

## Tarefa Básica 10

### Coeficientes Binomiais

### Triângulo de Pascal e Tartaglia

$$1. \binom{8}{3} = \frac{8!}{3!(8-3)!} = \frac{8 \cdot 7 \cdot 6 \cdot 5!}{3 \cdot 2 \cdot 1 \cdot 5!} = \frac{336}{6} = \boxed{56} \quad (B)$$

$$2. \binom{200}{198} = \frac{200!}{198!(200-198)!} = \frac{200 \cdot 199 \cdot 198!}{198! \cdot 2!} = \frac{200 \cdot 199}{2 \cdot 1} =$$

$$= \frac{39\ 800}{2} = \boxed{19\ 900} \quad (A)$$

$$3. \binom{n-1}{2} = \binom{n+1}{4}$$

↓

$$\frac{(n-1)!}{2!(n-1-2)!} = 0 \rightarrow \frac{(n-1)(n-2)(n-3)!}{2 \cdot 1 \cdot (n-3)!} = 0 \rightarrow$$

$$\Rightarrow \frac{n^2 - 2n - n + 2}{2} = 0 \rightarrow 0,5n^2 - 1,5n + 1 = 0 \quad \left\{ \begin{array}{l} \frac{1}{2} + \frac{2}{2} = 3 \\ \frac{1}{2} \cdot \frac{2}{2} = 2 \end{array} \right.$$

$$\frac{(n-1)!}{2!(n-1-2)!} = \frac{(n+1)!}{4!(n+1-4)!} \rightarrow \frac{(n-1)!}{2!(n-3)!} = \frac{(n+1)n(n-1)!}{4!(n-3)!}$$

$$\frac{1}{2} = \frac{n^2 + n}{24} \rightarrow \frac{2n^2 + 2n}{24} = \frac{24}{24} \quad \left\{ \begin{array}{l} \frac{3}{2} + \frac{-4}{2} = -\frac{1}{2} \\ \frac{3}{2} \cdot \frac{-4}{2} = -3 \end{array} \right. \quad \left. \begin{array}{l} \boxed{3} \\ -4 \rightarrow \text{não} \\ \text{convém} \end{array} \right.$$

$$n' = 1, n'' = 2 \text{ e } n''' = 3$$

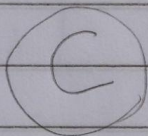
$$\boxed{V = \{1, 2, 3\}}$$



$$4. \binom{20}{13} + \binom{20}{14} =$$

$$\binom{n}{k} + \binom{n}{k+1} = \binom{n+1}{k+1} \rightarrow \binom{20}{13} + \binom{20}{14} = \boxed{\binom{21}{14}}$$

$$\binom{21}{14} = \boxed{\binom{21}{7}}$$



Complementares ( $14+7=21$ )

5. Soma na linha  $n = 2^n$   
ou seja

$$\binom{n}{0} + \binom{n}{1} + \binom{n}{2} + \dots + \binom{n}{n} = \boxed{2^n}$$

6.

$$a) \sum_{p=0}^{10} \binom{10}{p} = \binom{10}{0} + \binom{10}{1} + \dots + \binom{10}{10} = 2^{10} = \boxed{1024}$$

$$b) \sum_{p=0}^9 \binom{10}{p} = \binom{10}{0} + \binom{10}{1} + \dots + \binom{10}{9} = 2^{10} - \binom{10}{10} \rightarrow$$

$$\rightarrow 2^{10} - \binom{10}{10} = 1024 - 1 = \boxed{1023}$$

$$\downarrow$$

$$\binom{n}{n} = 1$$



$$c) \sum_{p=2}^9 \binom{9}{p} = \binom{9}{2} + \binom{9}{3} + \dots + \binom{9}{9} = 2^9 - \binom{9}{0} - \binom{9}{1} \rightarrow$$

$$\rightarrow 2^9 - \binom{9}{0} - \binom{9}{1} = 512 - 1 - 9 = \underline{\underline{502}}$$

$$\binom{n}{0} = 1 \quad \binom{n}{1} = n$$

$$d) \sum_{p=4}^{10} \binom{p}{4}$$

$$\binom{4}{4}$$

$$\binom{5}{4}$$

...

$$\binom{10}{4}$$

$$\Rightarrow \binom{11}{5}$$

$$\frac{11!}{5!(11-5)!} = \frac{11 \cdot 10 \cdot 9 \cdot 8 \cdot 7 \cdot 6!}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 \cdot 6!} \rightarrow$$

$$\rightarrow \frac{55440}{120} = \underline{\underline{462}}$$

$$e) \sum_{p=5}^{10} \binom{p}{5}$$

$$\binom{5}{5}$$

$$\binom{6}{5}$$

...

$$\binom{10}{5}$$

$$\Rightarrow \binom{11}{6}$$

complementar de  $\binom{11}{5}$

pois  $5+6=11$

logo:

$$\binom{11}{6} = \underline{\underline{462}}$$

7.

$$\sum_{k=0}^m \binom{m}{k} = 512 \quad \left. \begin{array}{l} \text{soma na linha !!!} \\ \approx 2^m \end{array} \right\}$$

$$2^m = 512$$

$$2^m = 2^9$$

$$\boxed{m = 9}$$

$$\left. \begin{array}{l} 2^m = 512 \\ 2^m = 2^9 \end{array} \right\} \binom{9}{0} + \binom{9}{1} + \dots + \binom{9}{9} = 2^9 = 512$$

