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## Contents

Theorem of circular permutation . . . . .	2
Derivation of expression of permutation of objects in a circle . . . . .	2
Expression of permutation of objects in a circle . . . . .	2
Expression of permutation of objects in a circle when clockwise and anti clockwise positions are not considered . . . . .	2
Expression of permutation of objects in a circle when a position of seat is fixed	2

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## Theorem of circular permutation

The total number of permutation of set of 'n' objects arranged in a circle is  $(n - 1)!$

### Derivation of expression of permutation of objects in a circle

- n objects

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$$a_1, a_2, a_3 \dots a_n$$

- For every arrangement in circle, n arrangements in a line
- Permutation of 'n' objects at a circle as P.

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$${}_nP = n!$$

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$$P = \frac{n!}{n}$$

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

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$$P = (n - 1)!$$

### Expression of permutation of objects in a circle

$$P = (n - 1)!$$

### Expression of permutation of objects in a circle when clockwise and anti clockwise positions are not considered

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

### Expression of permutation of objects in a circle when a position of seat is fixed

$$P = n!$$