

== Interior ==

①

$$a) 4! = 24$$

$$4 \cdot 2 \cdot 3 \cdot 2 = 24$$

$$4! = 24$$

$$b) 5! - 6! = -600$$

$$5! - 6 \cdot 5!$$

$$\left(5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 120 \right)$$

$$\rightarrow 120 - 6 \cdot 120$$

$$120 - 720$$

$$-600$$

$$c) \frac{9!}{6!} = 504$$

$$\frac{9!}{6!} = \frac{9 \cdot 8 \cdot 7 \cdot \cancel{6!}}{\cancel{6!}} = 9 \cdot 8 \cdot 7 = 504$$

$$d) \frac{98!}{100!} = \frac{1}{9999}$$

$$\frac{98!}{100!} = \frac{\cancel{98!}^1}{100 \cdot 99 \cdot \cancel{98!}}$$

$$= \frac{1}{9999}$$

②

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

$$\hookrightarrow (n+1)! = (n+1)n!$$

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

↪ evidência:

$$\frac{1}{n!} * \left(1 - \frac{n}{n+1}\right) = \frac{1}{n!} * \frac{(n+1-n)}{(n+1)} = \frac{1}{n!} * \frac{1}{(n+1)} = \frac{1}{\underbrace{(n+1) * n!}_{(n+1)}}$$

① $\frac{1}{n+1}$

③

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

↳ corta-se os iguais

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

(4)

$$\frac{(n+2)! * (n-2)!}{(n+1)! * (n-1)!} = 4 \Rightarrow \frac{(n+2) * \cancel{(n+1)!} * (n-2)!}{\cancel{(n+1)!} * (n-1) * (n-2)!} = 4$$

$$= \frac{(n+2) * \cancel{(n-2)!}}{(n-1) * \cancel{(n-2)!}} = \frac{n+2}{n-1} = \frac{4}{1} \quad \text{so } n+2 = 4(n-1)$$

$$n+2 = 4n-4$$

$$2+4 = 4n-n$$

$$6 = 3n$$

$$\text{PAR} \Rightarrow \boxed{n=2}$$

⑤

$$\frac{(n+1)! - n!}{(n+1)!} = \frac{7}{n+1} \Rightarrow \frac{(n+1) * n! - n!}{(n+1) * n!} = \frac{7}{n+1}$$

$n!$ em evidência:

$$\frac{\cancel{n!} (n+1-1)}{(n+1) * \cancel{n!}} = \frac{7}{n+1} = \frac{n+1-1}{n+1} = \frac{7}{n+1} \vee \frac{n}{n+1} = \frac{7}{n+1}$$

Como os denominadores são iguais, então os numeradores também serão:

$$n = 7$$

$$\textcircled{6} (n-1)! * [(n+1)! - n!] = (n-1)! * [(n+1) \cdot n(n-1)! - n \cdot (n-1)!]$$

$$= (n-1)! [(n-1)! (n+1) \cdot n - n(n-1)!]$$

$$= (n-1)! [(n-1)! (n^2 + n - n)] = (n-1)! [(n-1)! (n^2)]$$

$$= (n-1)!^2 * n^2 \Rightarrow (n(n-1)!)^2$$

$$\Rightarrow n(n-1)!^2 = n!^2$$

7)

$$\frac{n! + (n-1)!}{(n+1)! - n!} = \frac{6}{25} \Rightarrow \frac{n * (n-1)! + (n-1)!}{(n+1) * n! - n!} = \frac{6}{25}$$

↳ $(n-1)!$ em evidência:

$$\frac{(n-1)! * (n+1)}{(n+1) * n! - n!} = \frac{6}{25} \Rightarrow \frac{(n-1)! * (n+1)}{(n+1-1) * n!} = \frac{6}{25}$$

$$= \frac{(n-1)! * (n+1)}{n * n!} = \frac{6}{25} \Rightarrow \frac{(n-1) * (n+1)}{n * n(n-1)!} = \frac{6}{25}$$

$$\hookrightarrow \frac{n+1}{n * n} = \frac{6}{25} \Rightarrow \frac{n+1}{n^2} = \frac{6}{25} \hookrightarrow 25(n+1) = 6n^2$$

$$25n + 25 = 6n^2$$

$$-6n^2 + 25n + 25 = 0$$

$$x = \frac{-25 \pm \sqrt{1225}}{-12}$$

$$\Delta = -25^2 - (4 \cdot 6 \cdot 25)$$

$$\Delta = 625 + 600$$

$$\Delta = 1225$$

$$x' = \frac{-25 + 35}{-12} = -0.8$$

$$x'' = \frac{-25 - 35}{-12} = 5$$

$$n = 5$$

8-

$$21! = 21 \cdot 20 \cdot 19 \cdot \dots \cdot 3 \cdot 2 \cdot 1$$

(I) Cada fator múltiplo de 5, terminará em 0 ou 5.

(II) A quantidade de zeros que $21!$ terminará, é dada pela quantidade de fatores múltiplos de 5.

(III) Há 4 fatores múltiplos de 5 em $21!$, são eles: 5, 10, 15, 20, portanto, $21!$ termina com 4 zeros.

Tem-se:

$$\begin{array}{r} \dots 0000 \\ - 221 \\ \hline \dots 97\boxed{7}9 \end{array}$$



O algarismo das dezenas é o 7.

