03/01/24

lesson four

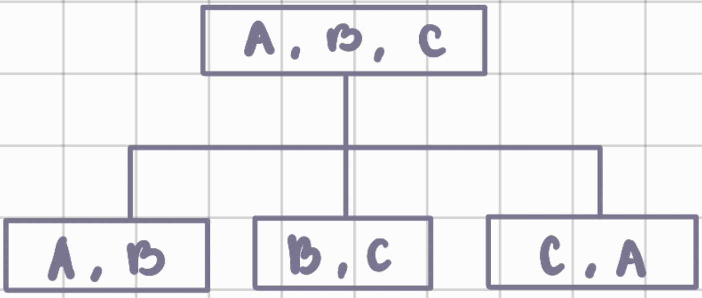
combination & permutation

↳ **combination** a selection of all parts of a set of objects, without regard to the order in which objects are selected

→ formula : $C(n,r) = \dfrac{n!}{r!(n-r)!}$

→ n = the number of objects to choose from

→ r = the number of objects selected



how many different groups of 10 students can a teacher select from her classroom of 15 students?

$n = 15$ since the teacher is choosing from 15 students

$r = 10$ since the teacher is selecting 10 students

$${}^{15}C_{10} = \frac{15!}{(15-10)!\,10!} = \frac{15!}{5!\,10!} = \frac{15(14)(13)(12)(11)\cancel{(10!)}}{5!\,\cancel{10!}}$$

$$= \frac{15(14)(13)(12)(11)}{5(4)(3)(2)(1)} = \frac{(14)(13)(3)(11)}{(2)(1)}$$

$$= (7)(13)(3)(11) = 3003$$

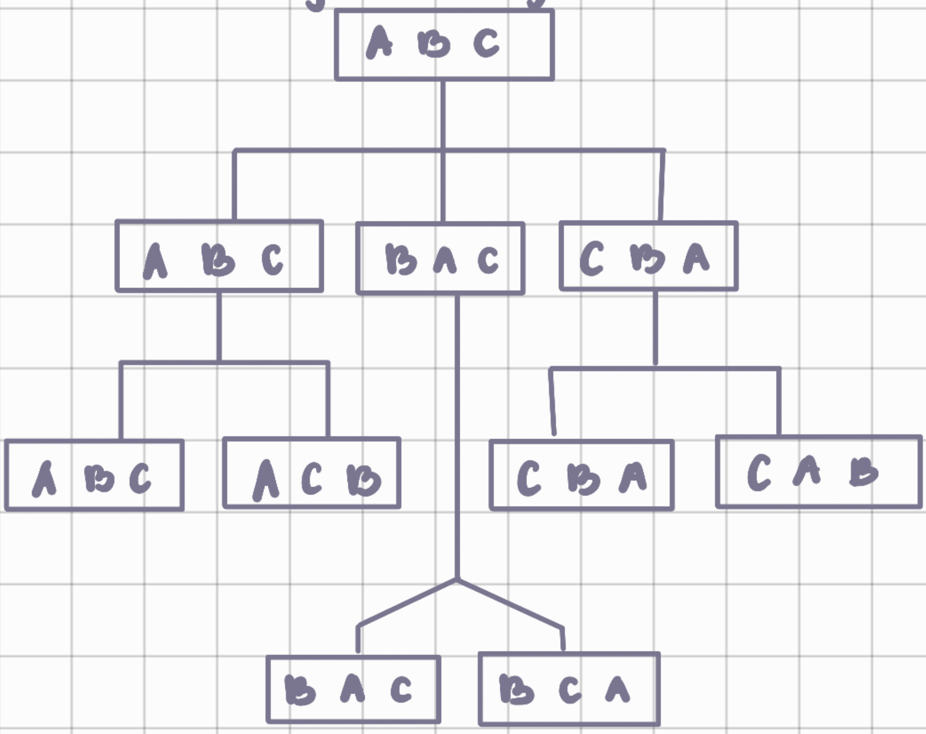
↳ **permutation** an arrangement of all or parts of a set of objects, with regard to the order arrangement.

→ formula : ${}^{n}P_{r} = \dfrac{n!}{(n-r)!}$

→ n = of the set from which elements are permutated

→ r = the size of each permutation

→ n, r = non negative integers



a computer scientist is trying to discover the keyword for a financial account. if the keyword only consists of 10 lower case characters, and no character can be repeated, how many different unique arrangements of characters exist?

$n = 26$ choosing from 26 possibilities

$r = 10$ choosing 10 characters

$$^{26}P_{10} = \frac{26!}{(26-10)!} = \frac{26!}{16!} = \frac{26(25)(24)\ldots(11)(10)(9)\ldots(1)}{(16)(15)\ldots(1)}$$

$$= 26(25)(24)\ldots(17) = 19275223968000$$