Mathematik * Klasse 9 * Binomische Formeln

1. Multipliziere aus und fasse neu zusammen!

a) $(3x-5y)^2-(3x+5y)^2$

b) $\frac{2}{3}(6a-1,5b)^2-3a(8a-4b)$

c) $(0,5x-y)^2-(0,5x-y)\cdot(0,5x+y)$

d) $(\frac{1}{3}x-2)^2+\frac{1}{3}\cdot(x+2)^2$

e) $(2x-3)^2-2\cdot(x+3)^2-\frac{1}{2}\cdot(6-2x)^2$

f) $\frac{1}{3}\cdot(1,5a-b)^2-\frac{3}{4}\cdot(\frac{1}{3}b+a)^2$

g) $(a-0,4b)^2-2\cdot(0,3b-0,5a)^2+0,2\cdot(a+0,1b)^2$

2. Faktorisiere, aber nur falls möglich!

a) $289x^2-100$

b) $1+8x+4x^2$

c) $1+4x+4x^2$

d) $2x^2-10x+12,5$

e) $49x^2+64y^2-112xy$

f) $2x^2-8xy+2y^2$

g) $48y^3-147x^2y$

h) $108a^2+147-252a$

i) $2x^2-6xy+2,25y^2$

k) $2x^2-y^2$

3. Ergänze!

a) $x^2-6xy+ ... = (...)^2$

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

c) $x^2-\frac{1}{5}xy+ ... = (...)^2$

d) $y^2+0,6xy+ ... = (...)^2$

e) $3a^2+1,5a+ ... = 3\cdot(...)^2$

f) $4x^2+0,25y^2+ ... = (...)^2$

g) $9a^2+9ab+ ... = (...)^2$

h) $9a^2+6ab+ ... = (...)^2$

i) $5x^2-4xy+ ... = 5\cdot(...)^2$

k) $\frac{1}{4}a^2+6a+ ... = (...)^2$

4. Gib den größtmöglichen Definitionsbereich an und vereinfache so weit wie möglich!

a) $\frac{5x^2-20x+20}{x-2}$

b) $\frac{3x^2+6x+3}{2x+2}$

c) $\frac{2a^2-12a+18}{a^2-9}$

d) $\frac{x^2+2x+1}{2x^2-2}$

Mathematik * Klasse 9 * Binomische Formel * Lösungen

1. a) $(3x-5y)^2 - (3x+5y)^2 = 9x^2 - 30xy + 25y^2 - (9x^2 + 30xy + 25y^2) = -60xy$

   b) $\frac{2}{3}(6a-1{,}5b)^2 - 3a(8a-4b) = 24a^2 - 12ab + 1{,}5b^2 - (24a^2 - 12ab) = 1{,}5b^2$

   c) $(0{,}5x-y)^2 - (0{,}5x-y)\cdot(0{,}5x+y) = 0{,}25x^2 - xy + y^2 - (0{,}25x^2 - y^2) = 2y^2 - xy$

   d) $(\frac{1}{3}x-2)^2 + \frac{1}{3}\cdot(x+2)^2 = \frac{1}{9}x^2 - \frac{4}{3}x + 4 + \frac{1}{3}x^2 + \frac{4}{3}x + \frac{4}{3} = \frac{4}{9}x^2 + \frac{16}{3}$

   e) $(2x-3)^2 - 2\cdot(x+3)^2 - \frac{1}{2}\cdot(6-2x)^2 =$

   $4x^2 - 12x + 9 - 2\cdot(x^2 + 6x + 9) - \frac{1}{2}\cdot(36 - 24x + 4x^2) = \ldots = -12x - 27$

   f) $\frac{1}{3}\cdot(1{,}5a-b)^2 - \frac{3}{4}\cdot(\frac{1}{3}b+a)^2 = \frac{1}{3}\cdot(2{,}25a^2 - 3ab + b^2) - \frac{3}{4}\cdot(\frac{1}{9}b^2 + \frac{2}{3}ab + a^2) =$

   $0{,}75a^2 - ab + \frac{1}{3}b^2 - \frac{1}{12}b^2 - \frac{1}{2}ab - \frac{3}{4}a^2 = -1{,}5ab + 0{,}25b^2$

   g) $(a-0{,}4b)^2 - 2\cdot(0{,}3b-0{,}5a)^2 + 0{,}2\cdot(a+0{,}1b)^2 = \ldots = 0{,}7a^2 - 0{,}16ab$

2. a) $289x^2 - 100 = (17x-10)\cdot(17x+10)$

   b) $1 + 8x + 4x^2$ ist nicht faktorisierbar!

   c) $1 + 4x + 4x^2 = (1+2x)^2$

   d) $2x^2 - 10x + 12{,}5 = 2\cdot(x-2{,}5)^2$

   e) $49x^2 + 64y^2 - 112xy = (7x-8y)^2$

   f) $2x^2 - 8xy + 2y^2 = 2\cdot(x-y)^2$

   g) $48y^3 - 147x^2y = 3y\cdot(4y-7x)\cdot(4y+7x)$

   h) $108a^2 + 147 - 252a = 3\cdot(36a^2 - 84a + 49) = 3\cdot(6a-7)^2$

   i) $2x^2 - 6xy + 1{,}25y^2$ ist nicht faktorisierbar!

   k) $2x^2 - y^2 = (\sqrt{2}\cdot x - y)\cdot(\sqrt{2}\cdot x + y)$

3. a) $x^2 - 6xy + 9y^2 = (x-3y)^2$

   b) $2a^2 - 4a + 2 = 2\cdot(a-1)^2$

   c) $x^2 - \frac{1}{5}xy + \frac{1}{100}y^2 = (x - \frac{1}{10}y)^2$

   d) $y^2 + 0{,}6xy + x^2 = (y + 0{,}3x)^2$

   e) $3a^2 + 1{,}5a + \frac{3}{16} = 3\cdot(a + \frac{1}{4})^2$

   f) $4x^2 + 0{,}25y^2 + 2xy = (2x + 0{,}5y)^2$

   g) $9a^2 + 9ab + 2{,}25b^2 = (3a + 1{,}5b)^2$

   h) $9a^2 + 6ab + b^2 = (3a+b)^2$

   i) $5x^2 - 4xy + \frac{4}{5}y^2 = 5\cdot(x - \frac{2}{5}y)^2$

   k) $\frac{1}{4}a^2 + 6a + 36 = (\frac{a}{2} + 6)^2$

4. a) $\frac{5x^2 - 20x + 20}{x-2} = \frac{5\cdot(x-2)^2}{x-2} = 5\cdot(x-2) = 5x - 10$ mit $D = R \setminus \{2\}$

   b) $\frac{3x^2 + 6x + 3}{2x+2} = \frac{3\cdot(x+1)^2}{2\cdot(x+1)} = \frac{3}{2}\cdot(x+1)$ mit $D = R \setminus \{-1\}$

   c) $\frac{2a^2 - 12a + 18}{a^2 - 9} = \frac{2\cdot(a-3)^2}{(a-3)\cdot(a+3)} = \frac{2\cdot(a-3)}{a+3} = \frac{2a-6}{a+3}$ mit $D = R \setminus \{-3, 3\}$

   d) $\frac{x^2 + 2x + 1}{2x^2 - 2} = \frac{(x+1)^2}{2\cdot(x-1)\cdot(x+1)} = \frac{x+1}{2\cdot(x-1)}$ mit $D = R \setminus \{-1, 1\}$