

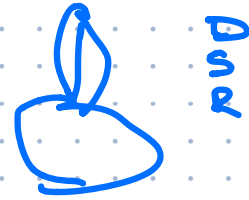
Lineups and Partial Lineups $\Rightarrow$ Permutations

In an 8-person race how many finishing orders are possible?

A B C D E F G H

D B H G A F C E

G H E C D A B F



$$\rightarrow \frac{8}{1st} \cdot \frac{7}{2nd} \cdot \frac{6}{3rd} \cdot \frac{5}{4th} \cdot \frac{4}{5th} \cdot \frac{3}{6th} \cdot \frac{2}{7th} \cdot \frac{1}{8th} = 40,320 \leftarrow \text{---}$$

$$= 8 \text{ factorial}$$

$$= \boxed{8!}$$

$$n! = n (n-1) (n-2) (n-3) \dots 1$$

$$1! = 1 \quad 2! = 2 \cdot 1 = 2 \quad 3! = 3 \cdot 2 \cdot 1 = 6$$

$$4! = 4 \cdot 3 \cdot 2 \cdot 1 = 24 \quad 5! = 5 \cdot 4! = 120 \quad 6! = 6 \cdot 5! = 720$$

In an 8-person race how many medaling orders are possible?

$\hookrightarrow$ Go Si Br

$$\frac{8}{Go} \cdot \frac{7}{Si} \cdot \frac{6}{Br} = 336$$

$$\frac{8 \cdot 7 \cdot 6 \cdot \cancel{5} \cdot \cancel{4} \cdot \cancel{3} \cdot \cancel{2} \cdot \cancel{1}}{\cancel{5} \cdot \cancel{4} \cdot \cancel{3} \cdot \cancel{2} \cdot \cancel{1}} = \frac{8!}{5!} = \frac{8!}{(8-3)!}$$

The number of permutations of ³r items chosen from among ⁸n items is:

$${}_nP_r = P(n, r) = \frac{n!}{(n-r)!} = \frac{8!}{(8-3)!} = \frac{8!}{5!}$$

! x! n!

8! - 3!

5! $\Rightarrow$ 120