PERMUTATIONS INVOLVING DIFFERENT OBJECTS

Note Title 1/8/2013

- FACTORIAL IS THE PRODUCT OF CONSECUTIVE NUMBERS IN DECREASING ORDER TO THE NUMBER ONE.

IE $5! = 5 \times 4 \times 3 \times 2 \times 1 = 120$

IE $\frac{9!}{6!} = \frac{9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1}{6 \times 5 \times 4 \times 3 \times 2 \times 1} = 504$

$= \frac{9 \times 8 \times 7 \times 6!}{6!} = 504$

IE $\frac{(n+2)!}{n!} = \frac{(n+2)(n+1)(n)!}{n!} = (n+2)(n+1)$

Ex DETERMINE THE NUMBER OF DIFFERENT WAYS 5 PEOPLE CAN BE ARRANGED IN A LINE

SOLN ORDER IS IMPORTANT
WITH 5 PEOPLE ∴ $n = 5$

$5! = 120$

- IN SOME SITUATIONS NOT ALL OF THE n OBJECTS ARE BEING CONSIDERED IN THE ARRANGEMENT
- PERMUTATIONS OF n DISTINCT OBJECTS TAKEN r AT A TIME, THE NOTATION ${}_nP_r$ IS USED TO ABBREVIATE THE NUMBER OF PERMUTATION

OF n DISTINCT OBJECTS TAKEN r AT A TIME

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

IE 8 STUDENTS, 3 MUST PRESENT THEIR PROJECTS.

HOW MANY POSSIBLE ARRANGEMENTS OF THE STUDENTS ARE POSSIBLE?

SOLN 8 STUDENTS $\therefore n = 8$

ONLY 3 NEEDED $\therefore r = 3$

$$ {}_8P_3 = \frac{8!}{(8-3)!} = \frac{8!}{5!} = 336 $$

- SOLVING FOR n AND r

IE $\quad {}_nP_2 = 12$

SOLN $\quad {}_nP_r = \dfrac{n!}{(n-r)!}$

$$\frac{n!}{(n-2)!} = 12$$

$$\frac{(n)(n-1)\cancel{(n-2)!}}{\cancel{(n-2)!}} = 12$$

$$n^2 - n = 12$$

$$n^2 - n - 12 = 0$$

$$(n-4)(n+3) = 0$$

$n = 4$ $\quad n = \cancel{-3}$

If $\quad {}_{10}P_r = 90$

$$\frac{10!}{(10-r)!} = 90$$

$$\frac{10!}{90} = (10-r)!$$

$$\underbrace{10 \times 9}_{2}$$

$$10P_2 = 90$$

If $\quad {}_{12}P_r = 1320$

$$\underbrace{12 \times 11 \times 10}_{3}$$

$r = 3$

H/W SECT 7.2 #1-11

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