

BE-Precalc | TUESDAY 1-26-10

- ① A bag of NUTS has 12 WALNUTS,
8 pecans, and 6 cashews. How many
ways can 4 of each be drawn?
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Ch. 13-2 PERMUTATIONS WITH REPETITIONS AND CIRCULAR PERMUTATIONS

Ex 1
Pg 846

How many 8 letter patterns
can be formed from the
letters of the word

"PARABOLA" ?

①②③④⑤⑥⑦⑧

All of the letters except "A" are
unique. There are 3 "A"s. If all
8 letters were unique it would simple

$$\text{be } {}_8P_8 \Rightarrow \frac{8!}{(8-8)!} = 8!$$

BUT this needs to be $\downarrow$ by the
number of arrangements of "a" since they
are all the same $\Rightarrow 3 \cdot 2 \cdot 1$ or $3!$

$$\therefore \text{Answer} \Rightarrow \frac{8!}{3!} = 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 = \boxed{6720}$$

EX 2
Pg 846

Number of 11-letter patterns from

"M 1 5 5 1 5 5 1 P P 1"

$$\begin{array}{c} \uparrow \\ 4! = 4 \cdot 3 \cdot 2 \cdot 1 \\ \uparrow \\ 4! = 4 \cdot 3 \cdot 2 \cdot 1 \\ \uparrow \\ 2! = 2 \cdot 1 \end{array}$$

$$\begin{aligned} \frac{{}_{11}P_{11}}{4!4!2!} &= \frac{11 \cdot 10 \cdot 9 \cdot 8 \cdot 7 \cdot 6 \cdot 5}{4 \cdot 3 \cdot 2 \cdot 1 \cdot 2 \cdot 1} \\ &= \frac{1,663,200}{48} = \boxed{34650} \end{aligned}$$

Ex Number of 7-letter patterns from:

"A 1 g e b r A"

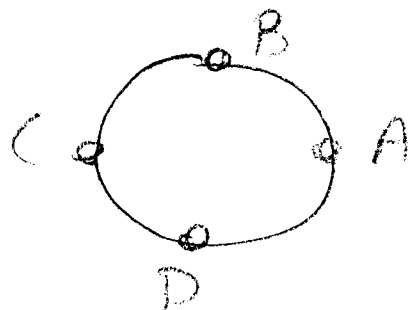
$$\begin{aligned} \Rightarrow \frac{{}_7P_7}{2!} &= \frac{7!}{2!} = 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \\ &= \boxed{2520} \end{aligned}$$

Circular PATTERNS

Problem $\Rightarrow$ As long as you are only rotating the circle, the pattern stays the same.

$\Rightarrow$ Reduce the possible arrangements by the number of positions on the circle.

(Ex) 4 letters in a circle, how many arrangements $\Rightarrow$ "A, B, C, D"



Normally $\Rightarrow 4P_4$

But 4 rotations are the same

$$\therefore \frac{4P_4}{4} = \frac{4!}{4} = \frac{4 \cdot 3 \cdot 2 \cdot 1}{4} = \boxed{6}$$

EX3
PG 847

9 bowls of food on a
"LAZY SUSAN", how many
Arrangements $\Rightarrow$

Circular $\Rightarrow$ 9 positions

$$\therefore \frac{{}_9P_9}{9} = \frac{9!}{9} = \frac{9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{9}$$

$$= \boxed{40,320}$$

EX4
PG 848

If A circular arrangement has a
fixed "reference" point, it changes
to a linear permutation.

7 people around a dinner table with a
window $\Rightarrow \boxed{7!}$ arrangements $\Rightarrow$ linear

• Homework: Pg. 849 #4-11

• Return / Review Quiz 3.