HW 7 CprE 310 Jacob Boicken

1.) a.) $\binom{15}{7}$

b.) i.) $\binom{9}{4} \cdot \binom{6}{3} = \frac{9!}{4! \cdot 5!} \cdot \frac{6!}{3! \cdot 3!}$

ii.) select 1 SE and then 6 from other 14

$= \binom{9}{1} \cdot \binom{14}{6} = 9 \cdot \frac{14!}{6! \cdot 8!}$

iii.) select 3 se and the 4 from other 12

$= \binom{9}{3} \cdot \binom{12}{4} = \frac{9!}{3! \cdot 6!} \cdot \frac{12!}{4! \cdot 8!}$

2.) 100 jellybeans w/ 4 varients

$n = 100 \quad r = 4$

$\rightarrow \binom{n+r-1}{r-1} = \binom{103}{3}$

3.) select first rook from 64 spaces and next rook from 49 spaces remaining that don't capture / are taken by first rook

$= \binom{64}{1} \cdot \binom{49}{1} = 64 \cdot 49$

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4.) a.) a^p b.) $a^p - a$

c.) If you go around the bracelet and select a bead as the starting bead of the string, then there is only possible combination to make that string. You can do this for each bead in the bracelet creating p number of strings that make the bracelet,

d.) We have $a^p - a$ strings of beads.

These map to a bracelet where p strings make 1 bracelet. A p-to-1 mapping.

So the division rule states If $f: A \to B$ is a d-to-1 function, then

$$|A| = d \cdot |B|$$

A is our strings, B is our braclets, and $d = p$ so

$$a^p - a = p \cdot \# \text{ of bracelets made}$$

so Fermat's Little theroem is true.