## Example: Factorials

Equation of Factorials

$$n! = (n) \times (n-1) \times (n-2) \times \ldots \times 1$$

- $1! = 1$
- $0! = 1$

## Example

- $3! = 3 \times 2 \times 1 = 6$
- $4! = 4 \times 3 \times 2 \times 1 = 24$
- $5! = 5 \times 4 \times 3 \times 2 \times 1 = 120$
- $7! = 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 5,040$
- Zero factorial : Remark $0! = 1$ not 0.

$$0! = 1$$

Importantly

$$\begin{aligned} n! &= n \times (n-1)! && (1) \\ &= n \times (n-1) \times (n-2)! && (2) \\ &= \ldots && (3) \end{aligned}$$

- $6! = 6 \times 5! = 6 \times 5 \times 4!$

### Binomial Coefficients

$$\binom{5}{2} = \frac{5!}{2!\,(5-2)!} = \frac{5.4.3!}{2!.3!} = \frac{5.4}{2.1} = 10$$

$$\binom{5}{0} = \frac{5!}{0!\,(5-0)!} = \frac{5!}{0!.5!} = \frac{5!}{2!} = 1$$

Recall $0! = 1$