13.3 Combinations & Probability

Order doesn't matter!

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

* n = # of things
* r = # you choose

Cards

52 cards

4 suits · ♡ ◇ ♣ ♠ … 13 cards per

Example

① Find total # of possible 5 card hands

$$_{52}C_5 = 2{,}598{,}960$$

AKQJ10

$$\frac{4}{2{,}598{,}960} = .000154\%$$

.00006 1539

② How many 5 card hand are all Same Color?

Warm-up

How many ways to arrange?

① hockey

$6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 6!$

$= 720$ ways

② Mayday

letters: 6

Repeats.

a - 2

y - 2

$\frac{6!}{2! \cdot 2!} = 180$ ways

③ How many permutations, Choosing 4 letters? (Prob #1)

6 letters, pick 4

$6 \cdot 5 \cdot 4 \cdot 3$

$6P_4 = 360$

$\frac{6!}{(6-4)!}$ or $\frac{6!}{2!}$

hocy
yhoc
yoch
} diff

④ How many Combinations, Choosing 4 letters?

$6C_4 = 15$

$\frac{6!}{2!\,4!}$ ← the 4 slots you put the cards or letters

hocy
yhoc
yoch
} using same letters, are the same

Probability - $\frac{\#\text{ of good outcomes}}{\text{total outcomes}}$

Coin - 2 sides (H/T)

$P(T) = \frac{1}{2}$

6 sided dice

one

$P(3) = \frac{1}{6}$

$P(\text{odd}) =$

two

$P(\text{both 3's}) = \frac{1}{6}\ (1^{st}) \cdot \frac{1}{6}\ (2^{nd})$

$= \frac{1}{36}$

Homework

Find # of 5 card hands:

① 1 ace & 4 that aren't

4 aces — 48 are not

$_4C_1 \cdot {}_{48}C_4 = 4 \cdot 194580 = 778{,}320$

② 4 kings & 1 other

4 kings

$_4C_4 \cdot {}_{48}C_1 = 1 \cdot 48 = 48$

③ All spades

13 spades

$_{13}C_5 = 1287$

Bag of Chips numbered 1-50. Find prob:

④ even

⑤ # < 35

⑥ perfect square

⑦ prime #

⑧ Factor of 150

⑨ multiples of 4