O) Another important type of questions in ordering problems are:

Some distinct items should be together.

This part is from that type.

we have 8 people and 4 couples $M_1 W_1$: Couple$_1$ $M_2 W_2 : C_2$

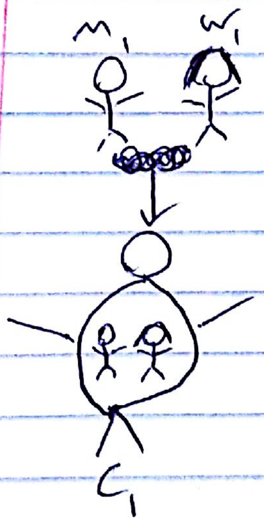
$M_3 W_3 : C_3$ $M_4 W_4 : C_4$

They want to sit together. one unacceptable examples:

$$\underset{\times}{M_1} \; \underbrace{W_2 \; M_2}_{\checkmark} \; \underset{\times}{W_1} \; \underbrace{W_3 \; M_3}_{\checkmark} \; \underbrace{M_4 \; W_4}_{\checkmark}$$

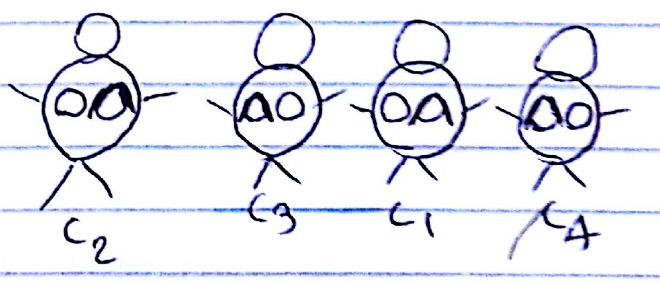
We try to coerce them into sitting together by bundling them together

as new person.



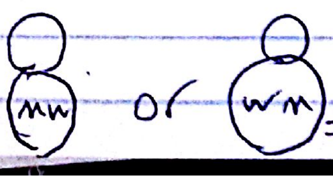
Now if we order new persons the condition is met:

one possible way:



4!

But inside each new person we have two possible ordering



$= 2!$ for each $\underline{C} \Rightarrow [2! \times 2! \times 2! \times 2!] \cdot 4!$

c) There is a special type of problems in which some items can not be adjacent. For solving these problems we need walls between those items to prevent them from being adjacent.

In this part we can not have adjacent women or men. Some unaccaptable

exampls: $M_1 M_2 \; W_1 \; M_3 \; W_2 \; M_4 \; W_3 W_4$

$M_1 M_2 M_3 M_4 W_1 W_2 W_3 W_4$

For solving this type first we look at problem to find out which items are restricted. In this qustion all men and women are rest

So we can choose each one. Suppose I choose Men as walls

Some possible ordering for walls:

$M_1 \quad M_2 \quad M_3 \quad M_4$

$M_2 \quad M_3 \quad M_1 \quad M_4$

# of orderings: $\underline{4} \; \underline{3} \; \underline{2} \; \underline{1} = 4!$

~~N~~Now between ~~each~~ two walls I have an empty spot for a women

(only one women can be in each spot) since they can not be adjacent

I have counted # of orderings of walls

So ordering is not important now

⊔ wall ⊔ wall ⊔ wall ⊔ wall ⊔

spots

I have ~~4~~ 5 spots for only 4 women. First I do not think about orderings of women and I only try to choose 4 spots from 5 possible for them, ~~B~~but $\binom{5}{4}$ is wrong because:

One possible way of choosing:

(x) wall (x) wall (x) wall wall (x)

X

because walls are men and they should not be adjacent

In other words I have to choose all these three spots

(?) wall ( ) wall ( ) wall ( ) wall (?)

and only one from these two = 2 ways

Now I have 4 spots for 4 different objects (women)

$$\left.\begin{matrix} w_1 \\ w_2 \\ w_3 \\ w_4 \end{matrix}\right\} \quad |4| \ |3| \ |2| \ |1| = 4!$$

Final result = $4! \times 2 \times 4!$