

## Lesson 5: Permutations Involving Groups

### GOAL:

- To determine the number of permutations possible when some of the objects are grouped.
- To determine the complement of the number of permutations where grouping is involved.

In the previous lesson you looked at permutations with some common restrictions. This lesson focusses on a new type of restriction, when some of the items being permuted must stay in a group.

### Example 1

In how many ways can you rearrange the letters in the word **MAGPIE** if the word 'GAP' must show up somewhere in the re-arrangement?

Permutation:

group  
↓  
4 3 2 1

$$4! = 4 \times 3 \times 2 \times 1$$

$$= 24 \text{ ways}$$

### Example 2

In how many ways can you rearrange the letters in the word **MAGPIE** if the letters **AGP** must remain together?

$$= 4! \cdot 3!$$

$$= 24 \times 6$$

$$= 144 \text{ ways}$$

AGP can be arranged 6 ways

AGP  
APG  
GPA  
PGA  
GAP  
PAG