

## Unit 9: Probability

### Example of Post 1: Initial Response

My salon, Hair It Is, is expanding to a second location, and I need to hire new people. In addition to our usual hair-related services, we're going to add a nail salon area and massage therapy. I'm looking to hire 7 hair stylists, 4 nail technicians, and 3 masseuses.

I have received resumes from many qualified applicants, and I've narrowed the choices to my top prospects. I've got 14 hair stylists, 8 nail technicians, and 6 masseuses from which to choose. In how many different ways can I staff this new branch?

This is an example of a combination because ....

Number of ways hair stylists can be chosen:

$$\begin{aligned} {}_{14}C_7 &= \frac{14!}{(14-7)!7!} \\ &= \frac{14!}{7!7!} \\ &= \frac{14 * 13 * 12 * 11 * 10 * 9 * 8 * 7!}{7!7!} \\ &= \frac{14 * 13 * 12 * 11 * 10 * 9 * 8}{7!} \\ &= \frac{17,297,280}{5,040} \\ &= 3,432 \end{aligned}$$

Number of ways nail technicians can be chosen:

$${}_8C_4 = \frac{8!}{(8-4)!4!} = \frac{8!}{4!4!} = \frac{8*7*6*5*4!}{4!4!} = \frac{8*7*6*5}{4!} = \frac{1,680}{24} = 70$$

Number of ways masseuses can be chosen:

$${}_6C_3 = \frac{6!}{(6-3)!3!} = \frac{6!}{3!3!} = \frac{6*5*4*3!}{3!3!} = \frac{6*5*4}{3!} = \frac{120}{6} = 20$$

So altogether, the number of different ways I can choose to staff my new location is:

$$3,432 * 70 * 20 = 4,804,800$$

Wow! I'd better get busy with those interviews!