Fatorial

1

a) $4! = 24$

$4.2.3.2 = 24$

$4! = 24$

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

$5! - 6.5!$

$\hookrightarrow 5.4.3.2.1 = 120$

$\hookrightarrow 120 - \underbrace{6.120}$

$120 - \underbrace{720}$

-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

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

↳ $(n+1)! = (n+1)\,n!$

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

↳ evidência:

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

Ⓐ $$\frac{1}{n+1}$$

3

$$\frac{(n!)^2-(n-1)!\,n!}{(n-1)!\,n!} = \frac{n!\,n!-(n-1)!\cdot n!}{(n-1)!\,n!} = \frac{n!-(n-1)!}{(n-1)!}$$

↳ corta-se os iguais

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

4)

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

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

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

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

$$6 = 3n$$

PAR $\Rightarrow$ $n = 2$

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:

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

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

$n = 7$

8

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

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

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

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

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

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:

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

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

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

$25n+25 = 6n^2$

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

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

$\Delta = 625+600$

$\Delta = 1225$

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

$$x' = \frac{-25+35}{-12} = -0{,}8$$

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

$n = 5$

8-

21!= 21*20*19*. . .*3*2*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:

$$\begin{array}{r} ...\,0\,0\,0\,0 \\ -\ \ 2\,2\,1 \\ \hline ...\,9\,7\,\boxed{7}\,9 \end{array}$$

O algarismo das dezenas é o 7.