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Spé Maths

Terminale

Bernoulli & binomiale



CORRIGÉ DE L'EXERCICE

FACTORIELLE

3

CORRECTION

Simplifier les expressions comportant la notion de factorielle:

On rappelle que pour $n \geq 0$: $n! = n \times (n-1) \times (n-2) \times \dots \times 2 \times 1$.

1. Pour $n \geq 1$, on a:

$$A = \frac{(n-1)!}{(n+1)!} = \frac{(n-1)!}{(n+1) \times n \times (n-1)!} = \frac{1}{n \times (n+1)}$$

$$\text{Ainsi: } \frac{(n-1)!}{(n+1)!} = \frac{1}{n \times (n+1)}$$

2. Pour $n \geq 1$, on a:

$$B = \frac{(2n+1)!}{(2n-1)!} = \frac{(2n+1) \times (2n) \times (2n-1)!}{(2n-1)!} = (2n) \times (2n+1)$$

$$\text{Ainsi: } \frac{(2n+1)!}{(2n-1)!} = (2n) \times (2n+1)$$

3. Pour $n \geq 1$, on a:

$$C = \frac{n!}{n} - (n-1)! = \frac{n! - n \times (n-1)!}{n} = \frac{n! - n!}{n} = 0.$$

$$\text{Ainsi: } \frac{n!}{n} - (n-1)! = 0.$$

3. Pour $n \geq 1$, on a:

$$\begin{aligned} D &= \frac{1}{n!} - \frac{1}{(n+1)!} = \frac{1}{n!} - \frac{1}{(n+1) \times n!} \\ &= \frac{1}{n!} \left(1 - \frac{1}{n+1} \right) \\ &= \frac{1}{n!} \left(\frac{n}{n+1} \right) \\ &= \frac{n}{(n+1) \times n \times (n-1)!} \\ &= \frac{1}{(n+1) \times (n-1)!}. \end{aligned}$$

$$\text{Ainsi: } \frac{1}{n!} - \frac{1}{(n+1)!} = \frac{1}{(n+1) \times (n-1)!}.$$