Statistics

Lecture 7

Feb 19-8:47 AM

$$P(\text{At least one}) = 1 - P(\text{None})$$

A box has 3 red and 5 blue balls.

Take 2 balls with replacement.

R → Red

B → Blue

RR RB BR BB

Sample Space

$P(\text{At least 1 red Ball})$

$= 1 - P(\text{No red Balls})$

$\text{No red Balls} = BB$

$= 1 - P(BB) = 1 - \frac{5}{8} \cdot \frac{5}{8}$

$P(\text{at least 1 blue ball}) = 1 - P(\text{No Blue balls})$

$= 1 - \frac{25}{64} = \boxed{\frac{39}{64}}$ ✓

BB
BR
RB

$= 1 - P(RR) = 1 - \frac{3}{8} \cdot \frac{3}{8} = 1 - \frac{9}{64} = \boxed{\frac{55}{64}}$

Jan 21-4:31 PM

Suppose a loaded coin is tossed 3 times.

$P(\text{Tails}) = .2$

$P(\text{Heads}) = .8$

T T T

Some T & Some H

H H H

$P(\text{At least 1 tail}) = 1 - P(\text{No tails})$

$= 1 - P(\text{All Heads})$

$= 1 - (.8)(.8)(.8) = \boxed{.488}$

$P(\text{At least 1 head}) = 1 - P(\text{No heads})$

$= 1 - P(\text{All tails}) = 1 - (.2)(.2)(.2)$

$= \boxed{.992}$

Jan 21-4:39 PM

From a standard deck of playing cards,

draw 2 cards, No replacement

4 Aces, 48 Aces

$P(\text{At least 1 Ace}) = 1 - P(\text{No Ace})$

$= 1 - \frac{48}{52} \cdot \frac{47}{51} = \frac{33}{221}$

$P(\text{At least 1 face card}) = 1 - P(\text{No face card})$

12 face

40 Face

$= 1 - \frac{40}{52} \cdot \frac{39}{51} = \frac{7}{17}$

Suppose we draw 3 cards, No replacement

$P(\text{At least 1 Red}) = 1 - P(\text{No Red})$

26 Red

26 Red

$= 1 - \frac{26}{52} \cdot \frac{25}{51} \cdot \frac{24}{50} = \boxed{\frac{15}{17}}$

Jan 21-4:45 PM

4 Females , 6 Males

3 shifts : Morning 4 , Afternoon 4, Graveyard 2

P(At least 1 Female in the Morning Shift)

$= 1 - P(\text{No Females})$ (All Males)

$= 1 - \frac{6}{10} \cdot \frac{5}{9} \cdot \frac{4}{8} \cdot \frac{3}{7} = \boxed{\frac{13}{14}}$

P(At least 1 Male in the afternoon Shift)

$= 1 - P(\text{No males})$

$= 1 - P(\text{All Females}) = 1 - \frac{4}{10} \cdot \frac{3}{9} \cdot \frac{2}{8} \cdot \frac{1}{7}$

$= \boxed{\frac{209}{210}}$

Jan 21-4:53 PM

If we have n different items and we like to choose r of them.

Order does not matter, No replacement

# of Selections is given by ${}_nC_r$ (n choose r)

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

$n! = n(n-1)(n-2)(n-3)\cdots 3 \cdot 2 \cdot 1$ (↑ Factorial)

$5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 120$

$10! = 10 \cdot 9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 =$ 3628800

10 [Math] → PRB [↓] 4:! [Enter]

${}_6C_2 = \frac{6!}{2! \cdot (6-2)!} = \frac{6!}{2! \cdot 4!} = \frac{\overset{3}{\cancel{6}} \cdot 5 \cdot \cancel{4} \cdot \cancel{3} \cdot \cancel{2} \cdot \cancel{1}}{\cancel{2} \cdot 1 \cdot \cancel{4} \cdot \cancel{3} \cdot \cancel{2} \cdot \cancel{1}} = 15$

6 [MATH] → PRB [↓] 3: nCr 2 [Enter]

Jan 21-5:00 PM

A team has 12 players, Coach needs 4 people to start the game. How many different Selection of starting line-up?

$$_{12}C_4 = 495$$

CA Lotto

50 numbers, choose 5 numbers

# of Selections → $_{50}C_5 = 2118760$

$$P(\text{Winning the jackpot}) = \frac{1}{2118760}$$

Jan 21-5:08 PM

A standard deck of playing Cards

Select 5 Cards, No replacement
order does not matter.

1) How many ways can this be done?

$$_{52}C_5 = 2598960$$

2) How many ways can we have 2 Aces & 3 face Cards?

$$_4C_2 \cdot {}_{12}C_3 = 1320$$

3) $P(2 \text{ Aces \& } 3 \text{ faces}) = \frac{{}_4C_2 \cdot {}_{12}C_3}{{}_{52}C_5} = \frac{1320}{2598960}$

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

4) $P(2 \text{ Aces and } 2 \text{ faces only}) = \frac{{}_4C_2 \cdot {}_{12}C_2 \cdot {}_{36}C_1}{{}_{52}C_5}$

Jan 21-5:13 PM

A piggy bank has 4 dimes & 6 Nickels.

Take 3 Coins, No replacement, order does not matter.

DDD

Some D & Some N

NNN

$P(\text{All Dimes}) = \frac{{}_4C_3 \cdot {}_6C_0}{{}_{10}C_3} = \boxed{\frac{1}{30}}$

$\frac{4}{10} \cdot \frac{3}{9} \cdot \frac{2}{8}$

$P(\text{All Nickels}) = \frac{{}_4C_0 \cdot {}_6C_3}{{}_{10}C_3} = \boxed{\frac{1}{6}}$

$P(1N \text{ \& } 2D) = \frac{{}_6C_1 \cdot {}_4C_2}{{}_{10}C_3} = \boxed{\frac{3}{10}}$

$P(2N \text{ \& } 1D) = \frac{{}_6C_2 \cdot {}_4C_1}{{}_{10}C_3} = \boxed{\frac{1}{2}}$

SG 12 & SG 13 ✓

Jan 21-5:21 PM