Statistics

Lecture 11

Feb 19-8:47 AM

Intro to odds:

I flipped a coin 300 times and it landed tails 100 times.

$$P(\text{land tails}) = \frac{100}{300} = \boxed{\frac{1}{3}}$$

To find odds in favor of landing tails

Tails : # tails

100 : 200 → $\boxed{1:2}$

odds against landing tails $\boxed{2:1}$

Apr 6-9:58 AM

A Standard deck of playing Cards

52 Cards 4 Aces

$P(\text{Draw Ace}) = \frac{4}{52} = \frac{1}{13}$

odds in favor of drawing an Ace

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

4 : 48 → 1 : 12

4 ÷ 48 Math 1:▶Frac Enter $\frac{1}{12}$

odds against drawing an Ace → 12 : 1

Apr 6-10:03 AM

odds in favor of event E are

a : b

$\overline{E}$ # $\overline{E}$

Always reduce

Always use : notation

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

Apr 6-10:08 AM

Suppose odds in favor of event E are

$3 : 47$

1) $P(E) = \frac{3}{3+47} = \boxed{\frac{3}{50}}$

2) $P(\bar{E}) = \frac{47}{3+47} = \boxed{\frac{47}{50}}$

3) odds against E. $\boxed{47 : 3}$

Apr 6-10:10 AM

If $P(E)$ is given, odds in favor of event E are

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

Always reduce

Suppose $P(E) = .15$

1) $P(\bar{E}) = 1 - P(E) = 1 - .15 = \boxed{.85}$

2) odds in favor of event E.

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

$$.15 : .85 \rightarrow \boxed{3 : 17}$$

.15 [÷] .85 [Math] [1:▶Frac] [Enter] $\frac{3}{17}$

3) odds against E $\boxed{17 : 3}$

Apr 6-10:13 AM

Suppose $P(E) = .02$

1) $P(\overline{E}) = 1 - 0.02 = \boxed{.98}$

2) odds in favor of E.

$.02 : .98 \longrightarrow \boxed{1:49}$

3) odds against E. $\boxed{49:1}$

Apr 6-10:19 AM

Multiplication Rule:

Keyword AND

Multiple Action event

Case I: A & B are independent Events

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

Independent events: one outcome does not change the prob. of next outcome.

flip a fair coin twice.

$P(\text{Two tails}) = \frac{1}{2} \cdot \frac{1}{2} = \boxed{\frac{1}{4}}$

Apr 6-10:24 AM

A quiz has two questions.
Each question has 4 choices, only one correct choice.
You are making random guesses.

P(guess both correctly) $= \frac{1}{4} \cdot \frac{1}{4} = \boxed{\frac{1}{16}}$

P(guess both incorrectly) $= \frac{3}{4} \cdot \frac{3}{4} = \frac{9}{16}$

Suppose this quiz has 3 questions

P(guess correctly on all 3 questions)
$= \frac{1}{4} \cdot \frac{1}{4} \cdot \frac{1}{4} = \frac{1}{64}$

P(guess incorrectly on all 3 questions)
$= \frac{3}{4} \cdot \frac{3}{4} \cdot \frac{3}{4} = \frac{27}{64}$

Apr 6-10:30 AM

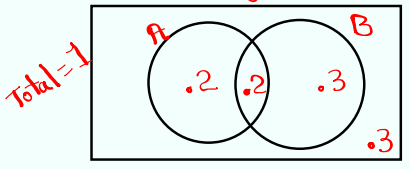
Given $P(A) = .4$ $P(B) = .5$
A & B are independent events.

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

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

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

4) Construct Venn Diagram.



5) $P(\overline{A} \text{ and } \overline{B}) = P(\overline{A \text{ or } B}) = 1 - .7 = \boxed{.3}$
De Morgan's Law

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

Apr 6-10:39 AM

$P(A) = .3$ $P(B) = .6$ A & B are independent events

1) $P(\bar{A}) = 1 - .3 = \boxed{.7}$

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

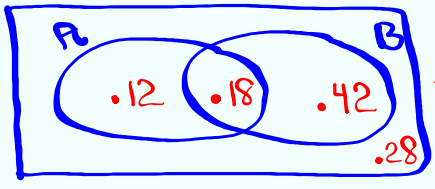
$= (.3) \cdot (.6) = \boxed{.18}$

3) $P(A \text{ or } B) = .3 + .6 - .18 = \boxed{.72}$

4) Construct Venn Diagram

$.3 - .18 = .12$

$.6 - .18 = .42$



Total = 1

Apr 6-10:51 AM

A full deck of playing cards

52 Cards 4 Aces

Draw 2 Cards with replacement

$P(\text{Both Aces}) = \frac{4}{52} \cdot \frac{4}{52} = \frac{1}{169}$

$P(\text{No Aces}) = \frac{48}{52} \cdot \frac{48}{52} = \frac{144}{169}$

Suppose we draw 3 cards,

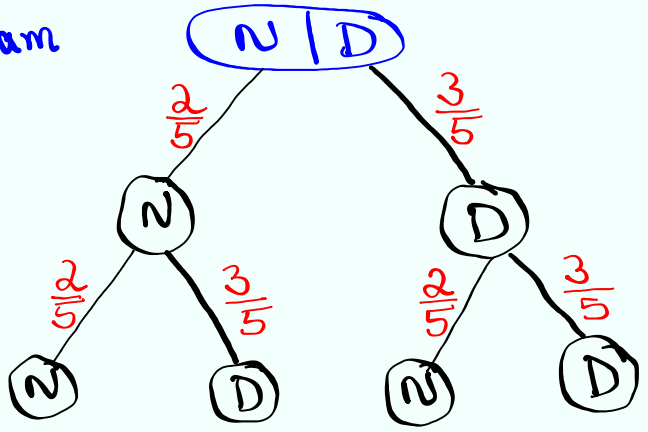
$P(\text{All aces}) = \frac{4}{52} \cdot \frac{4}{52} \cdot \frac{4}{52} = \boxed{\frac{1}{2197}}$

Apr 6-10:58 AM

A piggy bank has 2 Nickels & 3 Dimes.

Take 2 Coins with replacement.

Tree Diagram



Apr 6-11:05 AM