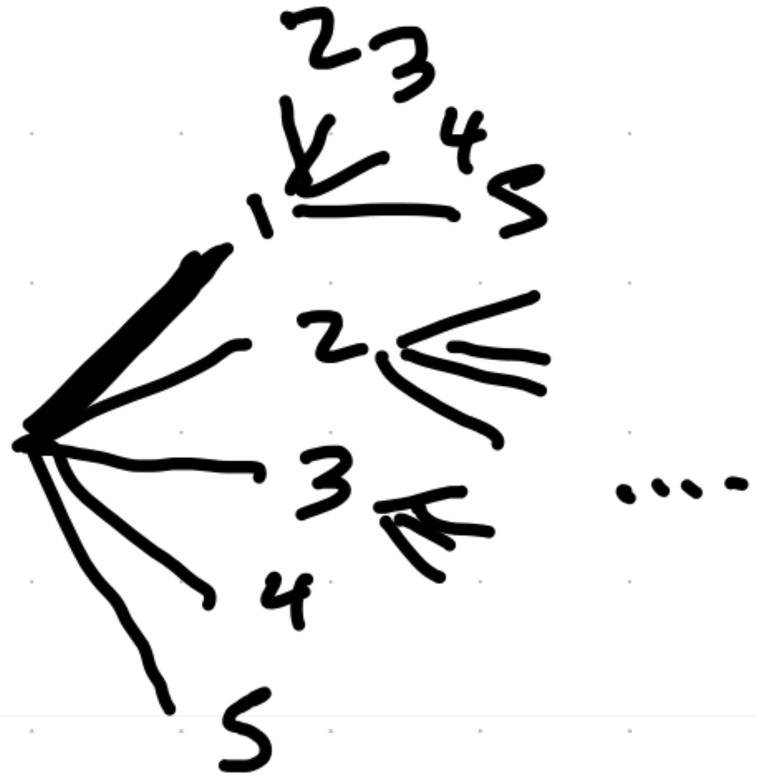
$\{1, 2, 3, 4, 5\}$



How many permutations if we pick 2 things?

$5 \cdot 4 = 20$

$${}_nP_r = \frac{n!}{(n-r)!}$$

$$\frac{5 \cdot 4 \cdot \cancel{3 \cdot 2 \cdot 1}}{\cancel{3 \cdot 2 \cdot 1}}$$

$${}_5P_2 = \frac{5!}{3!} = 5 \cdot 4$$

$\{1 \dots 10\}$

$${}_{10}P_3 = 10 \cdot 9 \cdot 8 = 740$$

Combinations

A B G

Gold Silver Bronze

G B A

Gold Silver Bronze

10 swimmers
{A ... J}

order does not matter

What are all the ways to choose who did not get a medal?

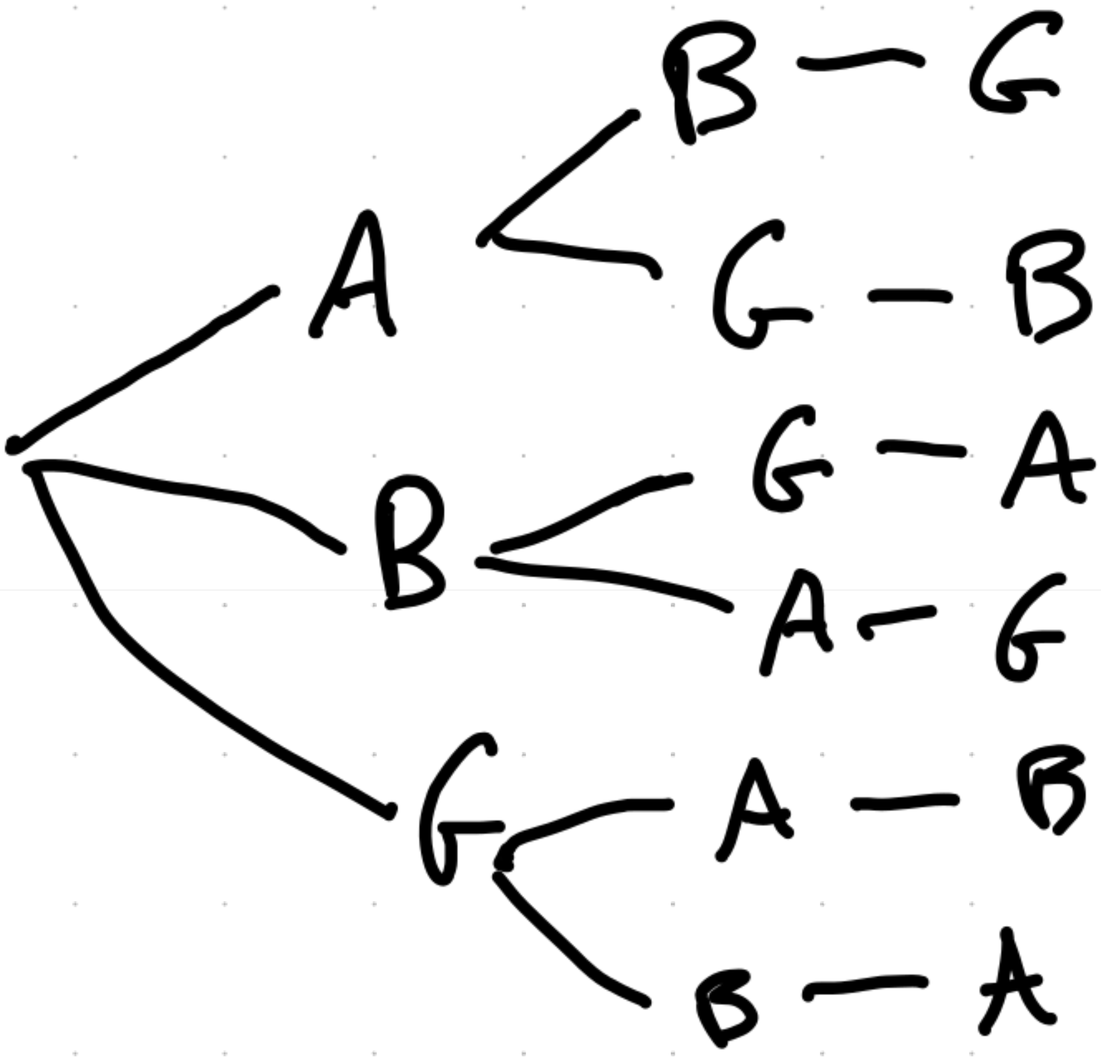
Permutations
order does matter

Combinations
order does not matter

Say we have 10 things and we pick 3 where order does not matter... "10 choose 3"

10 swimmers, choose 3

ABG



$$_{10}P_3 = \frac{10!}{7!} =$$

$$= 740$$

$$_{10}C_3 = \frac{740}{3!}$$

$$= \frac{740}{6}$$

$$ {}_nC_r = \frac{n!}{(n-r)!\,r!} = \frac{{}_nP_r}{r!} $$

$$ {}_{24}C_2 = \frac{24!}{(22!)\,2!} $$

2301

$24C_2 = \frac{24P_2}{2!}$

$24P_2 = 24 \cdot 23$

Darby

Chris

$|24|$

Darby Chris

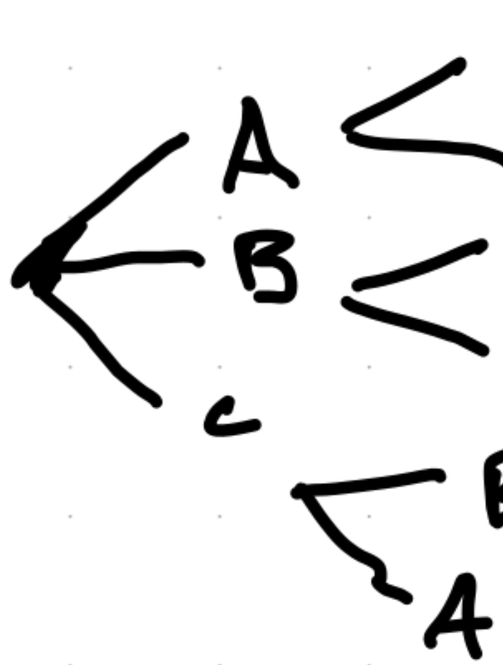
Chris Darby

$2!$

Darby - Chris

Chris - Darby

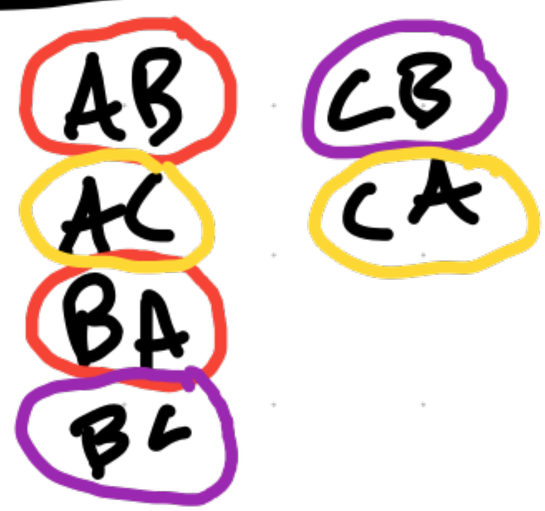
{A B C} = choose 2



$$_3P_2 = \frac{3!}{1!} = 3 \cdot 2 = 6$$

$$_3C_2 = \frac{3!}{1!\,2!} = 3$$

Permutations



Combinations