 - .35 = .45$

$.5 - .35 = .15$



Total = 1 ✓

$P(A \text{ only}) = P(A) - P(A \text{ and } B) = \boxed{.45}$ $P(B \text{ only}) = \boxed{.15}$

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

addition Rule

$= .45 + .15 - 0$

$= \boxed{.6}$

A only & B only are Mutually Exclusive events.

Oct 3-11:47 AM

Given $P(A) = .65$, $P(B) = .25$

A & B are disjointed events.

1) $P(\bar{A}) = 1 - P(A) = \boxed{.35}$ 2) $P(\bar{B}) = 1 - .25 = \boxed{.75}$

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

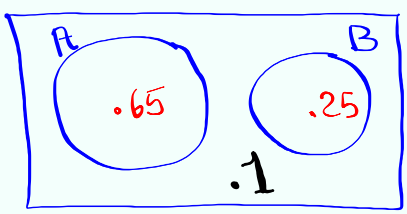
4) $P(A \text{ or } B)$

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

$= .65 + .25 - 0$

$= \boxed{.9}$

5) Construct Venn Diagram



Total = 1

Oct 3-11:57 AM

Given $P(A) = .32$ $P(B) = .48$

$P(A \text{ and } B) = .15$

1) $P(\bar{A}) = 1 - .32 = \boxed{.68}$

2) $P(A \text{ or } B)$

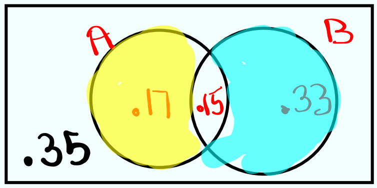
$= P(A) + P(B) - P(A \text{ and } B)$

$= .32 + .48 - .15$

$= \boxed{.65}$

3) Construct Venn Diagram

✓ Total=1



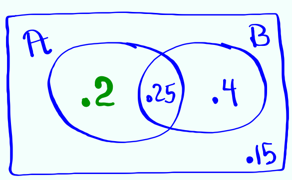
4) $P(A \text{ only}) = \boxed{.17}$

5) $P(B \text{ only}) = \boxed{.33}$

6) $P(A \text{ only or } B \text{ only}) = .17 + .33 = \boxed{.5}$

Oct 3-12:03 PM

Complete the Venn Diagram below



Total=1

1) $P(A \text{ only}) = \boxed{.2}$

2) $P(A) = \boxed{.45}$

3) $P(B \text{ only}) = \boxed{.4}$

4) $P(B) = \boxed{.65}$

5) $P(A \text{ or } B) = .2 + .25 + .4 = \boxed{.85}$

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

$= .45 + .65 - .25 = \boxed{.85}$

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

De Morgan's Law

$= 1 - .25 = \boxed{.75}$

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

$= 1 - .85$

$= \boxed{.15}$

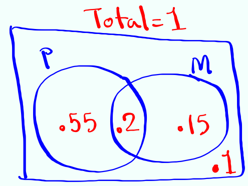
Oct 3-12:11 PM

$P(\text{iPhone}) = .75$

$P(\text{Macbook}) = .35$

$P(\text{iPhone and MacBook}) = .2$

1) Construct Venn Diagram



2) $P(\text{iPhone or MacBook}) = .55 + .2 + .15 = \boxed{.9}$

$= .75 + .35 - .2 = \boxed{.9}$

3) $P(\overline{\text{iphone}} \text{ and } \overline{\text{MacBook}}) = P(\overline{\text{Phone or Mac}})$

De Morgan's Law $= 1 - .9 = \boxed{.1}$

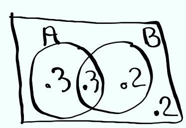
4) $P(\overline{\text{iphone}} \text{ or } \overline{\text{Macbook}})$

$= P(\overline{\text{phone and Mac}}) = 1 - .2 = \boxed{.8}$

Oct 3-12:21 PM

Given $P(A) = .6$ $P(B) = .5$

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



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

$= .6 + .5 - .3 = \boxed{.8}$ ✓

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

De Morgan's Law

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

4) Find the ratio of $P(A)$ to $P(\overline{A})$ in reduced fraction. $\frac{P(A)}{P(\overline{A})} = \frac{.6}{.4} = \frac{3}{2}$

SG 11 ✓

Oct 3-12:30 PM

Intro. to odds

SG 12

Odds in favor of event E are

$$a : b$$

# of times E happens

# of times $\bar{E}$ happens

in $a+b$ total attempts.

I flip a coint 80 times, it landed tails 50 times.

$P(\text{tails}) = \frac{50}{80} = \frac{5}{8}$

odds in favor of landing tails

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

$50 : 30 \rightarrow \boxed{5:3}$

50 $\boxed{\div}$ 30 $\boxed{\text{Math}}$ $\boxed{1{:}\triangleright\text{Frac}}$ $\boxed{\text{enter}}$ $\frac{5}{3}$

Oct 3-12:51 PM

A deck of cards has 40 cards, 25 red, 10 face, and 2 aces.

$P(\text{draw a red card}) = \frac{25}{40} = \boxed{\frac{5}{8}} = \boxed{.625}$

odds in favor of drawing a red card.

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

$25 : 15$ → $5:3$

Divide by 5

$P(\text{draw Ace}) = \frac{2}{40} = \boxed{\frac{1}{20}}$

odds in favor of drawing an ace.

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

$2 : 38 \rightarrow \boxed{1:19}$

2 $\boxed{\div}$ 38 $\boxed{\text{Math}}$ $\boxed{1{:}\triangleright\text{Frac}}$ $\boxed{\text{Enter}}$

$\frac{1}{19}$

Oct 3-12:57 PM

odds in favor of event E are

$a : b$

odds against event E are

$b : a$

30 students 25 passed.

$P(\text{student passed}) = \frac{25}{30} = \boxed{\frac{5}{6}}$

odds in favor of passing class.

$\#\text{ Passed} : \#\ \overline{\text{Passed}}$ $25 : 5$ $\boxed{5 : 1}$

odds against passing class.

$1 : 5$

Oct 3-1:03 PM

How to find $P(E)$ & $P(\bar{E})$ when odds are given.

odds in favor of event E are

$a : b$

$P(E) = \frac{a}{a+b}$, $P(\bar{E}) = \frac{b}{a+b}$

Suppose odds in favor of LA Dodgers win the world Series is $3 : 7$.

$P(\text{win}) = \frac{3}{3+7} = \frac{3}{10} = .3$

$P(\overline{\text{win}}) = \frac{7}{3+7} = \frac{7}{10} = .7$

odds in favor of winning the lotto is

$1 : 999$ (we wish)

$P(w) = \frac{1}{1+999} = \frac{1}{1000} = .001$

$P(\bar{w}) = \frac{999}{1+999} = \frac{999}{1000} = .999$

Oct 3-1:08 PM

How to find odds when P(E) is given.

odds in favor of event E are

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

Always reduce to whole #

Prob. that your LA Lakers win the championship this year is .125.

$P(W) = .125$ $\quad P(\bar{W}) = .875$

odds in favor of Lakers to win it all this year

$P(W) : P(\bar{W}) \rightarrow 1:7$

$.125 : .875$

.125 [:] .875 [Math] [1:▶Frac] [Enter] $\frac{1}{7}$

$1 bet
They win
$7 net return

odds against
7:1
$7 bet
They do not win
$1 net return

+130
Bet $100
Net return $130

−180 Bet $180
Net Return $100

Oct 3-1:14 PM

Multiplication Rule

Key word AND

Multiple Action event

P(A and B)

A happens then B happens

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

what are independent events

one outcome does not change the Prob. of next outcome

Flip a fair Coin H or T

New born babies B or G

Multiple choice exams → Independent Questions

Oct 3-1:23 PM

Roll a fair die

$\{1, 2, 3, 4, 5, 6\}$

Roll it twice

$P(\underbrace{\text{Double } 5}_{\text{Rare event}}) = P(5, 5) = \frac{1}{6} \cdot \frac{1}{6} = \boxed{\frac{1}{36}}$

.028

A family with 3 kids

$P(\underbrace{\text{all Boys}}_{\text{not rare}}) = P(B\ B\ B)$

$= \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} = \boxed{\frac{1}{8}}$

.125

Oct 3-1:29 PM

A standard deck of playing cards

Draw 2 cards with replacement

$P(\text{Both aces}) = P(A\ A)$

$= \frac{4}{52} \cdot \frac{4}{52} = \boxed{\frac{1}{169}}$

4 [÷] 52 [×] 4 [÷] 52 [Math] [1:▶Frac] [Enter]

Draw 3 cards with replacement

$P(\text{All face cards}) = P(F\ F\ F)$

$= \frac{12}{52} \cdot \frac{12}{52} \cdot \frac{12}{52} = \boxed{\frac{27}{2197}}$

Rare event

$= .012$

Oct 3-1:33 PM

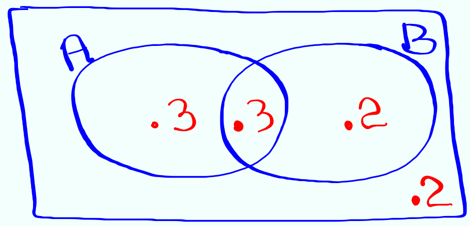
Given $P(A) = .6$, $P(B) = .5$

A and B are independent events

1) $P(\bar{A}) = 1 - .6 = \boxed{.4}$ 2) $P(\bar{B}) = 1 - .5 = \boxed{.5}$

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

A happens, then B happens



Total = 1

Oct 3-1:54 PM

$P(A) = .7$, $P(B) = .4$

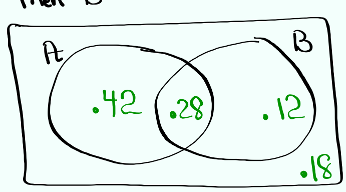
A & B are independent events

1) $P(\bar{A}) = \boxed{.3}$ 2) $P(\bar{B}) = \boxed{.6}$

3) $P(A \text{ and } B) = P(A) \cdot P(B) = (.7)(.4) = \boxed{.28}$

A then B

.7 - .28



.4 - .28

Total = 1 ✓

4) $P(A \text{ or } B) = .42 + .28 + .12 = \boxed{.82}$

$P(\bar{A} \text{ or } \bar{B}) = P(\overline{A \text{ and } B}) = 1 - .28 = \boxed{.72}$

$P(\bar{A} \text{ and } \bar{B}) = P(\overline{A \text{ or } B}) = 1 - .82 = \boxed{.18}$

Oct 3-1:58 PM

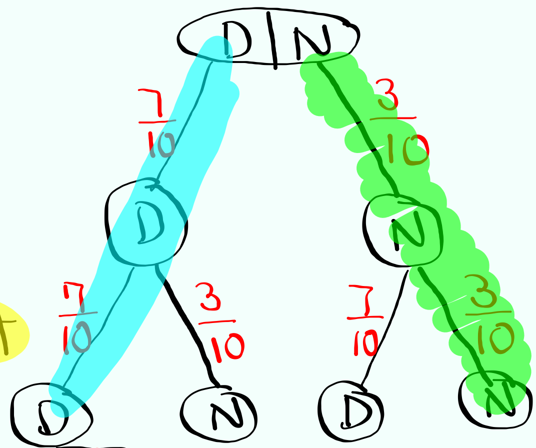
Tree diagram

A box has

7 dimes, 3 Nickels

Take 2 Coins

with replacement



$P(\text{2 dimes}) = \frac{7}{10} \cdot \frac{7}{10} = \boxed{\frac{49}{100}}$

$P(\text{1N 1D}) = \frac{7}{10} \cdot \frac{3}{10} + \frac{3}{10} \cdot \frac{7}{10} = \boxed{\frac{42}{100}}$

$P(\text{2 nickels}) = \frac{3}{10} \cdot \frac{3}{10} = \boxed{\frac{9}{100}}$

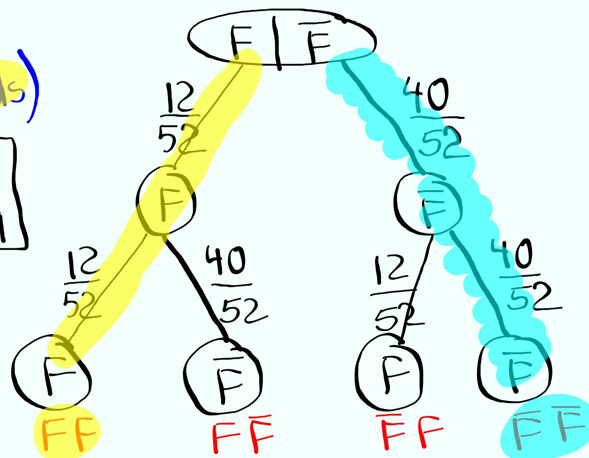
Oct 3-2:05 PM

A standard deck of playing Cards,

Draw 2 Cards with replacement

$P(\text{Both face Cards})$

$= \frac{12}{52} \cdot \frac{12}{52} = \boxed{\frac{9}{169}}$



$P(\text{No face Cards}) = \frac{40}{52} \cdot \frac{40}{52} = \boxed{\frac{100}{169}}$

Oct 3-2:12 PM

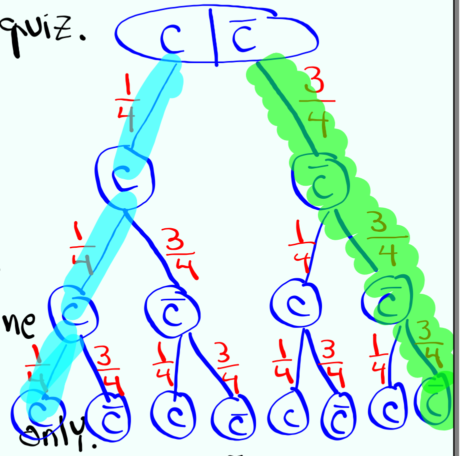
You are taking a quiz.

3 questions only.

Multiple choice

each question has 4 choices, only one Correct choice

Random guesses only.



$P(\text{all Correct Ans}) = \frac{1}{4} \cdot \frac{1}{4} \cdot \frac{1}{4} = \boxed{\frac{1}{64}}$

$P(\text{at least one correct ans})$ $\rightarrow \frac{37}{64}$

$= 1 - P(\text{All incorrect}) = 1 - \frac{3}{4} \cdot \frac{3}{4} \cdot \frac{3}{4}$

Oct 3-2:17 PM