

# Problem 1 - 1, 2, 3 (3.1, 3.2), 4, 5

1.        e a              

st  
↑  
appear  
somewhere

X = random  
alpha

2·26 X e a S/E S/E

+ 2·26 S/E e a X S/E

+ 2·26 S/E e a S/E X

$$\binom{26}{1} \cdot \binom{2}{1} \cdot \binom{1}{1}$$

SS

$$(2 \cdot 26) + (2 \cdot 26) + (2 \cdot 26) - 6$$

possible repeats  
↓

x → Seats  
Seats ← x  
Seats ← x

-2

Seats ← x  
Seats ← x  
Seats ← x  
Seats ← x

-1

x  
teats  
teats ← x  
teats ← x

-2

teats ← x  
teats ← x  
teats ← x  
teats ← x

-2

150 possible strings

2. Alice, Bob, Carlos

6 story building

0,0,3,0,0    3,0,0,0,0  
0,0,0,3,0    0,0,0,0,3  
2,3,4,5,6

order don't matter  
Carlos Bob Alice

$$\binom{5}{1} \binom{5}{1} \binom{4}{1} = \boxed{100}$$

$5 \cdot 4 \cdot 4$

3. A)

21 pokemons 7 water, 5 fire, 9 others

3 are selected  
just add up different hands

$$\begin{aligned}
 & \overset{315}{\binom{7}{1} \cdot \binom{5}{1} \cdot \binom{9}{1}} + \overset{84}{\binom{7}{0} \cdot \binom{5}{0} \cdot \binom{9}{3}} \\
 & \quad \quad \quad \begin{matrix} w & f & o \\ & 180 & \end{matrix} \\
 & + \binom{7}{0} \cdot \binom{5}{1} \cdot \binom{9}{2} + \overset{252}{\binom{7}{1} \cdot \binom{5}{0} \cdot \binom{9}{2}} \\
 & \quad \quad \quad \begin{matrix} & f & oo \\ w & & oo \end{matrix} = \boxed{831 \text{ combinations}}
 \end{aligned}$$

4 different possibilities of hand

B)

10 random pokemon cards

↑  
stars and bars problem

$$\begin{aligned}
 & \dots - | \dots | \dots \\
 & \quad \quad \quad \swarrow \text{bars + cards} \\
 & C \left( \begin{matrix} 12 \\ 10 \end{matrix} \right) \leftarrow \text{but choose only 10 cards} \\
 & \quad \quad \quad \begin{matrix} n=10 & k=3 \\ \left( \begin{matrix} 10+3-1 \\ 10 \end{matrix} \right) & \uparrow \\ & \text{types} \end{matrix}
 \end{aligned}$$

66 possible combinations

4. 4 identical copiers make 6 additional copies

1	5	1	0	0
	C	C	C	C
2	4	2	0	0
	C	C	C	C
3	4	1	1	0
	C	C	C	C
4	3	2	1	0
	C	C	C	C
5	3	1	1	1
	C	C	C	C
6	2	2	2	0
	C	C	C	C
7	2	2	1	1
	C	C	C	C
8	3	3	0	0
	C	C	C	C

$$\begin{array}{cccc}
 5 & 1 & 0 & 0 \\
 c & c & c & c \\
 = & 0 & 0 & 1 & 5 \\
 & c & c & c & c
 \end{array}$$
 Since identical copiers order doesn't matter

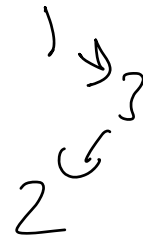
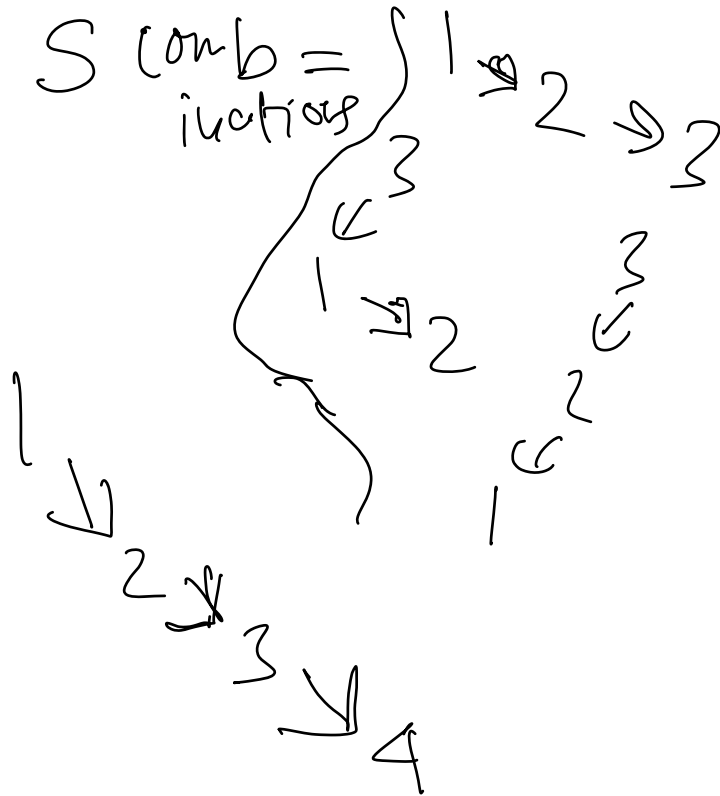
8 ways to copy 6 documents with identical copiers

5.) 13 noch

dienst 0-12

$$\text{root} = 8$$

root  $\rightarrow$  left = 5

$$19 \times 19 \times 2 = 1176$$


1 node  $\rightarrow$  1  
3 node  $\rightarrow$  5  
2 node  $\rightarrow$  2  
4 node  $\rightarrow$  14

0, 1, 2, 3, 4, 42

9, 10, 11, 12  
19

6,7  
2



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