Statistics
Lecture 21

Feb 19-8:47 AM

If A and B are independent events,

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

A happens
then
B happens.

Suppose $P(A) = .3$, $P(B) = .8$, A & B are independent events

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

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

$P(A \text{ and } B) = P(A) \cdot P(B) = (.3)(.8) = \boxed{.24}$
  Indep. events

$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$
  $= .3 + .8 - .24 = \boxed{.86}$

Construct Venn Diagram

.3 − .24 = .06
.8 − .24 = .56

A .06 .24 .56 B .14 Total = 1

$P(A \text{ only}) = .06$ $P(B \text{ only}) = .56$

$P(A \text{ only or } B \text{ only}) = .06 + .56 = \boxed{.62}$

De Morgan's Law

$P(\overline{A} \text{ and } \overline{B}) = P(\overline{A \text{ or } B}) = 1 - .86 = \boxed{.14}$

$P(\overline{A} \text{ or } \overline{B}) = P(\overline{A \text{ and } B}) = 1 - .24 = \boxed{.76}$

Oct 3-8:49 AM

A loaded coin is tossed twice.

$P(T) = .3$
$P(H) = .7$

First toss

Second toss

TT ✓   TH ✓   HT ✓   HH

$P(TT) = (.3)(.3) = \boxed{.09}$

$P(TH) = (.3)(.7) = \boxed{.21}$ } Sum of all prob. is 1.

$P(HT) = (.7)(.3) = \boxed{.21}$

$P(HH) = (.7)(.7) = \boxed{.49}$

#T	P(#T)
2	.09
1	.42
0	.49

$P(\text{at least 1 tail}) = 1 - P(\text{No tails})$
$= 1 - P(HH)$
$= 1 - .49 = \boxed{.51}$

Oct 3-9:04 AM

#T	P(#T)
2	.09
1	.42
0	.49

L1 { }L2

Clear All lists

#T → L1

P(#T) → L2

$\boxed{STAT}$ $\boxed{\rightarrow}$ CALC

$\boxed{1: 1\text{-Var Stats}}$

L1 & L2

$\bar{x} = .6$

$S_x = $ blank

$n = 1$ ← — Total prob. = 1

Oct 3-9:13 AM

A piggy bank has 2 quarters & 8 Dimes.

Take 2 Coins with $\boxed{\text{replacement}}$

Q → Quarter, D → Dime

Sample Space

$P(50\cancel{c}) = P(QQ) = \frac{2}{10} \cdot \frac{2}{10} = \boxed{.04}$

QQ → 50¢

✓QD

DQ → 35¢

$P(35\cancel{c}) = P(QD \text{ or } DQ)$
$= \frac{2}{10} \cdot \frac{8}{10} + \frac{8}{10} \cdot \frac{2}{10}$ $\Rightarrow \boxed{.32}$

✓DQ

✓DD → 20¢

$P(20\cancel{c}) = P(DD) = \frac{8}{10} \cdot \frac{8}{10} = \boxed{.64}$

P(at least 1 dime) = 1 − P(No dimes)

= 1 − P(QQ)

= 1 − .04 = $\boxed{.96}$

¢	P(¢)
50	.04
35	.32
20	.64

Oct 3-9:16 AM

¢	P(¢)
50	.04
35	.32
20	.64

L1 { ... } L2

Clear All lists

¢ → L1

P(¢) → L2

Use 1-Var Stats with L1 & L2

$\bar{x} = 26$

S_x = Blank

$n = 1$

Oct 3-9:25 AM

There are 4 Females and 6 Males.

We need to Select (2 people.)

Sample Space

✔ F F
✔ F M
✔ M F
$\boxed{\text{M M}}$

$P(FF) = \dfrac{4}{10} \cdot \dfrac{3}{9} = \dfrac{12}{90}$

$P(FM) = \dfrac{4}{10} \cdot \dfrac{6}{9} = \dfrac{24}{90}$

$P(MF) = \dfrac{6}{10} \cdot \dfrac{4}{9} = \dfrac{24}{90}$

$P(MM) = \dfrac{6}{10} \cdot \dfrac{5}{9} = \dfrac{30}{90}$

#F	P(#F)
2	$\frac{12}{90}$
1	$\frac{48}{90}$
0	$\frac{30}{90}$

$P(\text{Select at least 1 Female}) = 1 - P(\text{No F.})$
$= 1 - P(MM)$
$= 1 - \dfrac{30}{90} = \boxed{\dfrac{2}{3}}$

Oct 3-9:27 AM

#F	P(#F)
2	$\frac{12}{90}$
1	$\frac{48}{90}$
0	$\frac{30}{90}$

L1   L2

Clear all lists

#F → L1

P(#F) → L2

$\boxed{\text{STAT}}$ $\boxed{\rightarrow}$ CALC
$\boxed{1: 1-\text{Var stats}}$
with L1 & L2

$\bar{x} = .8$
$S_x = \text{blank}$
$n = 1$ ← Total Prob.

Oct 3-9:39 AM

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

Given

52 Cards, 4 Aces

take two Cards, (No replacement)

$$P(\text{Two Aces}) = P(\text{First card}) \cdot P(\text{Second Card})$$
$$= P(\text{Ace}) \cdot P(\text{Ace} | \text{First was Ace})$$
$$= \frac{4}{52} \cdot \frac{3}{51} = \boxed{\frac{1}{221}}$$

$$P(\text{No Aces}) = \frac{48}{52} \cdot \frac{47}{51} = \boxed{\frac{188}{221}}$$

Oct 3-9:42 AM

Class Quiz 6
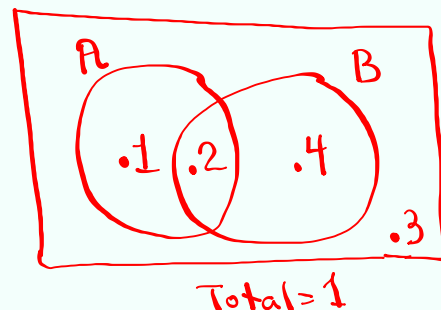
Given $P(A) = .3$ $P(B) = .6$ $P(A \text{ and } B) = .2$

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

2) $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$
$$= .3 + .6 - .2$$
$$= \boxed{.7}$$

3) Construct Venn Diagram.

A   B
.1 (.2) .4
.3
Total = 1

Oct 3-9:48 AM