Circular Permutations

Circular Permutations: a special case of permutation where the arrangement of things is in a circular pattern

The number of circular permutations of n different things is:

$$(n-1)! = (n-1)(n-2)\cdots(2)(1)$$

The number of permutations of n different things around a key ring and the like is:

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

Practice Exercises

Solve each problem completely.

1. In how many ways can 10 different colored toy horses be arranged in a merry-go-round?
2. In how many ways can 9 people be seated at a round table?
3. In how many ways can nine different colored beads be arranged on a bracelet?
4. In how many ways can eight keys be arranged on a key ring?
5. Snow white arranges the seven dwarfs around a maypole.
   a. In how many ways can she arrange them?
   b. In how many ways can she do it if Doc and Sleepy are to be together?
   c. In how many ways can she do it if Grumpy and Dopey must not be together?

Problem Set

Solve each problem completely.

1. In how many ways can five boys and three girls be arranged in a circle if the girls must always stand together?
2. Mother, father, and four children stand in a circle. In how many ways can they arrange themselves if mother and father stand opposite each other?
3. In how my ways can ten keys be arranged on a key ring?
4. If a spinner is divided in 7 equal parts, how many ways can you arrange 7 colors in it?
5. King Arthur arranges his 13 knights around a circular table.
   a. In how many ways can he arrange them?
   b. In how many ways can he do it if Galahad and Parcivale are to be seated together?
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