

5.4 Combinations.notebook



probability = $\frac{\text{event/s}}{\text{number of outcomes}}$

STARTING POINT X

FIRST CHOICE: A, B, C

SECOND CHOICE: B, C, A, C, A, B

THIRD CHOICE: C, B, C, A, B, A

5.4 Combinations

Combinations: order does NOT matter

$${}^n C_r = \frac{n!}{(n-r)!r!} \quad {}^n C_r = \binom{n}{r}$$

total # objects \rightarrow n

\uparrow

chosen \rightarrow r

Ex.) Lotto 6-49 gets its name from the fact that of 49 numbers, 6 are chosen. How many combinations are possible in Lotto 6-49?

$${}_{49} C_6 = \binom{49}{6} = \frac{49!}{(49-6)!6!} = \boxed{13\,983\,816}$$

May 9-10:53 AM



probability = $\frac{\text{event/s}}{\text{number of outcomes}}$

STARTING POINT X

FIRST CHOICE: A, B, C

SECOND CHOICE: B, C, A, C, A, B

THIRD CHOICE: C, B, C, A, B, A

Ex.) There are 8 people available to sit on a subcommittee of 3 people. How many ways are there is the subcommittee has:

a) no titles

$${}_8 C_3 = \frac{8!}{(8-3)!3!} = \frac{8!}{5!3!} = \frac{8 \cdot 7 \cdot 6 \cdot \cancel{5!}}{\cancel{5!} \cdot 3!} = \boxed{56}$$

b) titles (order matters; vice different from secretary...)

$${}_8 P_3 = \frac{8!}{(8-3)!} = \frac{8!}{5!} = \frac{8 \cdot 7 \cdot 6 \cdot \cancel{5!}}{\cancel{5!}} = \boxed{336}$$

May 9-11:01 AM

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Ex.) A group of 15 people (9 females, 6 males) will form a subcommittee with 7 people. How many combinations are there with

a) exactly 3 females 3F and 4M

$${}^9C_3 \times {}^6C_4 = 84 \times 15 = \boxed{1260}$$

b) 7 females

$${}^9C_7 = \boxed{36}$$

c) at least four females

$$\begin{aligned}
 & 4F \text{ and } 3M \text{ OR } 5F \text{ and } 2M \text{ OR } 6F \text{ and } 1M \text{ OR } 7F \\
 = & \binom{9}{4} \cdot \binom{6}{3} + \binom{9}{5} \cdot \binom{6}{2} + \binom{9}{6} \cdot \binom{6}{1} + \binom{9}{7} \\
 = & (126 \times 20) + (126 \times 15) + (84 \times 6) + 36 \\
 = & 2520 + 1890 + 504 + 36 \\
 = & \boxed{4950}
 \end{aligned}$$

Pg. 118 # 1-4, 7, 8, 10, 11, 15.

May 9-11:01 AM