Statistics

Lecture 7

Feb 19-8:47 AM

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

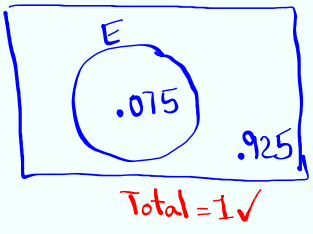
1) odds against event E.

37 : 3

2) $P(E) = \frac{3}{3+37} = \frac{3}{40} = .075$

3) $P(\bar{E}) = \frac{37}{3+37} = \frac{37}{40} = .925$

Venn Diagram



Total = 1 ✓

Oct 14-6:52 PM

Suppose $P(E) = .775$

1) $P(\bar{E}) = 1 - P(E) = .225$

2) odds in favor of event E. 31:9

$P(E) : P(\bar{E})$ $.775 : .225$

$.775 \div .225$ | Math | 1:▶Frac | Enter $\frac{31}{9}$

3) odds against event E.

9:31

Oct 14-6:56 PM

Suppose $P(A) = .8$, $P(B) = .5$, A & B are independent events

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

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

3) P(A and B)

$= P(A) \cdot P(B) = (.8)(.5)$

$= .4$

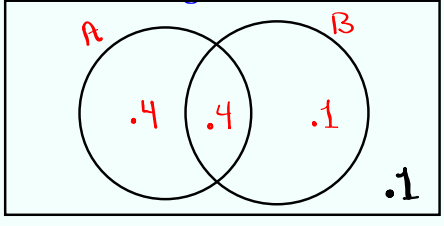
4) $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

$= .8 + .5 - .4 = .9$

5) Construct Venn Diagram

$.8 - .4 = .4$

$.5 - .4 = .1$



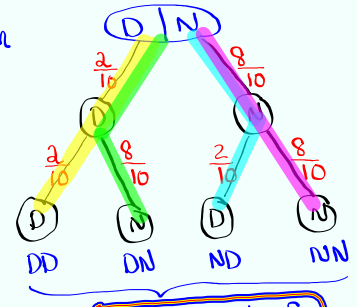
Total = 1 ✓

Oct 14-7:00 PM

A piggy bank has 2 dimes and 8 nickels.

We randomly take 2 coins **with replacement**

Tree Diagram



Complete list of all outcomes

Sample Space

$P(DD) = \frac{2}{10} \cdot \frac{2}{10} = \frac{4}{100} = .04$

$P(NN) = \frac{8}{10} \cdot \frac{8}{10} = \frac{64}{100} = .64$

$P(1D \& 1N) = P(DN \text{ or } ND) = 2 \cdot \frac{2}{10} \cdot \frac{8}{10} = \frac{32}{100} = .32$

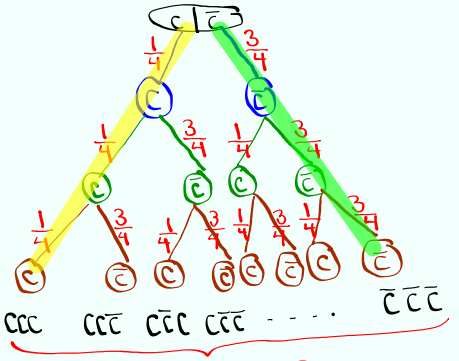
$.04 + .64 + .32 = 1 \checkmark$

Oct 14-7:07 PM

You are taking a multiple-choice quiz.

There are 3 questions.

Each question has 4 choices but only one correct choice. You are making random guesses.



Sample Space

$P(CCC) = \frac{1}{4} \cdot \frac{1}{4} \cdot \frac{1}{4} = \frac{1}{64}$

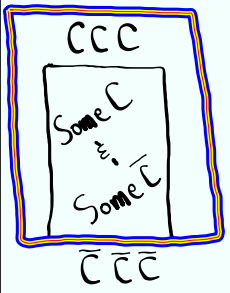
$P(\bar{C}\bar{C}\bar{C}) = \frac{3}{4} \cdot \frac{3}{4} \cdot \frac{3}{4} = \frac{27}{64}$

Oct 14-7:17 PM

P(at least 1 Correct) = 1 − P($\bar{C}\,\bar{C}\,\bar{C}$)

Total Prob.

$= 1 - \frac{27}{64} = \boxed{\frac{37}{64}}$



P(at least 1 incorrect) = 1 − P(CCC)

$= 1 - \frac{1}{64} = \boxed{\frac{63}{64}}$

SG 12 ✓

Oct 14-7:25 PM

Multiplication Rule

SG 13

Keyword AND

Multiple Action event

Dependent events

one outcome changes the prob. of the next outcome.

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

Given

Draw 2 cards from a full deck of playing cards **without replacement**

$P(2 \text{ Aces}) = \frac{4}{52} \cdot \frac{3}{51} = \boxed{\frac{1}{221}}$

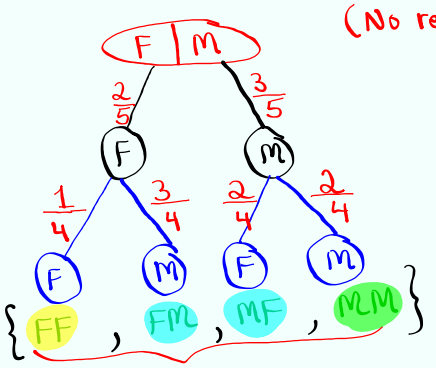
$P(2 \text{ Faces}) = \frac{12}{52} \cdot \frac{11}{51} = \boxed{\frac{11}{221}}$

take 3 cards, no replacement

$P(\text{All red Color}) = \frac{26}{52} \cdot \frac{25}{51} \cdot \frac{24}{50} = \boxed{\frac{2}{17}}$

Oct 14-7:40 PM

2 Females, 3 Males, Select 2 people (No replacement)



Sample Space

$P(FF) = \frac{2}{5} \cdot \frac{1}{4} = \boxed{\frac{1}{10}}$

$P(MM) = \frac{3}{5} \cdot \frac{2}{4} = \boxed{\frac{3}{10}}$

$P(1F \& 1M)$

$P(FM \text{ or } MF)$

$= 2 \cdot \frac{2}{5} \cdot \frac{3}{4} = \boxed{\frac{3}{5}}$

$\frac{1}{10} + \frac{3}{10} + \frac{3}{5} = \frac{1}{10} + \frac{3}{10} + \frac{6}{10} = \frac{10}{10} = 1 \checkmark$

Oct 14-7:50 PM

Multiplication Rule

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

Divide both sides by $P(A)$

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

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

Conditional Prob.

$P(A) = .6 \quad P(B) = .5 \quad P(A \text{ and } B) = .4$

$P(B|A) = \frac{P(A \text{ and } B)}{P(A)} = \frac{.4}{.6} = \frac{4}{6} = \frac{2}{3} = \boxed{.667}$

$P(A|B) = \frac{P(A \text{ and } B)}{P(B)} = \frac{.4}{.5} = \frac{4}{5} = \boxed{.8}$

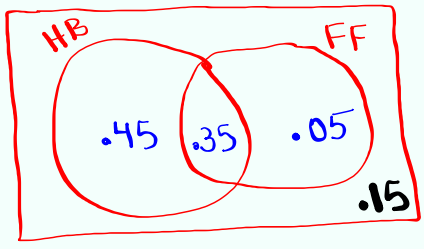
Oct 14-7:59 PM

$P(HB) = .8$

$P(FF) = .4$

$P(HB \text{ and } FF) = .35$

Venn Diagram



$.8 - .35 = .45$

$.4 - .35 = .05$

Total = 1 ✓

$P(FF \mid HB) = \dfrac{P(HB \text{ and } FF)}{P(HB)} = \dfrac{.35}{.80} = .4375 \approx .438$

$\frac{35}{80}$

$P(HB \mid FF) = \dfrac{P(HB \text{ and } FF)}{P(FF)} = \dfrac{.35}{.40} = .875$

$= \frac{35}{40}$

Oct 14-8:07 PM

$P(A) = .5$

$P(B) = .6$

$P(B|A) = .8$

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

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

Find $P(A \text{ and } B)$

Cross-multiply

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

$= .4$

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

$= \dfrac{.4}{.6} = \dfrac{4}{6} = \dfrac{2}{3} = .667$

Oct 14-8:17 PM

3 Females and 5 Males were hired.

You need 3 people of afternoon shift.

$P(\text{All Females}) = \frac{3}{8} \cdot \frac{2}{7} \cdot \frac{1}{6} = \boxed{\frac{1}{56}}$

$P(\text{All Males}) = \frac{5}{8} \cdot \frac{4}{7} \cdot \frac{3}{6} = \boxed{\frac{5}{28}}$

P(at least 1 Female) = 1 − P(All Male)

FFF
Some F
Some M
MMM

$= 1 - \frac{5}{28} = \boxed{\frac{23}{28}}$

P(all Same gender) = P(FFF or MMM)

SG 13 ✓

$= \frac{1}{56} + \frac{5}{28} = \boxed{\frac{11}{56}}$

Oct 14-8:25 PM

x	P(x)
1	.2
2	.5
3	.3

1) Show $\sum P(x) = 1$

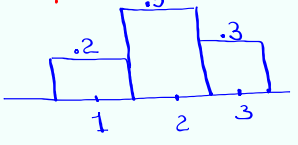
$.2 + .5 + .3 = \boxed{1}$

2) Find $P(x \leq 2)$

$= .2 + .5 = \boxed{.7}$

3) Draw Prob. dist. histogram.

x → Midpoint, P(x) → Rel. F.



4) x → L1, P(x) → L2

L1	L2
1	.2
2	.5
3	.3

STAT → CALC

1:1-Var Stats

List: L1

FreqList: L2

L1, L2

Enter

Calculate

$\bar{x} = 2.1$

S = Blank

$\sum P(x) = \boxed{1} \rightarrow n = 1$

Oct 14-8:42 PM

x	$P(x)$
1	.15
2	.25
3	.45
4	.15

1) Verify $\sum P(x) = 1$

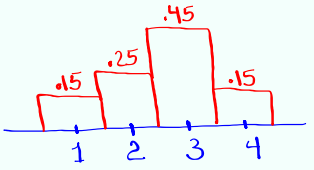
$.15 + .25 + .45 + .15 = 1$

2) Find $P(2 \le x \le 3)$

$= .25 + .45 = .7$

3) Draw Prob. Dist. Histogram

$x \to$ Midpoint, $P(x) \to$ Rel. F.



4) $x \to L1$, $P(x) \to L2$

use [1-Var Stats] with L1 & L2

$\bar{x} = 2.6$

$S =$ Blank

$n = 1$

Oct 14-8:51 PM

Exam 1: (100 pts)

1) opens Friday at 12:00 noon,
Closes Saturday at 6:00 p.m.

2) You have 3 hours in total to take the exam in one attempt.

3) Total 6 pages.

4) Your work must be similar to my notes and my resources.

5) Submit as one file like Study guides.

6) on Sunday, Look for announcement on Canvas with Calendar link.
Pick a date & time for exam 1 Q&A. (20 pts)

Oct 14-9:01 PM