Statistics
Spring 2023
Lecture 7

Feb 19-8:47 AM

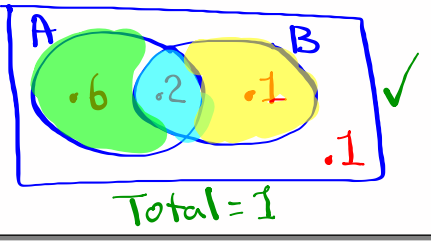
Class QZ 2

Suppose $P(A)=.8$, $P(B)=.3$, $P(A \text{ and } B)=.2$

1) $P(\overline{B}) = 1 - P(B) = .7$ ✓

2) $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B) = .9$ ✓

3) Construct Venn Diagram.



✓

Mar 14-9:11 PM

Introduction to Counting:

Select 1 number from 0 to 9.

0 1 2 3 4 5 6 7 8 9

10 choices

Select 2 numbers from 0 to 9.

Repetition allowed.

00 01 02 03 - - - 09

10 11 12 - - - - - - 19

20 21 22 - - - - - - 29

⋮

90 91 92 - - - - - - 99

10 choices

10 choices

First number · Second number

10 · 10 = 100 choices

P(I guess Your Selection) = $\frac{1}{100}$

Now Select 2 numbers, No repetition.

First one · Second one

10 · 9 = 90 choices

P(I guess Your Selection) = $\frac{1}{90}$

Mar 21-6:52 PM

How many ways can we Select a passcode with 4 digits?

1) Repetition allowed

First · Second · Third · Fourth

10 · 10 · 10 · 10 = 10,000 choices

2) No Repetition

First · Second · Third · Fourth

10 · 9 · 8 · 7 = 5040 choices

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A passcode is made of a letter, followed by 3 digits.

1) Not case sensitive, and repetition allowed.

Letter · digits

$26 \cdot 10 \cdot 10 \cdot 10 = \boxed{26000}$ choices

2) It is case sesitive, NO repetition.

Letter · digits

$52 \cdot 10 \cdot 9 \cdot 8 = \boxed{33280}$ choices

Mar 21-7:02 PM

Consider 5 people

Allen Bill Carol Donna Eddie

Select 2 people

~~AB~~ ~~AC~~ ~~AD~~ ~~AE~~

BA ~~BC~~ ~~BD~~ ~~BE~~

CA CB ~~CD~~ ~~CE~~

DA DB DC ~~DE~~

EA EB EC ED

10 choices

20 choices

If order does not matter

If we have n different items and we wish to select r items, order does not matter, No repetition

# of Selections $_nC_r = \frac{n!}{r! \cdot (n-r)!}$

Combination formula

Using TI:

$_5C_2 = \frac{5!}{2! \cdot (5-2)!}$

5 MATH → PRB [!] [3:nCr] 2 Enter $= \frac{5!}{2! \cdot 3!}$

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

$= \boxed{10}$

Mar 21-7:06 PM

Find $10C_4$

10 MATH → PRB ↓ 3:nCr 4 enter 210

Select 5 numbers from 1 to 50.
No repetition, order does not matter.
# of Selection $50C_5 = 2,118,760$

Select 8 numbers from 1 to 100
No repetition, order does not matter.
Selection $100C_8 = 1.861 \times 10^{11}$
S.N. $\approx 1.9 \times 10^{11}$

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A deck of playing cards has 52 cards and 12 face cards.
Draw 3 cards, No replacement, order does not matter.

1) How many ways can this be done?
$52C_3 = 22100$

2) How many ways can we draw 3 face cards?
$12C_3 = 220$

3) P(Select 3 face cards) = $\frac{\text{Total face selection}}{\text{Total selection}}$
Rare event
$0 < P(\text{Rare event}) \leq .05$
$= \frac{12C_3}{52C_3} = \frac{220}{22100} = \frac{11}{1105}$
$\approx .010$

Mar 21-7:20 PM

A piggy bank has 15 nickels and 5 dimes.

take 2 coins, no replacement

order does not matter

1) How many ways can this be done?

$20C2 = 190$

2) How many ways can we select 2 dimes?

$5C2 = 10$

3) $P(\text{Select 2 Dimes}) = \frac{5C2}{20C2} = \frac{10}{190} = \frac{1}{19}$

Mar 21-7:27 PM

4 Females, 11 Males $n=15$

Select 3 different people, order does not matter

$P(\text{Select 1F \& 2M}) = \frac{4C1 \cdot 11C2}{15C3}$

FMM
MFM
MMF

$= \frac{220}{455} = \frac{44}{91}$

$P(\text{Select 2F \& 1M}) = \frac{4C2 \cdot 11C1}{15C3} = \frac{66}{455}$

FFM
FMF
MFF

$= .145$

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Standard deck of playing cards has 52 cards, 12 faces & 4 Aces.

Select 5 cards, no replacement, order does not matter.

$$P(\text{2 Aces \& 3 Faces}) = \frac{{}_4C_2 \cdot {}_{12}C_3}{{}_{52}C_5}$$

$$= \frac{1320}{2598960}$$

$$= \frac{66}{129948}$$

$$= \frac{33}{64974} = \boxed{\frac{11}{21658}}$$

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

$$P(\text{3 Aces \& 2 Faces}) = \frac{{}_4C_3 \cdot {}_{12}C_2}{{}_{52}C_5}$$

$$= \frac{264}{2598960}$$

$$= \boxed{1.02 \times 10^{-4}}$$

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