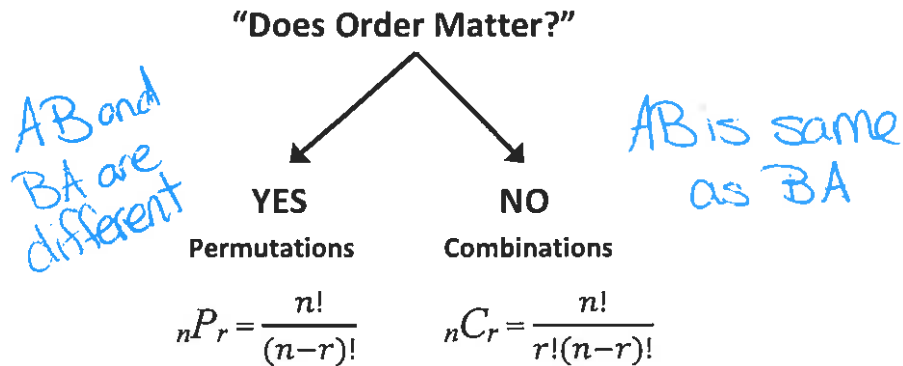
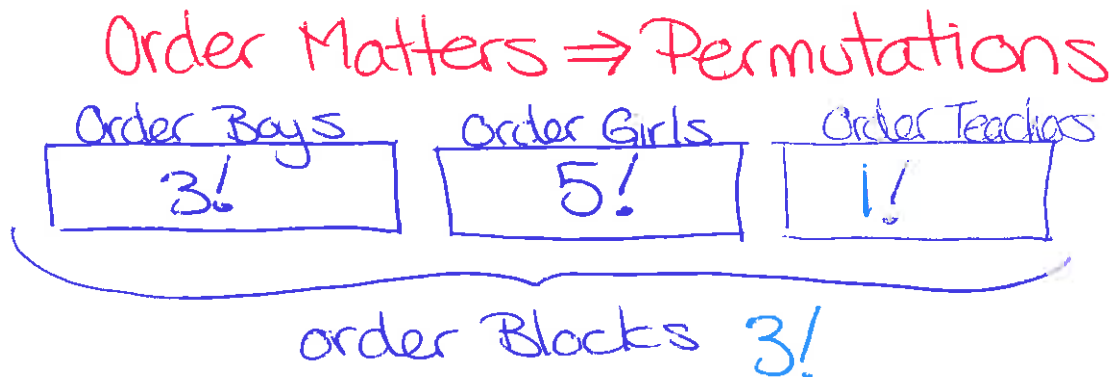


When solving problems, ask yourself:



Example 1: A piano teacher and her students are having a group photograph taken. There are three boys and five girls. The photographer wants the boys to sit together and the girls to sit together for one of the poses. How many ways can the students and teacher sit in a row of nine chairs for this pose?



$$3! \times 5! \times 1! \times 3!$$

$$= 6 \times 120 \times 1 \times 6$$

$$= 4320 \text{ ways to pose for picture}$$

Example 2: Combination problems are common in computer science. Suppose there is a set of 10 different data items represented by $(a, b, c, d, e, f, g, h, i, j)$ to be placed into four different memory cells in a computer. Only 3 data items are to be placed into the first cell, 4 data items in the second cell, 2 data items in the third cell, and 1 data item in the last cell. How many ways can the 10 data items be placed in the four memory cells?

order doesn't matter. (combination)

$$\begin{array}{cccc}
 \text{Cell 1} & \text{Cell 2} & \text{Cell 3} & \text{Cell 4} \\
 (10 \text{ data items}) & (7 \text{ items left}) & (3 \text{ items left}) & (1 \text{ item left}) \\
 \boxed{10C_3} & \times \boxed{7C_4} & \times \boxed{3C_2} & \times \boxed{1C_1} \\
 120 & \times 35 & \times 3 & \times 1
 \end{array}$$

$$\boxed{= 12600 \text{ ways to place data}}$$

Example 3: How many different five-card hands that contain at most one black card can be dealt to one person from a standard deck of playing cards?

Order doesn't matter (combinations)
 (add parts because they are different cases)

$$0 \text{ black } 5 \text{ Red} = {}_{26}C_0 \times {}_{26}C_5 = 1 \times 65780 = 65780$$

$$1 \text{ Black } 4 \text{ Red} = {}_{26}C_1 \times {}_{26}C_4 = 26 \times 14950 = 388700$$

$$65780 + 388700$$

$$\boxed{= 454480 \text{ different hands}}$$