1 6.1: Counting

Food truck

1 dollar: cupcake

1 type of cake, 1 type of icing always.

Cake: {chocolate, blueberry, red velvet, peach, strawberry, vanilla} (6 types)

Icing: {mango, vanilla, cream cheese, coffee} (4 types)

Product rule: $6 \cdot 4 = 24$

Pizza

3 dollars: pizza

1 topping, sauce, crust always.

Crust: {thin, deep dish} (2 types)

Sauce: {tomato, pesto, alfredo, BBQ} (4 types)

Topping: {pineapple, pepperoni, mushrooms} (3 types)

(Extended) product rule: $2 \cdot 4 \cdot 3 = 24$

1 free cupcake $\oplus$ 1 free pizza

How many choices? Sum rule: $24 + 24 = 48$

Interns

12 offices (empty and unique)

2 interns (Zim and Gir, unique)

How many ways to have office assignments?

If they must share an office: 12 possibilities.

If they must NOT share an office: $12 \cdot 11$ possibilities.

If sharing doesn't matter: $12 + 12 \cdot 11$ (there is no way to share and not share at the same time)

Car tag

Format: 3 letters and 4 numbers (LLLDDDD).

26 possible letters, 10 possible numbers.

Possibilities: $26^3 \cdot 10^4$

If we want to avoid one certain sequence of 3 starting characters (that might be obscene), we would have $26^3 \cdot 10^4 - 10^4$ possibilities (inclusion-exclusion technique). Note we are not taking into account the spelling itself.

How many bit strings are of length 7? 2^7

BASIC language variable names

Rules:

1. Starts with a letter (one of 26 letters), and is otherwise alphanumeric (not case-sensitive).

2. Maximum length is 2.

3. Cannot use a reserved word. There are 5 "collisions" (reserved words of length 2).

$V = V_1 + V_2$

$V_1 = 26$

$V_2 = 26 \cdot (26 + 10)$

so $V = 962$

Removing the 5 reserved word collisions, $V_f = 957$

Passwords

Length 6 to 8, alphanumeric: $36^6 + 36^7 + 36^8$