Statistics

Lecture 9

Feb 19-8:47 AM

Given $P(A) = 0.075$

1) Write $P(A)$ in %.

$.075(100\%) = \boxed{7.5\%}$

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

.075 [MATH] [1:▶Frac] [Enter] $\boxed{\frac{3}{40}}$

3) Find $P(\bar{A}) = 1 - P(A) = 1 - .075 = \boxed{.925}$

4) Find odds in favor of event A.

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

$.075 : .925 \rightarrow \boxed{3:37}$

.075 [÷] .925 [MATH] [1:▶Frac] [Enter] $\frac{3}{37}$

5) Find odds against event A → $\boxed{37:3}$

Jan 25-4:35 PM

Suppose odds in favor of event E are $1:15$

$1 bet → Net Return $15

1) Give odds **against** event E.

$15:1$

2) Find $P(E) = \frac{1}{1+15} = \frac{1}{16}$

3) Find $P(\overline{E}) = \frac{15}{1+15} = \frac{15}{16}$

Jan 25-4:42 PM

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

A & B are disjointed events.

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

$= .75$

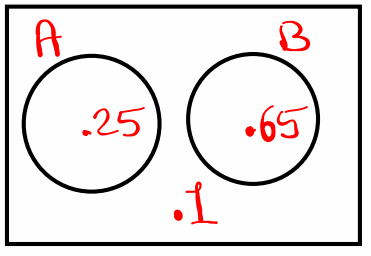
2) $P(A \text{ and } B) = 0$

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

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

$= .25 + .65 - 0 = .9$

4) Construct Venn Dia.



Jan 25-4:45 PM

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

A & B are independent events.

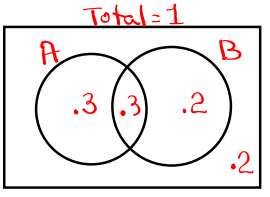
1) $P(\bar{A}) = 1 - P(A) = .4$

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

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

$= .6 + .5 - .3 = .8$

4) Construct Venn Diagram



5) Use DeMorgan's Law to find

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

$= 1 - .8 = .2$

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

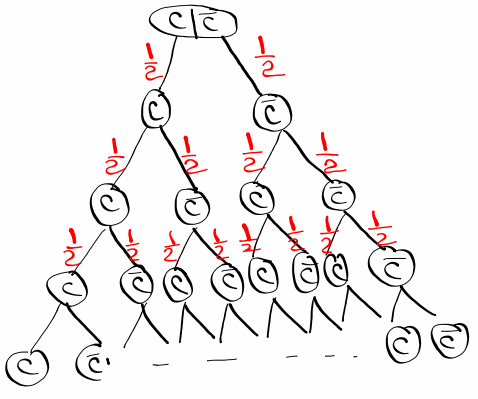
$= 1 - .3 = .7$

Jan 25-4:50 PM

You are guessing on a True/False quiz with 4 questions

C → Correct

$\bar{C}$ → Correct



Sample Space

C C C C

Some C & Some $\bar{C}$

$\bar{C}$ $\bar{C}$ $\bar{C}$ $\bar{C}$

$P(\text{All Correct}) = \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{16}$

P(at least one Correct)

$= 1 - P(\text{None Correct})$

$= 1 - \frac{1}{16} = \frac{15}{16}$

Jan 25-4:59 PM

Suppose we have a deck of playing cards with 40 cards and 10 are face cards.

Draw 2 Cards with replacement

$P(\text{both are face cards}) = \frac{10}{40} \cdot \frac{10}{40} = \frac{1}{4} \cdot \frac{1}{4} = \boxed{\frac{1}{16}}$

Draw 3 cards without replacement

$P(\text{all are face cards}) = \frac{10}{40} \cdot \frac{9}{39} \cdot \frac{8}{38} = \boxed{\frac{3}{247}}$

odds in favor of getting 3 face cards now

3 : 244

Give me $3

Draw 3 cards

if You have 3 face cards, I give You $200.

Jan 25-5:06 PM

There are 3 Females & 7 Males.

we need to have 2 people. (NO replacement)

F F

F M

M F

M M

$P(\text{2 Females}) = \frac{3}{10} \cdot \frac{2}{9} = \frac{6}{90}$

$P(\text{1F \& 1M}) = 2\left(\frac{3}{10} \cdot \frac{7}{9}\right) = \frac{42}{90}$

$P(\text{2 Males}) = \frac{7}{10} \cdot \frac{6}{9} = \frac{42}{90}$

# Females	P(# Females)
2	6/90
1	42/90
0	42/90

L1 L2

Females → L1

P(# Females) → L2

STAT → CALC

1: 1-Var Stats

List: L1

Freq List: L2

Calculate

$\bar{x} = .6$

$S =$ Blank

$n = 1$ ← Total Prob.

Jan 25-5:14 PM

Multiplication Rule

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

A happens first

then

B happens

Given

Conditional Prob.

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

Jan 25-5:26 PM

$P(\text{Shirt}) = .6$

$P(\text{pants}) = .5$

$P(\text{Shirt and pants}) = .4$

$$P(\text{Shirt} \mid \text{pants}) = \frac{P(\text{Shirt and Pants})}{P(\text{Pants})} = \frac{.4}{.5}$$

$$= \boxed{.8}$$

$$P(\text{Pants} \mid \text{Shirt}) = \frac{P(\text{Shirt and Pants})}{P(\text{Shirt})} = \frac{.4}{.6}$$

$$= \boxed{.667}$$

Jan 25-5:30 PM

$P(A) = .7$

$P(B) = .6$

$P(A|B) = .8$

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

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

$$.8 = \frac{P(A \text{ and } B)}{.6}$$

Cross-Multiply

$P(A \text{ and } B) = .48$

$$\text{Find } P(B|A) = \frac{P(A \text{ and } B)}{P(A)} = \frac{.48}{.7} = \frac{24}{35}$$

$= .686$

Jan 25-5:35 PM

Intro. to counting

Choose a number from 0 to 9.

10 choices.

Choose two numbers from 0 to 9.

First Selection: 10 choices

Second Selection: 10 choices Rep. / 9 choices No Rep

Total: $10 \cdot 10 = 100$ with repetition

$10 \cdot 9 = 90$ No repetition

Your ATM card passcode 4 digits

Repetition allowed

$10 \quad 10 \quad 10 \quad 10$

= 10000 choices

Jan 25-6:02 PM

Suppose your password is a letter followed by 5 digits. letters are case-sensitive 52
digits are not repeated.

52	10	9	8	7	6
Letter	digits	-	-	-	-	-

choices $52 \cdot 10 \cdot 9 \cdot 8 \cdot 7 \cdot 6 =$

1,572,480

Jan 25-6:07 PM

There are 5 people, I need to select 2 of them

Adam Bill Carol David Emily

~~AB~~ ~~AC~~ ~~AD~~ ~~AE~~
BA ~~BC~~ ~~BD~~ ~~BE~~
CA CB ~~CD~~ ~~CE~~
DA DB DC ~~DE~~
EA EB EC ED

$5 \cdot 4 = 20$ choices

Say order does not matter

10 choices

Combination

n different items

choose

r items

NO replacement, order does not matter

$$n C_r = \frac{n!}{r! \cdot (n-r)!}$$

Jan 25-6:10 PM

$5C_2 = \frac{5!}{2! \cdot (5-2)!}$

$= \frac{5 \cdot 4^{2} \cdot 3 \cdot 2 \cdot 1}{2 \cdot 1 \cdot 3 \cdot 2 \cdot 1} = 10$

5 MATH → PRB ↓ 3:nCr 2 Enter 10

You are the manager of a place, and you need to select 3 people from 10 people to report to work.

How many ways can this be done?

$10C_3$

10 Math → PRB ↓ 3:nCr 3 Enter 120

CA Lotto

there are 50 numbers, choose 5 numbers.

# of choices $50C_5$

$= 2,118,760$

Jan 25-6:16 PM

3 Females, 7 Males

Select 2 people in any order.

1) How many ways can this be done?

$10C_2 = 45$

2) How many ways can we select 1F and 1M?

$3C_1 \cdot 7C_1 = 21$

3) $P(1F \& 1M) = \frac{\text{Total desired Selection}}{\text{Total Selection}} = \frac{3C_1 \cdot 7C_1}{10C_2}$

$= \frac{21}{45} = \frac{7}{15}$

Jan 25-6:25 PM

4 Quarters, 8 Dimes, Select 2 Coins
No replacement

DD → 20¢

DQ → 35¢

QD → 35¢

QQ → 50¢

$P(20¢) = \frac{{}_8C_2}{{}_{12}C_2} = \frac{28}{66} = \frac{14}{33}$

$P(35¢) = \frac{{}_8C_1 \cdot {}_4C_1}{{}_{12}C_2} = \frac{32}{66} = \frac{16}{33}$

$P(50¢) = \frac{{}_4C_2}{{}_{12}C_2} = \frac{6}{66} = \frac{3}{33} = \frac{1}{11}$

Total in ¢	P(Total in ¢)
20	14/33
35	16/33
50	1/11

L1 L2

1-Var Stats with L1 & L2

$\bar{x} = 30$

S = Blank

$n = 1$

Jan 25-6:32 PM

A standard deck of playing cards has 52 cards
12 face cards, and 4 Aces.

Select 5 cards,

P(3 face and 2 ace cards)

$$= \frac{{}_{12}C_3 \cdot {}_4C_2}{{}_{52}C_5} = \frac{1320}{2598960}$$

1320 ÷ 2598960

MATH | 1:▶Frac | Enter

$\approx 5.1 \times 10^{-4}$

Jan 25-6:43 PM

CA Lotto

50 numbers

Choose 5 numbers.

5 winning #

45 losing #

$$P(3W \text{ \& } 2L) = \frac{{}_5C_3 \cdot {}_{45}C_2}{{}_{50}C_5}$$

Rare Event

$\nabla \leq .05$

$$= \frac{9900}{2\,118\,760} = \boxed{.005}$$

Jan 25-6:52 PM