

11/21/2022

→ COMBINATORICS

→ PROBABILITY

### PRACTICE

Twenty workers are assigned to 20 different jobs, one to each. How many different assignments exist?

20!

How many ways can 10 people be seated in a row if...

- there are no restrictions on seating?
- two people insist on sitting next to each other?
- there are 5 men and 5 women in alternating order?
- there are 5 men and 5 women and all the men sit next to each other?
- there are 5 couples and they must sit next to each other?

a. 10!

b.  $\binom{9}{1} \cdot 2! \cdot 8!$

c.  $2 \cdot 5!^2$

d.  $\binom{6}{1} \cdot 5!^2$

e.  $5! \cdot 2!^5$

A class consists of 10 men and 12 women. How many ways can you pair off 5 men and 5 women?

$$\binom{10}{5} \cdot \binom{12}{5} \cdot 5!$$

A person has 10 friends and invites 6 of them to a party. How many possible invite lists if ...

- 2 of the friends are feuding and refuse to attend together?
- 2 of the friends will only attend together?

a.  $\binom{10}{6} - \binom{8}{4}$

b.  $\binom{8}{6} + \binom{8}{4}$

There are 20 families; 4 families have 1 child, 8 families have 2 children, 5 families have 3 children, 2 families have 4 children, and 1 family has 5 children

- 1 family is chosen at random. What is the probability that it has  $i$  children for  $i = 1, 2, 3, 4, 5$
- 1 child is randomly selected. What is the probability that the child comes from a family having  $i$  children for  $i = 1, 2, 3, 4, 5$

a.

$i =$	1	2	3	4	5
$P(i) =$	4/20	8/20	5/20	2/20	1/20

b.

$i =$	1	2	3	4	5
$P(i) =$	4/48	16/48	15/48	8/48	5/48

An urn contains  $M$  white balls and  $N$  black balls. You draw a random sample of  $r$  balls. What is the probability the sample contains ...

a. exactly  $k$  white balls?

b.  $k$  or less white balls?

a. 
$$\frac{\binom{M}{k} \binom{N}{r-k}}{\binom{M+N}{r}}$$

b. 
$$\sum_{i=0}^k \frac{\binom{M}{i} \binom{N}{r-i}}{\binom{M+N}{r}}$$