1. In how many ways can 12 people be seated in a row if

(a) person A must sit next to persons B and C; There are 10 choices for where person A can sit. Once that is chosen there are 2 choices for where B and C can sit and 9! choices of where the other people can sit. So there are

\[10(2)9!\]

arrangements.

(b) there are 6 men and 6 women and no 2 men or 2 women can sit next to each other; There are two choices for which gender sits first. This determines which chairs the men are in and which chairs the women are in. There are 6! ways to arrange both the men and the women so there are

\[2(6!)^2\]

possible arrangements.

(c) there are 6 men and they must sit next to each other? There are 7 choices for which chairs the men sit in. There are 6! ways to arrange both the men and the women so there are

\[7(6!)^2\]

possible arrangements.

2. 50 people show up at a volunteer project.

(a) How many ways are there to divide them into two groups of 10 and two groups of 15; There are \(\binom{50}{15,15,10,10}\) ways to divide a group into two labeled groups of 10 and two labeled groups of 15. We want unlabeled groups. So for each unlabeled group there are four labeled groups so the answer is

\[\frac{1}{4}\binom{50}{15,15,10,10}\]

(b) 10 people are needed for signing people in, 10 people are needed for information desk, 15 are needed at the refreshment stand and 15 are needed at the first aid booth. How many ways are there to assign the 50 volunteers to the jobs so that every person gets one assignment and every job gets filled?

\[\binom{50}{15,15,10,10}\]