Aufgaben zu binomischen Formeln

1. Zeige, dass eine binomische Formel vorliegt und löse diese anschließend auf!

a)

$(-8 + x)^2$

$(a + (-3))^2$

$(7 - (-b))^2$

$(-8 - x)^2$

b)

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

$(-x - y)^2$

$(-y + x)^2$

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

c)

$(3a + (-5b))^2$

$(-7a + b)^2$

$(-9x - 3y)^2$

$(-2a - (-5b))^2$

d)

$(4r + 9s) \cdot (-4r + 9s)$

$(-8x + 5y)^2$

$(2a - 6b) \cdot (2a + 6b)$

$(-x + 6y) \cdot (-x - 6y)$

2. Zeige, wie gut du bereits einfach zu erkennende binomische Formeln auflösen kannst.

a)

$(7a + 9)^2$

$(9s + 3t)^2$

$(0{,}8u - 6)^2$

b)

$(12x + 8y)^2$

$(7k - 3)^2$

$\left(\frac{2}{5} - 8b\right)^2$

c)

$(3{,}6 + a)^2$

$(x + 7{,}8)\,(x - 7{,}8)$

$(y - 1{,}5)^2$

d)

$(7a - 15)^2$

$(14x - 20)^2$

$\left(\frac{9}{2}s + \frac{7}{3}\right)^2$

e)

$(s + 3{,}1t)^2$

$(d - 0{,}4e)\ (d + 0{,}4e)$

$(0{,}5a - b)^2$

f)

$\left(\frac{1}{5}s + \frac{2}{9}t\right) \cdot \left(\frac{1}{5}s - \frac{2}{9}t\right)$

$(3a + 9b) \cdot (3a - 9b)$

$(2x + 3y) \cdot (2x - 3y)$

g)

$\left(\frac{3}{8} - x\right)^2$

$\left(\frac{1}{3}a + \frac{1}{4}b\right)^2$

$\left(\frac{2}{9}a + b\right) \cdot \left(\frac{2}{9}a - b\right)$

h)

$\left(3{,}2x + \frac{y}{3}\right) \cdot \left(3{,}2x - \frac{y}{3}\right)$

$\left(\frac{17}{3}x - 0{,}9y\right)^2$

$\left(\frac{a}{8} + 11b\right)^2$

Lösungen

a)

$(-8 + x)^2 = (x - 8)^2 = (x)^2 - 2 \cdot x \cdot 8 + (8)^2 = x^2 - 16x + 64$

$(a + (-3))^2 = (a - 3)^2 = (a)^2 - 2 \cdot a \cdot 3 + (3)^2 = a^2 - 6a + 9$

$(7 - (-b))^2 = (7 + b)^2 = (7)^2 + 2 \cdot 7 \cdot b + (b)^2 = 49 + 14b + b^2 = b^2 + 14b + 49$

$(-8 - x)^2 = (-8 - x) \cdot (-8 - x) = (-1) \cdot (8 + x) \cdot (-1) \cdot (8 + x) = (8 + x)^2 = (8)^2 + 28x + (x)^2 =$

$64 + 16x + x^2 = x^2 + 16x + 64$

b)

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

$(-x - y)^2 = (-x - y) \cdot (-x - y) = (-1) \cdot (x + y) \cdot (-1) \cdot (x + y) = (x + y)^2 = (x)^2 + 2 \cdot x \cdot y + (y)^2 =$

$x^2 + 2xy + y^2$

$(-y + x)^2 = (x - y)^2 = (x)^2 - 2 \cdot x \cdot y + (y)^2 = x^2 - 2xy + y^2$

$(-a + (-b))^2 = (-a - b) \cdot (-a - b) = (-1) \cdot (a + b) \cdot (-1) \cdot (a + b) = (a + b)^2 =$

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

c)

$(3a + (-5b))^2 \ (3a - 5b)^2 = (3a)^2 - 2 \cdot 3a \cdot 5b + (5b)^2 = 9a^2 - 30ab + 25b^2$

$(-7a + b)^2 = (b - 7a)^2 = (b)^2 - 2 \cdot b \cdot 7a + (7a)^2 = b^2 - 14ab + 49a^2 = 49a^2 - 14ab + b^2$

$(-9x - 3y)^2 = (-9x - 3y) \cdot (-9x - 3y) = (-1) \cdot (9x + 3y) \cdot (-1) \cdot (9x + 3y) = (9x + 3y)^2 =$

$(9x)^2 + 2 \cdot 9x \cdot 3y + (3y)^2 = 81x^2 + 54xy + 9y^2$

$(-2a - (-5b))^2 = (-2a + 5b)^2 = (5b - 2a)^2 = (5b)^2 - 2 \cdot 5b \cdot 2a + (2a)^2 = 25b^2 - 20ab + 4a^2 =$

$4a^2 - 20ab + 25b^2$

d)

$(4r + 9s) \cdot (-4r + 9s) = (9s + 4r) \cdot (9s - 4r) = (9s)^2 - (4r)^2 = 81s^2 - 16r^2$

$(-8x + 5y)^2 = (5y - 8x)^2 = (5y)^2 - 2 \cdot 5y \cdot 8x + (8x)^2 = 25y^2 - 80xy + 64x^2 = 64x^2 - 80xy + 25y^2$

$(2a - 6b) \cdot (2a + 6b) = (2a + 6b) \cdot (2a - 6b) = (2a)^2 - (6b)^2 = 4a^2 - 36b^2$

$(-x + 6y) \cdot (-x - 6y) = (-1) \cdot (x - 6y) \cdot (-1) \cdot (x + 6y) = (x + 6y) \cdot (x - 6y) = (x)^2 - (6y)^2 =$

$x^2 - 36y^2$

2. Zeige, wie gut du bereits einfach zu erkennende binomische Formeln auflösen kannst.

a)

$(7a + 9)^2 = (7a)^2 + 2 \cdot 7a \cdot 9 + (9)^2 = 49a^2 + 126a + 81$

$(9s + 3t)^2 = (9s)^2 + 2 \cdot 9s \cdot 3t + (3t)^2 = 81s^2 + 54st + 9t^2$

$(0{,}8u - 6)^2 = (0{,}8u)^2 - 2 \cdot 0{,}8u \cdot 6 + (6)^2 = 0{,}64u^2 - 9{,}6u + 36$

b)

$(12x + 8y)^2 = (12x)^2 + 2 \cdot 12x \cdot 8y + (8y)^2 = 144x^2 + 192xy + 64y^2$

$(7k - 3)^2 = (7k)^2 - 2 \cdot 7k \cdot 3 + (3)^2 = 49k^2 - 42k + 9$

$\left(\frac{2}{5} - 8b\right)^2 = \left(\frac{2}{5}\right)^2 - 2 \cdot \frac{2}{5} \cdot 8b + (8b)^2 = \frac{4}{25} - \frac{32}{5}b + 64b^2 = 64b^2 - \frac{32}{5}b + \frac{4}{25}$

c)

$(3{,}6 + a)^2 = (3{,}6)^2 + 2 \cdot 3{,}6 \cdot a + (a)^2 = 12{,}96 + 7{,}2a + a^2 = a^2 + 7{,}2a + 12{,}96$

$(x + 7{,}8)\ (x - 7{,}8) = (x)^2 - (7{,}8)^2 = x^2 - 60{,}84$

$(y - 1{,}5)^2 = (y)^2 - 2 \cdot y \cdot 1{,}5 + (1{,}5)^2 = y^2 - 3y + 2{,}25$

d)

$(7a - 15)^2 = (7a)^2 - 2 \cdot 7a \cdot 15 + (15)^2 = 49a^2 - 210a + 225$

$(14x - 20)^2 = (14x)^2 - 2 \cdot 14x \cdot 20 + (20)^2 = 196x^2 - 560x + 400$

$$(\frac{9}{2}s+\frac{7}{3})^2=(\frac{9}{2}s)^2-2\cdot\frac{9}{2}s\cdot\frac{7}{3}+(\frac{7}{3})^2=\frac{81}{4}s^2-\frac{126}{6}s+\frac{49}{9}=\frac{81}{4}s^2-21s+\frac{49}{9}$$

e)

$(s + 3,1t)^2 = (s)^2 + 2 \cdot s \cdot 3,1t + (3,1t)^2 = s^2 + 6,2st + 9,61t^2$

$(d – 0,4e)\ (d + 0,4e) = (d)^2 – (0,4e)^2 = d^2 – 0,16e^2$

$(0,5a – b)^2 = (0,5a)^2 – 2 \cdot 0,5 \cdot a \cdot b + (b)^2 = 0,25a^2 – ab + b^2$

f)

$$(\frac{1}{5}s+\frac{2}{9}t)\cdot(\frac{1}{5}s-\frac{2}{9}t)=(\frac{1}{5}s)^2-(\frac{2}{9}t)^2=\frac{1}{25}s^2-\frac{4}{81}t^2$$

$(3a + 9b) \cdot (3a – 9b) = (3a)^2 – (9b)^2 = 9a^2 – 81b^2$

$(2x + 3y) \cdot (2x – 3y) = (2x)^2 – (3y)^2 = 4x^2 – 9y^2$

g)

$$(\frac{3}{8}-x)^2=(\frac{3}{8})^2-2\cdot\frac{3}{8}\cdot x+(x)^2=\frac{9}{64}-\frac{6}{8}x+x^2=x^2-\frac{3}{4}x+\frac{9}{64}$$

$$(\frac{1}{3}a+\frac{1}{4}b)^2=(\frac{1}{3}a)^2+2\cdot\frac{1}{3}a\cdot\frac{1}{4}b+(\frac{1}{4}b)^2=\frac{1}{9}a^2+\frac{2}{12}ab+\frac{1}{16}b^2=\frac{1}{9}a^2+\frac{1}{6}ab+\frac{1}{16}b^2$$

$$(\frac{2}{9}a+b)\cdot(\frac{2}{9}a-b)=(\frac{2}{9}a)^2-(b)^2=\frac{4}{81}a^2-b^2$$

h)

$$(3,2x+\frac{y}{3})\cdot(3,2x-\frac{y}{3})=(3,2x)^2-(\frac{y}{3})^2=10,24x^2-\frac{1}{9}y^2$$

$$(\frac{17}{3}x-0,9y)^2=(\frac{17}{3}x)^2-2\cdot\frac{17}{3}x\cdot 0,9y+(0,9y)^2=\frac{289}{9}x^2-\frac{51}{5}xy+0,81y^2$$

$$(\frac{a}{8}+11b)^2=(\frac{a}{8})^2+2\cdot\frac{a}{8}\cdot 11b+(11b)^2=\frac{1}{64}a^2+\frac{22}{8}ab+121b^2=\frac{1}{64}a^2+\frac{11}{4}ab+121b^2$$