⊛ For disjoint sets, $|A \cup B| = |A| + |B|$

⊛ Theorem: Addition rule:
If $A$ is union of $n$-pairwise disjoint sets
$A_1, A_2, \dots A_n$

$$|A| = |A_1 \cup A_2 \cup \dots \cup A_n| = |A_1| + |A_2| + \dots + |A_n|$$

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⊛ Ex: A certain brand have 5 models, 3 of which have 3 color options, and other 2 have 4 color options.
How many options for model and color?

$$\underbrace{\boxed{3 \times 3}}_{A} + \underbrace{\boxed{2 \times 4}}_{B} = 17.$$

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⊛ Difference rule: If $B \subseteq A$, $|A - B| = |A| - |B|$

⊛ Ex: If we choose 4 people for 3 positions where Ann CAN'T be president, and either Cyd or Dan must be secretary:

- If Ann <u>can</u> be president, we have

  $\underset{se.}{2} \cdot \underset{pr.}{3} \cdot \underset{tr.}{2} = 12$ (ways)

- If Ann <u>is</u> president:

  $2 \cdot 1 \cdot 2 = 4$ (ways)

→ If Ann can't be president:

  $12 - 4 = 8$ (ways)

Inclusion- Exclusion (Bao lồi):

$|A \cup B| = |A| + |B| - |A \cap B|$

$|A \cup B \cup C| = |A| + |B| + |C|$ 1 el.

$- |A \cap B| - |B \cap C| - |C \cap A|$ 2 el.

$+ |A \cap B \cap C|$ 3 el.

Rule of thumb: $\boxed{+ \text{ odd } - \text{ even.}}$