

## Counting Rules

**Sum Rule:** If you are choosing one thing between  $n$  options in one group and  $m$  in another group with no overlap, the total number of options is:  $n + m$ .

**Product Rule:** If you have a sequential process, where step 1 has  $n_1$  options, step 2 has  $n_2$  options,...,step  $k$  has  $n_k$  options, and you choose one from each step, the total number of possibilities is  $n_1 \cdot n_2 \cdots n_k$

18

## Baseball Outfits

The Husky baseball team has three hats (purple, black, gray)

Three jerseys (pinstripe, purple, gold)

And three pairs of pants (gray, white, black)

How many outfits are there (consisting of one hat, jersey, and pair of pants) if

the pinstripe jersey cannot be worn with gray pants,  
the purple jersey cannot be worn with white pants,  
and the gold jersey cannot be worn with black pants.

22

## Assigning Books

We have 5 books to split to 3 people (Alice, Bob, and Charlie)

Every book goes to exactly one person, but each person could end up with no books (or all of them, or something in between).

Attempt 1: We're choosing subsets!

Alice could get any of the  $2^5 = 32$  subsets of the books.

Bob could get any of the  $2^5 = 32$  subsets of the books.

Charlie could get any of the  $2^5 = 32$  subsets of the books.

Total is product of those three steps  $32 \cdot 32 \cdot 32 = 32768$

26

## Strings

How many strings of length 5 are there over the alphabet  $\{A, B, C, \dots, Z\}$ ? (repeated characters allowed)

How many binary strings of length  $n$  are there?

36