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CTII348

Fatorial de um número natural

1) a) $4! = 4.3.2.1 = \boxed{24}$

b) $5! - 6! = 5! - 6.5!$

$5!(-6+1)$

$120.(-5) = \boxed{-600}$

c) $\frac{9!}{6!} = \frac{9.8.7.6!}{6.5!} = \frac{9.8.7.6!}{720} = \frac{9.8.7.\cancel{720}}{\cancel{720}} = 9.8.7 = \boxed{504}$

$5! = 120$

d) $\frac{98!}{100!} = \frac{\cancel{98!}}{100.99.\cancel{98!}} = \frac{1}{100.99} = \boxed{\frac{1}{9900}}$

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

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

$\frac{n!(1)}{n!(n+1).n!} \Rightarrow \frac{\cancel{n!}}{\cancel{n!}(n+1)!} = \boxed{\frac{1}{(n+1)!}}$ A

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

$\frac{(n!)^2}{(n-1)!\,n!} - \frac{\cancel{(n-1)!}\,n!}{\cancel{(n-1)!}\,n!} \Rightarrow \frac{(n!)^2}{(n-1)!\,n!} - \frac{1}{1} \therefore$

$\therefore \dfrac{n!\,\cancel{n!}}{(n-1)\,\cancel{n!}} = \dfrac{1}{1} \Rightarrow \dfrac{n!}{(n-1)!} = \dfrac{1}{1} \therefore$

$\therefore \dfrac{n \cdot \cancel{(n-1)!}}{\cancel{(n-1)!}} = \dfrac{1}{1} \Rightarrow /\underline{\overline{n-1}}/$ A

4) $\dfrac{(n+2)!(n-2)!}{(n+1)!(n-1)!} = 4$ $\qquad n = ?$

$\dfrac{(n+2).\cancel{(n+1)!}\,(n-2)!}{\cancel{(n+1)!}\,(n-1)!} = 4 \Rightarrow \dfrac{(n+2).\cancel{(n-2)!}}{(n-1).\cancel{(n-2)!}} = 4 \therefore$

$\therefore \dfrac{n+2}{n-1} = 4$

$n+2 = 4(n-1)$
$n+2 = 4n-4$
$2+4 = 4n-n$
$3n = 6$
$n = 6/3$
$n = 2 \Rightarrow$ PAR

A

5) $\dfrac{(n+1)! - n!}{(n+1)!} = \dfrac{7}{n+1} \Rightarrow n = ?$

$\dfrac{\cancel{(n+1)!}}{\cancel{n+1!}} - \dfrac{n!}{n+1!} = \dfrac{7}{n+1} \Rightarrow \dfrac{1}{1} - \dfrac{n!}{(n+1)!} = \dfrac{7}{n+1}$

$\dfrac{1}{1} - \dfrac{\cancel{n!}}{(n+1)\cancel{n!}} = \dfrac{7}{n+1} \Rightarrow \dfrac{1}{1} = \dfrac{7}{n+1} + \dfrac{1}{n+1}$

$\dfrac{8}{n+1} = \dfrac{1}{1} \Rightarrow 8 = 1(n+1)$
$8 = n+1$

$n = 8-1$
$\underline{n = 7}/$

D

⑥ $n \in \mathbb{N}, n \geq 1 \Rightarrow (n-1)![(n+1)!-n!]$

$(n-1)![(n+1)!-n!]$

$(n-1)![(n+1).n.(n-1)!-n.(n-1)!]$

$(n-1)![(n-1)![(n+1).n-n]]$

$(n-1)![(n-1)![n(n+\cancel{1}-\cancel{1}]]$

$(n-1)![(n-1)![(n)(n)]]$

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

$(n-1)![(n-1)!(n.n)]$

$[n(n-1)!].[n(n-1)!]$

$(n!).(n!)=(n!)^2$

D

⑦ $\dfrac{n!+(n-1)!}{(n+1)!-n!}=\dfrac{6}{25}$

$\dfrac{n(n-1)!+(n-1)!}{(n+1).n.(n-1)!-n(n-1)!}=\dfrac{6}{25}$

$\dfrac{\cancel{(n-1)!}(n+1)}{\cancel{(n-1)}.[(n+1).n-n]}=\dfrac{6}{25} \Rightarrow \dfrac{(n+1)}{(n+1).n-n}=\dfrac{6}{25}$

$\dfrac{n-1}{n^2+\cancel{n}-\cancel{n}}=\dfrac{6}{25} \Rightarrow \dfrac{n-1}{n^2}=\dfrac{6}{25}$

$6n^2=25(n+1)$

$6n^2=25n+25$

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

$\Delta=(-25)^2-4.6.(-25)$

$\Delta=625+600$

$\Delta=1125$

$n=\dfrac{25\pm\sqrt{1125}}{2.6}=\dfrac{25\pm35}{12}$

$n_1=60/12=5$

$n_2=-10/12 \Rightarrow$ ñ satisfaz

C

⑧ 21! - 221 → Algarismo das dezenas

$(\underbrace{21.20}_{420} . \underbrace{19.18}_{342} . \underbrace{17.16}_{272} . \underbrace{15.14}_{210} . \underbrace{13.12}_{156} . \underbrace{11.10}_{110} . \underbrace{9.8.7}_{504} . \underbrace{6!}_{720}) - 221$

51090942171709440000 - 221 =

51090942171709439779

↳ DEZENAS

(D)