

BE-1B TUESDAY 4-22-08

- ① Name this symbol → !
- ② How do you read $5!$
- ③ What is $5!$
- ④ How many ways CAN 7 cars be parked in 7 parking spots?
In 2 spots?

• Homework review — Pg 756 #1-8

New NOTATION :

$${}^5P_2 \text{ means } \frac{5!}{(5-2)!} = \frac{5!}{3!}$$

$${}^5C_2 \text{ means } \frac{5!}{(5-2)!(2)!} = \frac{5!}{3!2!}$$

What do these mean?

①

THE type OF ARRANGEMENTS WE
HAVE BEEN dealing WITH ARE
called "PERMUTATIONS."



ORDER IS IMPORTANT

A B C IS NOT THE SAME
AS A C B

EX) Number of ways 6 books on shelf
can be arranged: $6!$

EX) Number of ways 6 books can be
arranged on shelf that only holds
2 books: $6 \cdot 5$ OR $\frac{6!}{4!}$

(2)

The case of 6 books on a shelf that holds 2 is:

6 books taken 2 at a time

It is a permutation and is written

$${}_6P_2$$

where ${}_6P_2 = \frac{6!}{4!}$

$$\begin{array}{cc} \uparrow & \uparrow \\ N & r \end{array}$$

or $6 \cdot 5$
(FCP way)

General: ${}_NP_r = \frac{N!}{(N-r)!}$

Note: ${}_6P_6$ means $\frac{6!}{(6-6)!} = \frac{6!}{0!} = \frac{6!}{1}$

6 books taken 6 at a time

PERMUTATION

AN ARRANGEMENT OF items
WHERE ORDER IS IMPORTANT.

$${}_N P_r = \frac{N!}{(N-r)!}$$

COMBINATION

AN ARRANGEMENT OF items
WHERE ORDER DOES NOT MATTER

$${}_N C_r = \frac{N!}{(N-r)! r!}$$

EX) You are putting 8 books on a shelf that holds 3 books, how many combinations of 3 books are there? (ABC same as ACB or CBA etc.)

$${}_8 C_3 = \frac{8!}{(5)! 3!} = \frac{8 \cdot 7 \cdot 6}{3 \cdot 2 \cdot 1} = \boxed{56}$$

4

NOTE: WHEN ORDER IS IMPORTANT,
more arrangements are possible.
BUT WHEN ORDER IS NOT IMPORTANT,
the number of arrangements are
less - the EXACT amount less is
found by $\div$ by $r!$

EX 5
pg 763

Pick 12 of 16 students to be
peer tutors. How many ways
can you pick them?

$$\begin{aligned}\text{Order NOT important} \therefore nCr &= \frac{n!}{(n-r)!r!} \\ 16C_{12} &= \frac{16!}{4!12!} = \frac{\overset{4}{16} \cdot \overset{5}{15} \cdot \overset{7}{14} \cdot 13}{\underset{1}{4} \cdot \underset{1}{3} \cdot \underset{1}{2} \cdot 1} \\ &= (140)(13) \\ &= \boxed{1820}\end{aligned}$$

How about 6P_1 ?

$$\frac{6!}{5!} = \frac{\cancel{6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}}{\cancel{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}}$$

SIX books taken ONE AT A TIME

EX 1
Pg
760

4 people apply for 2 positions,
how many ways can they be
hired?

$${}^4P_2 = \frac{4!}{2!} = 4 \cdot 3 = \boxed{12}$$

How would you solve this?

$$(6P_4)(5C_2) = ?$$

$$\left(\frac{6!}{2!}\right)\left(\frac{5!}{3!2!}\right)$$

$$(6 \cdot 5 \cdot 4 \cdot 3) \left(\frac{5 \cdot \cancel{4}^3}{\cancel{2} \cdot 1}\right)$$

$$(360)(10) = \boxed{3600}$$

NOTE: MOST SCIENTIFIC CALCULATORS
HAVE nPr AND nCr KEYS

Read: Ch 14-2

CW/

HW: Pg 764-765 # 14-33