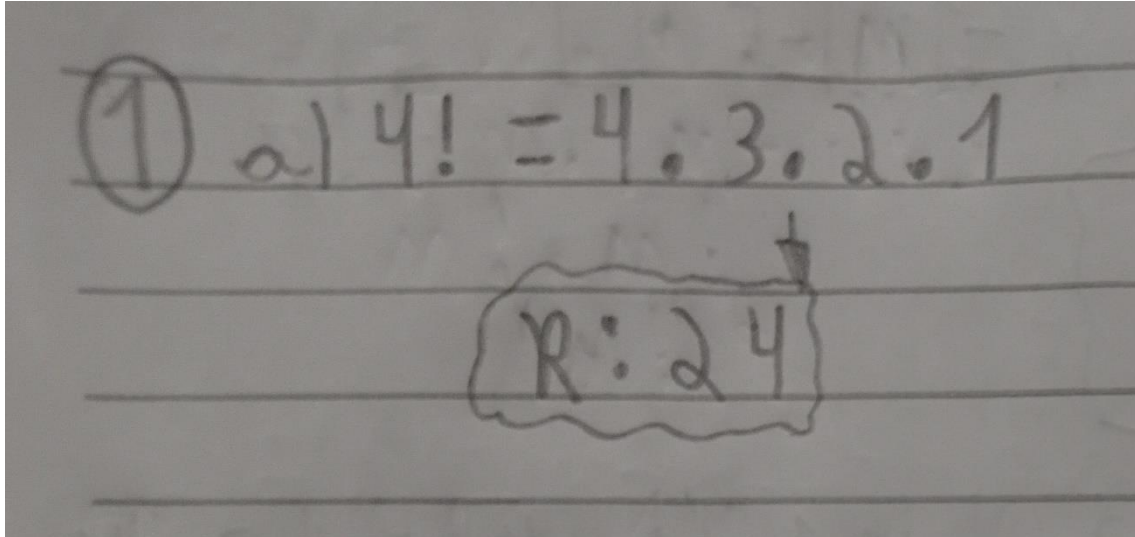


Fatorial:

1.

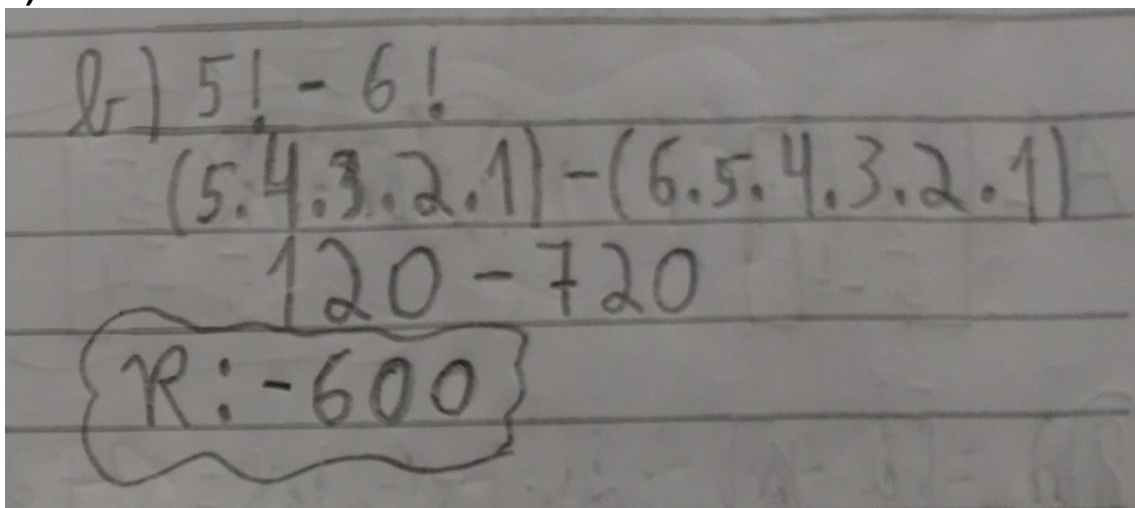
a)



Handwritten calculation of 4 factorial on lined paper. The first line shows the expression $① a) 4! = 4 \cdot 3 \cdot 2 \cdot 1$. The second line shows the result $R: 24$ enclosed in a hand-drawn cloud-like border.

R: 24

b)



Handwritten calculation of the difference between 5 factorial and 6 factorial on lined paper. The first line shows the expression $b) 5! - 6!$. The second line shows the expanded calculation $(5 \cdot 4 \cdot 3 \cdot 2 \cdot 1) - (6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1)$. The third line shows the intermediate result $120 - 720$. The fourth line shows the final result $R: -600$ enclosed in a hand-drawn cloud-like border.

R: -600

c)

$$\begin{aligned} \text{c) } \frac{9!}{6!} &\rightarrow \frac{9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1} \rightarrow \frac{362880}{720} \rightarrow 504 \\ \mathcal{R}: 504 \end{aligned}$$

R: 504

d)

$$\begin{aligned} \text{d) } \frac{98!}{100!} &\rightarrow \frac{\cancel{98 \cdot 97 \cdot 96 \dots}}{100 \cdot 99 \cdot \cancel{98 \cdot 97 \cdot 96 \dots}} \rightarrow \frac{1}{100 \cdot 99} \rightarrow \frac{1}{9900} \\ \mathcal{R}: \frac{1}{9900} \end{aligned}$$

R: 1/9900

2.

$$\begin{aligned} \text{② } \frac{1 - \frac{m}{(n+1)!}}{n!} &\rightarrow \frac{1}{n!} - \frac{m}{(n+1) \cdot n!} \rightarrow \frac{(n+1) \cdot 1 - m}{(n+1) \cdot n!} \\ &\rightarrow \frac{n+1-m}{n! \cdot (n+1)} \rightarrow \frac{1}{(n+1)!} \quad (\text{MMC}) \\ \mathcal{R}: \frac{1}{(n+1)!} \end{aligned}$$

R: a) $1/(n+1)!$

3.

$$\begin{aligned} \textcircled{3} \quad \frac{(m!)^2 - (m-1)! \cdot m!}{(m-1)! \cdot m!} &\rightarrow \frac{m! \cdot m! - (m-1)! \cdot m!}{(m-1)! \cdot m!} \\ \frac{m! \cdot (m! - (m-1)!)}{(m-1)! \cdot m!} &\rightarrow \frac{m! - (m-1)!}{(m-1)!} \\ \frac{m \cdot (m-1)! - (m-1)!}{(m-1)!} &\rightarrow m-1 \quad \{R: A \mid m-1\} \end{aligned}$$

R: a) $n-1$

4.

$$\begin{aligned} \textcircled{4} \quad \frac{(m+2)! \cdot (m-2)!}{(m+1)! \cdot (m-1)!} &= 4 \rightarrow m! = m \cdot (m-1)! \\ (m+2)! &= (m+2) \cdot (m+1)! \\ (m-1)! &= (m-1) \cdot (m-2)! \\ \frac{(m+2) \cdot (m+1)! \cdot (m-2)!}{(m+1)! \cdot (m-1) \cdot (m-2)!} &= 4 \rightarrow \frac{m+2}{m-1} = 4 \\ m+2 &= 4 \cdot (m-1) \rightarrow m+2 = 4m-4 \rightarrow m-4m = -4-2 \\ -3m &= -6 \\ m &= \frac{-6}{-3} \rightarrow m = 2 \quad \{R: A \mid \text{par.}\} \end{aligned}$$

R: a) par.

5.

$$\begin{aligned} \textcircled{5} \quad \frac{(m+1)! - m!}{(m+1)!} &= \frac{7}{m+1} \rightarrow \frac{(m+1) \cdot m! - m!}{(m+1) \cdot m!} = \frac{7}{m+1} \\ \frac{m! \cdot (m+1 - 1)}{(m+1) \cdot m!} &= \frac{7}{m+1} \rightarrow \frac{m}{m+1} = \frac{7}{m+1} \rightarrow m = 7 \\ \text{R: D) } 7 \end{aligned}$$

R: d) 7

6.

$$\begin{aligned} \textcircled{6} \quad (m-1)! \cdot [(m+1)! - m!] \\ (m-1)! \cdot [(m+1) \cdot m! - m!] \\ (m-1)! \cdot m! \cdot (m+1 - 1) \\ (m-1)! \cdot m! \cdot m \\ m! \cdot [m \cdot (m-1)!] \\ m! \cdot m! \\ (m!)^2 \\ \text{R: D) } (m!)^2 \end{aligned}$$

R: d) $(n!)^2$

7.

$$\begin{aligned} \textcircled{7} \frac{m! + (m-1)!}{(m+1)! - m!} &= \frac{6}{25} \rightarrow \frac{m \cdot (m-1)! + (m+1)!}{(m+1) \cdot m! - m!} = \frac{6}{25} \\ \frac{(m-1)! \cdot (m+1)}{(m+1-1) \cdot m!} &= \frac{6}{25} \rightarrow \frac{(m-1)! \cdot (m+1)}{m \cdot m \cdot (m-1)!} = \frac{6}{25} \\ \frac{m+1}{m^2} &= \frac{6}{25} \quad 25 \cdot (m+1) = 6m^2 \rightarrow 25m + 25 = 6m^2 \\ 25m + 25 - 6m^2 &= 0 \quad (-1) \\ 6m^2 - 25m - 25 &= 0 \\ \Delta &= (25)^2 - 4 \cdot 6 \cdot (-25) \\ \Delta &= 625 + 600 \\ \Delta &= 1225 \\ \frac{25 \pm 35}{12} &\rightarrow \Delta X' = \frac{60}{12} \rightarrow \Delta X' = 5 \\ \Delta X'' &= \frac{-10}{12} \\ \text{R: c) } m &= 5 \end{aligned}$$

R: c) $n = 5$

8.

$\textcircled{8} 21! - 221$ De 5 em 5 números, um 0 é adicionado no fator. $21/5 = 4,2$, logo $21!$ termina com quatro zeros.

$$\begin{array}{r} \dots 0000 \\ - 221 \\ \hline 9779 \\ \downarrow \\ \text{dezenas} \end{array}$$

$\text{R: d) } 7$

R: d) 7

Explicação: De 5 em 5 números, um 0 é adicionado no resultado do fatorial. $21/5 = 4,2$; logo $21!$ termina com quatro zeros.