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# Teorema de Binômio

1.

$$\binom{6}{k} 1^{6-k} \cdot (2x^2)^k = \binom{6}{k} \cdot 1 \cdot 2^k \cdot x^{2k} = \binom{6}{k} 2^k \cdot x^{2k}$$

$2k = 8$

$k = \frac{8}{2} = 4$

$$\binom{6}{4} 2^4 \cdot x^8 = \frac{6!}{4!\,2!} = 16 \cdot x^8 = 15 \cdot 16x^8 = \boxed{240x^8}$$

$$\frac{6!}{4!\,2!} = \frac{6 \cdot 5 \cdot \cancel{4}}{\cancel{4} \cdot 2 \cdot 1} = \frac{30}{2} = 15$$

2.

$(14x - 13y)^{237}$

$(14x - 13y)^{237}$ $\quad x = 1 \quad y = 1$

$(14.1 - 13.1)^{237}$

$14 - 13 = 1^{237}$

coeficiente = 1

3.

$(x+a)^{11} = 1386x^5$

Termo geral

$T_{K+1} = \binom{n}{K} \cdot x^{n-K} \cdot a^K$

$11 - K = 5$

$K = 5 - 11$

$\boxed{K = 6}$

$T_{K+1} = \binom{11}{K} \cdot x^{11-K} a^K = 1386x^5$

$T_{6+1} \binom{11}{6} x^{11-6} a^6 = 1386x^5$

$T_7 = \binom{11}{6} x^5 \cdot a^6 = 1386x^5$

$T_7 = \frac{11!}{6!5!} a^6 = 1386$

$T_7 = \frac{11.10.9.8.7.\cancel{6}}{\cancel{6}!\,5.4.3.2.1}$

$a^6 = 1386 = \frac{55440}{120} a^6 = 1386$

$= 462a^6 = 1386$

$462a^6 = 1386$

$a^6 = \frac{1386}{462} = 3$

$\boxed{a = \sqrt[6]{3}}$

4.

$$\left(x + \frac{1}{x^2}\right)^4$$

$$T_{9+1} = \binom{9}{k} x^{9-k} \cdot \left(\frac{1}{x^2}\right)^k$$

$$T_{9+1} = \binom{9}{k} x^{9-k} \cdot \left(x^{24}\right)^k = \binom{9}{k} x^{\frac{9-k}{2}} \cdot x^{-k} =$$

$$\frac{9-k}{2} - k =$$

$$\binom{9}{k} x^{\frac{9-p}{2} - k}$$

$$\frac{9-k}{2} - \frac{2k}{2} = \frac{9-3k}{2} \qquad T_{9+1} = \binom{9}{k} x^{\frac{9-3k}{2}} \rightarrow \frac{9-3k}{2} = 0$$

$$9 - 3k = 0 \qquad k = \binom{9}{3}$$

$$9 = 3k \rightarrow$$

5. $\left(x + \frac{1}{x^2}\right)^n$ - independente de $x$

$T_{n+1} = \binom{n}{k} \cdot x^{n-k} \cdot \left(\frac{1}{x^2}\right)^k \rightarrow T_{n+1} = \binom{n}{k} x^{n-k} (x^{2-1})^k = \binom{n}{k} x^{\frac{n-k}{2}} \cdot x^{-k} = \binom{n}{k} x^{\frac{n-k}{2} - k}$

$\frac{n-k}{2} - k = \frac{n-3k}{2} \rightarrow T_{n+1} = \binom{n}{k} x^{\frac{n-3k}{2}} \rightarrow \frac{n-3k}{2} = 0$

$n = 3k \rightarrow \frac{3}{3} = 1$ divisível por 3

6. $\left(3.1^3 + \frac{2}{1^2}\right)^5 - \left(234.1^{15} + 810.1^{10} + 1080^5 + \frac{240}{1^5} + \frac{32}{1^{10}}\right)$

$\left(3.1 + \frac{2}{1}\right)^5$ $\qquad 234 + 810 + 1080 + 240 + 32$

$2405$

$(3+2)^5$

$\boxed{5^5} \rightarrow 3125 \qquad 3125 - 2405 = \boxed{720}$

7.

$$(2x+y)^5 = \binom{5}{0} 2x^5 \cdot y^0 + \binom{5}{1} 2x^{\overset{5-1}{4}} \cdot y^1 + \binom{5}{2} 2^{\overset{5-2}{3}} \cdot y^2 + \dots \binom{5}{5} 2x^{\overset{5-5}{0}} \cdot y^5$$

$$\binom{5}{0} 2^5 + \binom{5}{1} 2^4 + \binom{5}{2} 2^3 + \binom{5}{3} 2^2 + \binom{5}{4} 2^1 + \binom{5}{5} 2^0$$

$$= 2^5 + 5.2^4 + 10.2^3 + 10.2^2 + 5.2^1 + 1.2^0$$

$$= 32 + 80 + 80 + 40 + 10 + 1$$

$$= \boxed{243}$$