1.

- $\binom{10}{2}\binom{10}{1}\binom{7}{1}$
- $\binom{10}{4}+\binom{10}{4}+\binom{7}{4}+\binom{5}{1}$
- $\binom{10+10+7+5}{4}-\binom{10+10+7}{4}$
- $\binom{10+7+5}{4}+\binom{10+7+5}{3}\binom{10}{1}+\binom{10+7+5}{2}\binom{10}{2}$

2.

$\binom{12}{1}\binom{4}{3}\binom{13}{2}\binom{4}{1}\binom{4}{1}$

3.

- $\binom{10}{2}\binom{6}{2}$
- $\binom{10+6+5}{5}-(\binom{10}{5}+\binom{6}{5}+\binom{5}{5})$

4.

$2 * P(20,2) * 2^3$ (there are 3 toppings of which each can either be used or not)

5.

- 5^7
- $9 * 10^6 - 5^7$
- $8 * 9^6$

6.

2^7 (there are 7 toppings of which each can either be used or not)

7.

- $20 * 19 * 18$
- $\binom{10}{2}\binom{10}{1} * 3!$

8.

we select an arbitrary element from [n]. If it is one of the elements we want to rank (we only want to rank k of them)

it will have k possible ranks then we recurse –> kP(n-1, k-1)

otherwise we don't want to rank it –> P(n-1, k)

9.

$\binom{5+8+10}{4}-\binom{8+10}{4}$