$n \geq r$

① ② ③ . . . . . ⓝ

$\underbrace{n}_{b_1}\ \underbrace{(n-1)}_{b_2}\ \underbrace{(n-2)}_{b_3} \ldots \underbrace{(n-r+1)}_{b_r}$

$$\frac{n \times (n-1) \times (n-2) \times \cdots \times (n-r+1) \times (n-r)!}{(n-r)!}$$

r permutation of n, $\boxed{{}^nP_r \;,\; P(n,r) = \frac{n!}{(n-r)!}}$

A B C = 3!

A B C D E

$\frac{5 \times 4 \times 3}{3!}$

$$^nC_r = \binom{n}{r} = C(n,r) = \frac{P(n,r)}{r!}$$

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

$P_1\ P_2\ P_3$

(A B C) = (B C A)

= (C A B)

. . .

$$^{10}C_2 = \frac{10!}{2!\,(10-2)!} = \frac{10!}{2! \times 8!}$$

$$^{10}C_8 = \frac{10!}{8!\,(10-8)!} = \frac{10!}{8! \times 2!}$$

$$\boxed{^{n}C_r = {}^{n}C_{n-r}}$$

$26 \times 25 \times 24 \times 10 \times 10 \times 10$

letters (can't repeat) | digits (can repeat)

AAB 001 ✗

ABC 010 ✓

(AB) C D E

AB C D E → $4! \times 2!$

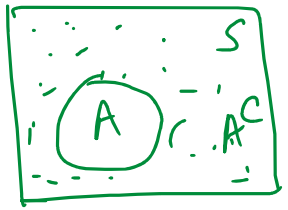
BA / AB

C_1 C_2 → tossing two coins simultaneously

$S = \{HH, HT, TH, TT\}$

Complement of an Event :-

Rolling a dice, $S = \{1, 2, 3, 4, 5, 6\}$



A = outcome is a multiple of 3. $A = \{3, 6\}$

$$P(A) = \frac{2}{6} = \frac{1}{3}.$$

A^c = outcome is not a multiple of 3. $A^c = \{1, 2, 4, 5\}$

$$P(A^c) = \frac{4}{6} = \frac{2}{3}$$

A, A^c are mutually exclusive. $A \cup A^c = S$

$$P(A \cup A^c) = P(A) + P(A^c) = P(S) = 1$$

$$\Rightarrow \boxed{P(A^c) = 1 - P(A)}$$

Rolling of a die

$S = \{1, 2, 3, 4, 5, 6\}$

Event-A : outcome is multiple of 3 ,

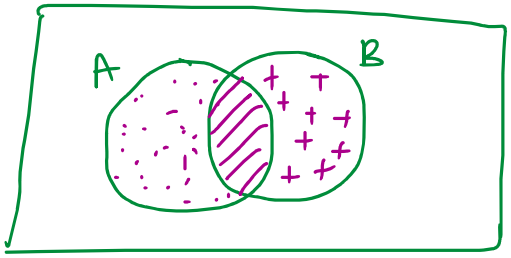
$A = \{3, 6\}$

Event-B : outcome is even

$B = \{2, 4, 6\}$

$A \cup B = \{2, 3, 4, 6\}$

$A \cap B = \{6\}$



$(A \setminus B) \cup (A \cap B) = A$

$(B \setminus A) \cup (A \cap B) = B$

$\Rightarrow P(B \setminus A) + P(A \cap B) = P(B)$

$\Rightarrow \boxed{P(B \setminus A) = P(B) - P(A \cap B)}$

$P(A \setminus B) + P(A \cap B) = P(A)$

$\Rightarrow \boxed{P(A \setminus B) = P(A) - P(A \cap B)}$

$P(A \cup B) = P(A \setminus B) + P(A \cap B) + P(B \setminus A)$

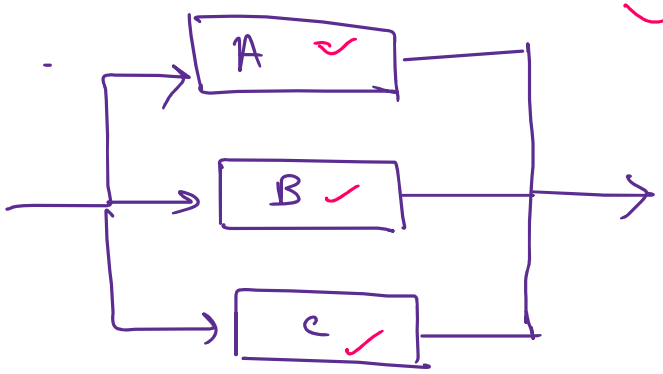
$= P(A) - P(A \cap B) + P(A \cap B) + P(B) - P(A \cap B)$

$\boxed{P(A \cup B) = P(A) + P(B) - P(A \cap B)}$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$P(\text{success}) = 1 - P(\text{failure})$$

$P(\text{success}) = 1 - 0.001 = 0.999$ (99.9%)



$P(\text{failure}) = P(f_A) \times P(f_B) \times P(f_C)$

$= (0.1)^3 = 0.001$

If A, B are two events and they are independent of each other then $P(A \cap B) = P(A) \cdot P(B)$

(C) → tossing the coin two times.

What is the probability of getting all tails.

$\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

1st shoot	2nd shoot	3rd shoot	
miss	miss	miss	(M, M, H), (M, H, M)
hit	hit	hit	(M, H, H)
			(M, M, M)