Statistics

Lecture 9

Feb 19-8:47 AM

There are 12 Females, and 18 males.

We randomly Select 1 person,

1) $P(\text{female}) = \frac{12}{30} = \frac{2}{5} = .4$

2) $P(\overline{\text{female}}) = 1 - P(\text{female})$

$= 1 - .4 = .6$

3) Simplify $\frac{P(\text{female})}{P(\overline{\text{female}})} = \frac{.4}{.6} = \frac{2}{3}$

.4 ÷ .6 Math 1:▶Frac Enter

Mar 30-1:48 PM

Suppose $P(A)=.55$, $P(B)=.65$, $P(A \text{ and } B)=.25$

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

2) $P(\bar{B}) = 1 - P(B) = 1 - .65 = .35$

3) $P(\overline{A \text{ and } B}) = 1 - P(A \text{ and } B) = 1 - .25 = .75$

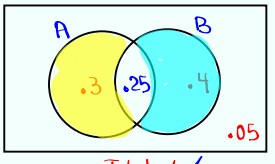
4) $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B) = .55 + .65 - .25 = .95$

5) $P(\overline{A \text{ or } B}) = 1 - P(A \text{ or } B) = 1 - .95 = .05$

6) Make Venn Diagram

$.55 - .25 = .3$

$.65 - .25 = .4$



Total = 1 ✓

7) $P(A \text{ only OR } B \text{ only}) = .3 + .4 = .7$

8) $P(\bar{A} \text{ and } \bar{B}) = P(\overline{A \text{ or } B}) = .05$ See above

De Morgan's Law

9) $P(\bar{A} \text{ or } \bar{B}) = P(\overline{A \text{ and } B}) = .75$ See above

Mar 30-1:52 PM

$P(A) = .4$ $P(B) = .3$

A and B are Mutually Exclusive Events.

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

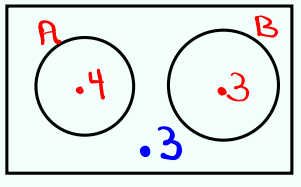
2) $P(\bar{B}) = 1 - .3 = .7$

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

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

5) $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B) = .4 + .3 - 0 = .7$

6) Construct Venn Diagram



Total = 1

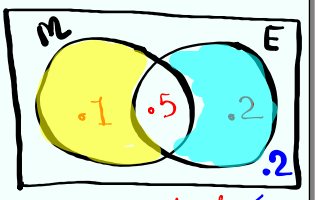
Mar 30-2:07 PM

P(Math) = .6 $\quad .6 - .5 = .1$

P(English) = .7 $\quad .7 - .5 = .2$

P(Math and English) = .5 ✓

1) Make Venn Diagram



Total = 1 ✓

2) P(Math or English)

= P(M) + P(E) − P(M and E)

= .6 + .7 − .5 = $\boxed{.8}$

3) P(Math or English but not both)

= P(Math only OR English only)

= .1 + .2 = $\boxed{.3}$

Mar 30-2:15 PM

Introduction to odds:

the odds in favor of event E are

E happens : # $\bar{E}$ happens

Always Reduce

I flip a coin 20 times, it landed tails 8 times.

odds in favor of landing tails are

8 Tails : 12 Tails

Divide by 4

$\boxed{2 : 3}$

odds against landing tails are

$\boxed{3 : 2}$

Mar 30-2:23 PM

A Standard deck of playing Cards has 52 Cards and 4 aces.

odds in favor of drawing an ace

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

4 : 48

Divide by 4 → $\boxed{1:12}$

odds against drawing an Ace

$\boxed{12:1}$

Mar 30-2:28 PM

If the odds in favor of event E are

$a:b$

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

ex: odds in favor of event E are 3:37.

$P(E) = \frac{3}{3+37} = \boxed{\frac{3}{40}}$ $P(\bar{E}) = \frac{37}{3+37} = \boxed{\frac{37}{40}}$

odds against E. $\boxed{37:3}$

we use reduced fraction or decimals for Prob.

we use : for odds.

Mar 30-2:32 PM

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

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

Always simplify

Suppose $P(E) = .04$

1) $P(\bar{E}) = 1 - .04 = .96$

2) odds in favor of event E.

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

$$.04 : .96 \longrightarrow 1 : 24$$

.04 ÷ .96 Math 1:▶Frac Enter $\frac{1}{24}$

3) odds against E. **24 : 1**

Mar 30-2:38 PM

$P(A) = .025$

$P(\bar{A}) = 1 - .025 = .975$

odds in favor of A

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

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

odds against A **39 : 1**

Mar 30-2:47 PM

Multiplication Rule

Keyword AND

Multiple Action Event

Case I: Independent events

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

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

Flip a fair coin twice → $P(T) = .5$, $P(H) = .5$

$$P(\text{Two Tails}) = (.5)(.5) = \boxed{.25}$$

Mar 30-3:03 PM

A quiz has 2 questions.

Each question has 4 choices but only 1 Correct choice.

we are making guesses.

$$P(\text{Correct on any question}) = \frac{1}{4}$$

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

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

Mar 30-3:08 PM

A deck of playing cards has 52 cards and 12 face cards.

Draw 2 cards **with replacement.**

$$P(\text{2 face cards}) = \frac{12}{52} \cdot \frac{12}{52} = \boxed{\frac{9}{169}}$$

12 ÷ 52 × 12 ÷ 52 Math 1:▶Frac Enter

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

Mar 30-3:13 PM

A box has 2 red and 3 blue balls.

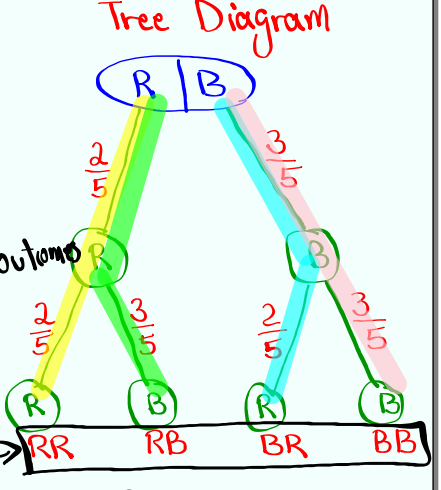
Take 2 balls

with replacement

Sample Space

A complete list of all outcomes

Tree Diagram



$P(RR) = \frac{2}{5} \cdot \frac{2}{5} = \frac{4}{25} = \boxed{.16}$

$P(1R\ 1B) = 2 \cdot \frac{2}{5} \cdot \frac{3}{5} = \frac{12}{25} = \boxed{.48}$

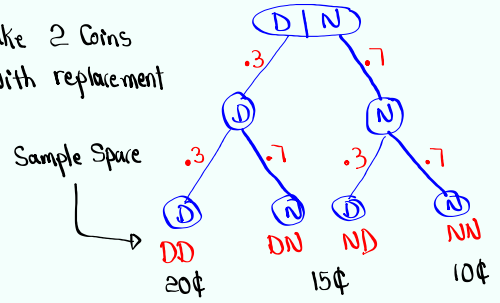
$P(BB) = \frac{3}{5} \cdot \frac{3}{5} = \frac{9}{25} = \boxed{.36}$

Total = 1

Mar 30-3:19 PM

A piggy bank has 3 dimes & 7 nickels.

Take 2 coins with replacement



$P(20¢) = P(DD) = (.3)(.3) = .09$

$P(15¢) = P(DN \text{ or } ND) = 2(.3)(.7) = .42$

$P(10¢) = P(NN) = (.7)(.7) = .49$

Total Prob. 1

L1	L2
20	.09
15	.42
10	.49

STAT → CALC

1-Varstats

Use L1 & L2

$\bar{x} = 13$

$s = S_x = \text{Blank}$

$n = 1$

Mar 30-3:27 PM

$P(A) = .6 \qquad P(B) = .5$

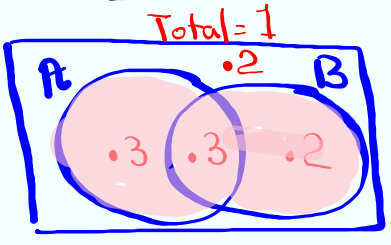
A and B are independent events.

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

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

$= (.6)(.5) = .3$

3) Make Venn Diagram



$.6 - .3 = .3$

$.5 - .3 = .2$

4) $P(A \text{ or } B) = .6 + .5 - .3 = .8$

Mar 30-3:38 PM

$P(A) = .4$ $\quad P(\overline{B}) = 1 - .3 = .7$

$P(B) = .3$

A and B are independent events.

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

$= (.4)(.3) = .12$

Make Venn Diagram

Total = 1

$.4 - .12 = .28$

$.3 - .12 = .18$

$P(A \text{ or } B) = .58$

$P(A \text{ or } B, \text{ not both}) = .46$

Mar 30-3:44 PM

A box has 3 Red and 2 Blue balls.

Take 2 balls, No replacement.

$P(\text{Both Red}) = \frac{3}{5} \cdot \frac{2}{4} = \frac{6}{20} = .3$

$P(\text{Both Blue}) = \frac{2}{5} \cdot \frac{1}{4} = \frac{2}{20} = .1$

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

Draw 3 Cards, No replacement.

$P(\text{All 3 are face Cards}) = \frac{12}{52} \cdot \frac{11}{51} \cdot \frac{10}{50}$

$= \frac{11}{1105}$ ✓

Mar 30-3:51 PM

Class QZ 6

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

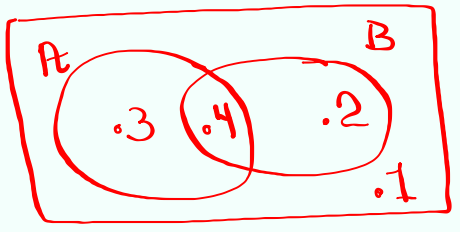
1) $P(\bar{A}) = 1 - .7$

$= \boxed{.3}$

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

$= \boxed{.9}$

3) Construct Venn Diagram.



Mar 30-3:59 PM