

BINOMISCHE FORMELN

Erste Binomische Formel

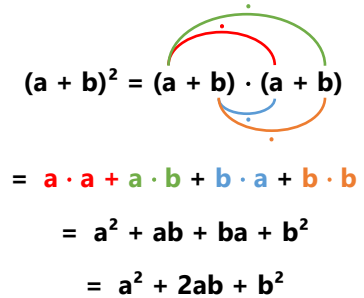
$$(a + b)^2 = a^2 + 2ab + b^2$$

Beispiele

$$\begin{array}{ccccccc} (x + 5)^2 = x^2 + 2 \cdot x \cdot 5 + 5^2 \\ \downarrow \downarrow \downarrow \downarrow \downarrow \\ a \quad b \quad a^2 \quad 2 \cdot a \cdot b \quad b^2 \\ = x^2 + 10 \cdot x + 25 \end{array}$$

$$\begin{array}{ccccccc} (3x + y)^2 = (3x)^2 + 2 \cdot 3x \cdot y + y^2 \\ \downarrow \downarrow \downarrow \downarrow \downarrow \\ a \quad b \quad a^2 \quad 2 \cdot a \cdot b \quad b^2 \\ = 9x^2 + 6xy + y^2 \end{array}$$

Herleitung



$$\begin{aligned} (a + b)^2 &= (a + b) \cdot (a + b) \\ &= a \cdot a + a \cdot b + b \cdot a + b \cdot b \\ &= a^2 + ab + ba + b^2 \\ &= a^2 + 2ab + b^2 \end{aligned}$$

Zweite Binomische Formel

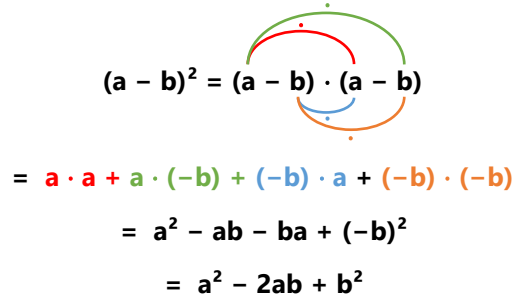
$$(a - b)^2 = a^2 - 2ab + b^2$$

Beispiele

$$\begin{array}{ccccccc} (x - 3)^2 = x^2 - 2 \cdot x \cdot 3 + 3^2 \\ \downarrow \downarrow \downarrow \downarrow \downarrow \\ a \quad b \quad a^2 \quad 2 \cdot a \cdot b \quad b^2 \\ = x^2 - 6 \cdot x + 9 \end{array}$$

$$\begin{array}{ccccccc} (2x - 3y)^2 = (2x)^2 - 2 \cdot 2x \cdot 3y + (-3y)^2 \\ \downarrow \downarrow \downarrow \downarrow \downarrow \\ a \quad b \quad a^2 \quad 2 \cdot a \cdot b \quad b^2 \\ = 4x^2 + 12xy + 9y^2 \end{array}$$

Herleitung



$$\begin{aligned} (a - b)^2 &= (a - b) \cdot (a - b) \\ &= a \cdot a + a \cdot (-b) + (-b) \cdot a + (-b) \cdot (-b) \\ &= a^2 - ab - ba + (-b)^2 \\ &= a^2 - 2ab + b^2 \end{aligned}$$

Dritte Binomische Formel

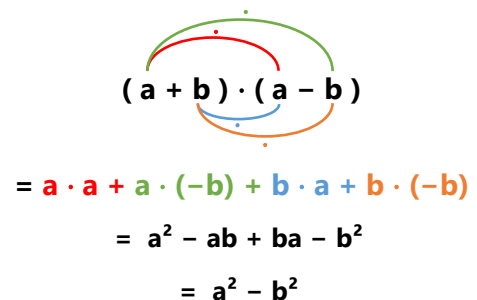
$$(a + b) \cdot (a - b) = a^2 - b^2$$

Beispiele

$$\begin{array}{ccccccc} (x + 4) \cdot (x - 4) = x^2 - 4^2 \\ \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow \\ a \quad b \quad a \quad b \quad a^2 \quad b^2 \end{array}$$

$$\begin{array}{ccccccc} (2x + y) \cdot (2x - y) = (2x)^2 - y^2 = 4x^2 - y^2 \\ \downarrow \downarrow \downarrow \downarrow \downarrow \downarrow \\ a \quad b \quad a \quad b \quad a^2 \quad b^2 \end{array}$$

Herleitung



$$\begin{aligned} (a + b) \cdot (a - b) \\ &= a \cdot a + a \cdot (-b) + b \cdot a + b \cdot (-b) \\ &= a^2 - ab + ba - b^2 \\ &= a^2 - b^2 \end{aligned}$$