

## Algebraické vzorce

1 Použij vzorce:

$$a) (k+l)(k-l) = k^2 - l^2$$

$$b) (m-n)(m+n) = m^2 - n^2$$

$$c) (n+o)(o-n) = o^2 - n^2$$

$$d) (r-p)(p+r) = r^2 - p^2$$

$$e) (s+3)(s-3) = s^2 - 9$$

$$f) (t-2)(2+t) = t^2 - 4$$

$$g) (4+u)(u-4) = u^2 - 16$$

$$h) (5-v)(v+5) = 25 - v^2$$

2 Použij vzorce:

$$a) (3x+2)(3x-2) = 9x^2 - 4$$

$$b) (4y-1)(4y+1) = 16y^2 - 1$$

$$c) (7+5z)(7-5z) = 49 - 25z^2$$

$$d) (3d-4)(3d+4) = 9d^2 - 16$$

$$e) (8e+3)(3-8e) = 9 - 64e^2$$

$$f) (7-2h)(2h+7) = 49 - 4h^2$$

$$g) (3a-6)(6+3a) = 9a^2 - 36$$

$$h) (5b+8)(8-5b) = 64 - 25b^2$$

3 Vynásob pomocí vzorce:

$$a) (3z+5y)(3z-5y) = 9z^2 - 25y^2$$

$$b) (2u+3v)(3v-2u) = 9v^2 - 4u^2$$

$$c) (7k-8l)(8l+7k) = 49k^2 - 64l^2$$

$$d) (6mn-11o)(11o+6mn) = 36m^2n^2 - 121o^2$$

$$e) (9rs+2t)(2t-9rs) = 4t^2 - 81r^2s^2$$

$$f) (10a+3b)(-10a+3b) = 9b^2 - 100a^2$$

$$g) (5de-2f)(2f+5de) = 25d^2e^2 - 4f^2$$

$$h) (4c+9b)(-9b+4c) = 16c^2 - 81b^2$$

\* 4 Uprav pomocí vzorce:

$$a) (k^2+l^2)(k^2-l^2) = k^4 - l^4$$

$$b) (2m^3+4n^2)(-4n^2+2m^3) = 4m^6 - 16m^4n^2$$

$$c) (5s^2-4rs)(4rs+5s^2) = 25s^4 - 16r^2s^2$$

$$d) (3t+7t^2)(7t^2-3t) = 49t^4 - 9t^2$$

$$e) (u^2v-3z^2)(-u^2v-3z^2) = -u^4v^2 - 9z^4$$

$$f) (9x^2-4y^2)(4y^2+9x^2) = 81x^4 - 16y^4$$

$$g) (2a-\sqrt{2})(2a+\sqrt{2}) = 4a^2 - 2$$

$$h) \left(3b - \frac{1}{\sqrt{2}}\right)\left(3b + \frac{1}{\sqrt{2}}\right) = 9b^2 - \frac{1}{2}$$

\* 5 Uprav pomocí vzorce:

$$a) \left(\frac{2}{3}c - \frac{1}{2}d\right)\left(\frac{2}{3}c + \frac{1}{2}d\right) = \frac{4}{9}c^2 - \frac{1}{4}d^2$$

$$b) \left(\frac{7}{9}g + \frac{6}{5}f\right)\left(\frac{6}{5}f - \frac{7}{9}g\right) = \frac{36}{25}f^2 - \frac{49}{81}g^2$$

$$c) \left(\frac{1}{6}a^2 - \frac{5}{3}b\right)\left(\frac{5}{3}b + \frac{1}{6}a^2\right) = \frac{1}{36}a^4 - \frac{25}{9}b^2$$

$$d) \left(\frac{3}{4}z^2 + \frac{2}{9}y\right)\left(-\frac{3}{4}z^2 + \frac{2}{9}y\right) = \frac{4}{81}y^2 - \frac{9}{16}z^4$$

$$e) (0,2x - 0,03y)(0,2x + 0,03y) = 0,04x^2 - 0,0009y^2$$

$$f) (0,13k^2 + 0,11m)(0,11m - 0,13k^2) =$$

$$= 0,0121m^2 - 0,0169k^4$$

$$g) (-0,5t + 0,3s)(0,5t + 0,3s) = 0,09s^2 - 0,25t^2$$

$$h) (0,7r - 0,3p)(-0,3p - 0,7r) = -(0,7r - 0,3p)(0,3p + 0,7r)$$

$$= -(0,49r^2 - 0,09p^2) = 0,09p^2 - 0,49r^2$$

6) Vypočítej z paměti: Vzor:  $36 \cdot 44 = (40 - 4)(40 + 4) = 1600 - 16 = 1584$

$$20^2 - 18^2 = (20 + 18)(20 - 18) = 38 \cdot 2 = 76$$

$$a) 48 \cdot 52 = (50 - 2) \cdot (50 + 2) = 50^2 - 2^2 = 2500 - 4 = 2496$$

$$b) 103 \cdot 97 = (100 + 3)(100 - 3) = 10000 - 9 = 9991$$

$$c) 0,99 \cdot 1,01 = (1 - 0,01)(1 + 0,01) = 1 - 0,0001 = 0,9999$$

$$d) 1\frac{2}{3} \cdot 2\frac{1}{3} = \left(2 - \frac{1}{3}\right) \cdot \left(2 + \frac{1}{3}\right) = 4 - \frac{1}{9} = 3\frac{8}{9}$$

$$e) 41^2 - 40^2 = (41 - 40)(41 + 40) = 1 \cdot 81 = 81$$

$$f) 63^2 - 62^2 = (63 - 62)(63 + 62) = 1 \cdot 125 = 125$$

$$g) 35^2 - 25^2 = (35 - 25)(35 + 25) = 10 \cdot 60 = 600$$

$$h) 105^2 - 95^2 = (105 - 95)(105 + 95) = 10 \cdot 200 = 2000$$

7) Zapiš druhou mocninu dvojčlenu:

$$a) (x + y)^2 = x^2 + 2xy + y^2$$

$$b) (u - v)^2 = u^2 - 2uv + v^2$$

$$c) (k - l)^2 = k^2 - 2kl + l^2$$

$$d) (t + u)^2 = t^2 + 2tu + u^2$$

$$e) (a + 2)^2 = a^2 + 4a + 4$$

$$f) (b - 3)^2 = b^2 - 6b + 9$$

$$g) (c - 7)^2 = c^2 - 14c + 49$$

$$h) (d + 5)^2 = d^2 + 10d + 25$$

8) Zapiš druhou mocninu dvojčlenu:

$$a) (2f + 3)^2 = 4f^2 + 12f + 9$$

$$b) (4g - 5)^2 = 16g^2 - 40g + 25$$

$$c) (7h - 3)^2 = 49h^2 - 42h + 9$$

$$d) (5k + 8)^2 = 25k^2 + 80k + 64$$

$$e) (9n + 2o)^2 = 81n^2 + 36no + 4o^2$$

$$f) (5p + 3r)^2 = 25p^2 + 30pr + 9r^2$$

$$g) (2r - 5s)^2 = 4r^2 - 20rs + 25s^2$$

$$h) (4tu - 7o)^2 = 16t^2u^2 - 56tuo + 49o^2$$

\* 9) Umocni dvojčlen:

$$a) (x^2 + 3y)^2 = x^4 + 6x^2y + 9y^2$$

$$b) (4z^2 - 9)^2 = 16z^4 - 72z^2 + 81$$

$$c) (6d^3 - 5e^2)^2 = 36d^6 - 60d^3e^2 + 25e^4$$

$$d) (-4k^2 - 5l^2)^2 = [(4k^2 + 5l^2)]^2 = 16k^4 + 40k^2l^2 + 25l^4$$

$$e) (3m^2n + 2m)^2 = 9m^4n^2 + 12m^3n + 4m^2$$

$$g) (-r^2 + 4s^2)^2 = 16s^4 - 8r^2s^2 + r^4$$

$$f) (7s^2t - 9st^2)^2 = 49s^4t^2 - 126s^3t^3 + 81s^2t^4$$

$$h) (4k^2 - 6l^3)^2 = 16k^4 - 48k^2l^3 + 36l^6$$

\* 10 Vypočítej:

$$a) (0,2x + 5z)^2 = \frac{1}{25}x^2 + 2xz + 25z^2$$

$$c) (1,2a^2 - 0,3b)^2 = \frac{36}{25}a^4 - \frac{18}{25}a^2b + \frac{9}{100}b^2$$

$$e) \left(\frac{1}{2}z + y\right)^2 = \frac{1}{4}z^2 + yz + y^2$$

$$g) \left(\frac{1}{2}t - \frac{2}{3}u\right)^2 = \frac{1}{4}t^2 - \frac{2}{3}tu + \frac{4}{9}u^2$$

$$b) (4y - 0,5)^2 = 16y^2 - 4y + \frac{1}{4}$$

$$d) (k - 0,4l)^2 = k^2 - 0,8kl + 0,16l^2$$

$$f) \left(\frac{2}{3}d - \frac{1}{4}e\right)^2 = \frac{4}{9}d^2 - \frac{ed}{3} + \frac{e^2}{16}$$

$$h) (\sqrt{3m} + \sqrt{12n})^2 = 3m + \sqrt{24mn} + 12n$$

\* 11 Vypočítej:

$$a) (a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2ac + 2bc$$

$$c) (2d + e - 4)^2 = 4d^2 + e^2 + 16 + 4ed - 16d - 8e$$

$$e) (3k + 1)^3 = 27k^3 + 27k^2 + 9k + 1$$

$$g) (2t + u)^3 = 8t^3 + 12t^2u + 6tu^2 + u^3$$

$$b) (3z - 2y + x)^2 = 9z^2 + 4y^2 + x^2 - 12yz + 6zx - 4xy$$

$$d) (5r - 2s + 3)^2 = 25r^2 + 4s^2 + 9 - 20rs + 30r - 12s$$

$$f) (2m - 5n)^3 = 8m^3 - 60m^2n + 150mn^2 - 125n^3$$

$$h) (4 - 5v)^3 = -125v^3 + 300v^2 - 240v + 64$$

## 8. Rozklad mnohočlenů na součin Vytýkáním

1 Vytkni z mnohočlenů společného dělitele:

$$a) 15x - 20y = 5(3x - 4y)$$

$$c) 9u^2 - 18u^3 + 9 = 9(u^2 - 2u^3 + 1)$$

$$e) -30k^4 - 24k^2 - 36 = -6(5k^4 + 4k^2 + 6)$$

$$g) 52m^3 + 39n^2 - 26p = 13(4m^3 + 3n^2 - 2p)$$

$$b) 18t^2 + 15t - 12 = 3(6t^2 + 5t - 4)$$

$$d) 21z - 14z^2 + 42 = 7(3z - 2z^2 + 6)$$

$$f) -48p^2 - 32p - 64 = -16(3p^2 + 2p + 4)$$

$$h) 144a^2c - 72b^2d^2 + 108bc = 36(4a^2c - 2b^2d^2 + 3bc)$$

2 Uprav na součin vytýkáním:

$$a) 3x^3 + 5x^2 - 7x = x(3x^2 + 5x - 7)$$

$$c) 2z^4 - 3z^2 = z^2(2z^2 - 3)$$

$$e) 4a^2b - 10ab - 13ab^2 = ab(4a - 10 - 13b)$$

$$g) -4k^3m^2 - 3k^2m^3 - 7k^3m^3 = -k^2m^2(4k + 3m + 7k)$$

$$b) 9y^3 - 4y^2 - y = y(9y^2 - 4y - 1)$$

$$d) -5u^4 - 3u^3 - 7u = -u(5u^3 + 3u^2 + 7)$$

$$f) 6c^2de^3 - 5c^3d^2e^2 - c^2de^2 = c^2d^2e(6e - 5cd - 1)$$

$$h) 4p^5r^3s^2 + 5p^3rs^5 - 7p^2r^3s^3 = p^2rs^2(4p^3r^2 + 5p^2s^3 - 7r^2s)$$

3 Uprav na součin vytýkáním:

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

$$c) 15k^3m + 40k^2m^3 + 35km^5 = 5km(3k^2 + 8km^2 + 7m^4)$$

$$e) 75x^3y^2z^4 + 105x^4y^2z^3 + 60x^2y^3z = 15x^2y^2z(5xk^3 + 7x^2z^2 + 4y) = -8pqr(6p^2r + 4r^2s + 7p^2s^2)$$

$$f) -105t^2u^3v - 84t^3uv^2 - 56t^2u^2v = -7t^2uv(15u^2 + 12uv + 8v)$$

$$b) -16s^4 + 8s^3 + 12s^2 = -4s^2(4s^2 - 2s - 3)$$

$$d) -48p^3r^2s - 32pr^3s^2 - 56p^2rs^3 =$$

4 Vytkni stejné dvojčleny:

$$a) 3(a - 4) + b(a - 4) = (a - 4)(3 + b)$$

$$c) 3k(m + 2) - 4(m + 2) = (m + 2)(3k - 4)$$

$$b) c(d + 2) - 5(d + 2) = (d + 2)(c - 5)$$

$$d) 5f(2g + 3) + 2h(2g + 3) = (2g + 3)(5f + 2h)$$

$$e) s(r+5) + (r+5) \cdot 3 = (r+5)(s+3)$$

$$g) 2d(3e+f) - g(3e+f) = (3e+f)(2d-g)$$

$$f) 3x(x^2+4) - (x^2+4) \cdot 4 = (x^2+4)(3x-4)$$

$$h) (1+y^2) \cdot 4 - (y^2+1) \cdot z = (y^2+1)(4-z)$$

5. Uprav vytykáním:

$$a) z(x+3) + (x+3) = (x+3)(z+1)$$

$$c) d+4+d(d+4) = (d+4)(1+d)$$

$$e) a^2(b+2) + 2 + b = (b+2)(a^2+1)$$

$$g) r(p-8) - p + 8 = (p-8)(r-1)$$

$$b) 3k(m-2) + (m-2) = (m-2)(3k+1)$$

$$c) n-7 - o(n-7) = (n-7)(1-o)$$

$$f) 2s(s-3) - 3 + s = (s-3)(2s-1)$$

$$h) 5-c + d(c-5) = (c-5)(-1+d)$$

\* 6. Rozlož na součin:

$$a) 3(b-2) + a(2-b) = (b-2)(3-a)$$

$$c) z(4a-5) + 7(5-4a) = (4a-5)(z-7)$$

$$e) 3m + 4n(3m+2) + 2 = (3m+2)(1+4n)$$

$$g) a(x+3) + 2x + 6 = (x+3)(a+2)$$

$$b) 2e(d-f) - 5(f-d) = (d-f)(2e+5)$$

$$d) u(3t-2) + 6(2-3t) = (3t-2)(u-6)$$

$$f) 5x-y-4z(y-5x) = (y-5x)(-1-4z)$$

$$h) 4(t-2) - tu + 2u = (t-2)(4-u)$$

7. Vytýkej postupně:

$$a) ax + bx + ay + by = x(a+b) + y(a+b) = (a+b)(x+y)$$

$$b) 3c + 3d + ce + de = 3(c+d) + e(c+d) = (c+d) \cdot (3+e)$$

$$c) mo - no + 2m - 2n = o(m-n) + 2(m-n) = (m-n)(o+2)$$

$$d) k^2 - 4k + kl - 4l = k(k-4) + l(k-4) = (k-4)(k+l)$$

$$* e) yz - 4y - 3z + 12 = y(z-4) - 3(z-4) = (z-4)(y-3)$$

$$f) xy + 3y + x + 3 = y(x+3) + (x+3) = (x+3)(y+1)$$

$$* g) ef - 7e - 5f + 35 = e(f-7) - 5(f-7) = (f-7)(e-5)$$

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

$$3a(b-2) + b(b-2) = (b-2)(3a+b)$$

8. Rozlož na součin:

$$a) x^3 + x^2 + x + 1 = x^2(x+1) + x+1 = (x+1)(x^2+1)$$

$$b) y^3 - y^2 + y - 1 = y^2(y-1) + y-1 = (y-1)(y^2+1)$$

$$c) k^4 + k^3 + k + 1 = k^3(k+1) + k+1 = (k+1)(k^3+1)$$

$$e) z^4 - z^3 - z + 1 = (z-1)(z^3-1)$$

$$g) r^3 - 2r^2 + 3r - 6 = (r^2+3)(r-2)$$

$$d) u^4 - u^3 + u - 1 = (u^3+1)(u-1)$$

$$f) m^4 + 2m^3 - 3m^2 - 6m = (m-2)(m^3+3m)$$

$$h) ab^3 + ab^2 + ab + a = a(b^2+1)(b+1)$$

Pomocí vzorců

1. Rozlož pomocí vzorce  $(A+B)^2$ :

$$a) a^2 + 4a + 4 = (a+2)^2$$

$$b) b^2 - 2bc + c^2 = (b-c)^2$$

$$c) 4d^2 + 12de + 9e^2 = (2d+3e)^2$$

$$e) k^2 - 6k + 9 = (k-3)^2$$

$$g) x^2 + y^2 + 2xy = (x+y)^2$$

$$d) 25m^2 - 20m + 4 = (5m-2)^2$$

$$f) 4n^2 + 28n + 49 = (2n+7)^2$$

$$h) 16t^2 + 9u^2 - 24tu = (4t-3u)^2$$

\* 2. Rozlož na součin:

$$a) z^4 + 2z^2 + 1 = (z^2+1)^2$$

$$b) c^4 - 4c^2 + 4 = (c^2-2)^2$$

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

$$d) e^2 + e + 0,25 = (e+0,5)^2$$

$$e) m^4 - 4m^2n + 4n^2 = (m^2-2n)^2$$

$$f) 4r^4 - 12r^2s^2 + 9s^4 = (2r^2-3s^2)^2$$

$$g) \frac{1}{9k^2} - \frac{2}{3k} + 1 = \left(\frac{1}{3k} - 1\right)^2$$

$$h) 25u^2v^2 + 4z^2 - 20uvz = (5uv-2z)^2$$

3. Nejprve vytkni, potom použij vzorec:

$$a) -d^2 - 2de - e^2 = -(d+e)^2$$

$$b) k^2 + 8k - 16 = -(16-8k-k^2) \text{ nelze}$$

$$c) 10mn - 25m^2 - n^2 = -(5m+n)^2$$

$$e) -49x^2 - 9y^2 + 42xy = -(7x-3y)^2$$

$$d) -9t^2 + 24tu - 16u^2 = -(3t-4u)^2$$

$$f) -4r^2 - 20rs - 25s^2 = -(2r+5s)^2$$

4. Rozlož na součin:

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

$$b) 20m^2 - 60m + 45 = 5(4m^2 - 12m + 9) = 5(2m-3)^2$$

$$c) 18s^2 + 48rs + 32r^2 = 2(9s^2 + 24rs + 16r^2) = 2(3s+4r)^2$$

$$e) -4k^2 + 8k - 4 = -4(k^2 - 2k + 1) = -4(k-1)^2$$

$$f) 44 - 44z + 11z^2 = 11(4 - 4z + z^2) = 11(2-z)^2$$

$$\Rightarrow 7(3-2m)^2$$

\* 5. Rozlož vytkáním a pomocí vzorce:

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

b)  $c^3 + 8c^2 + 16c = c(c^2 + 8c + 4) = c(c+4)^2$

c)  $2d - 4d^2 + 2d^3 = 2d(1 - 2d + d^2) = 2d(1-d)^2$

d)  $4k^4 + 12k^3l + 9k^2l^2 = k^2(4k^2 + 12kl + 9l^2) = k^2(2k+3l)^2$

e)  $-x^3 + 2x^2 - x = -x(x^2 - 2x + 1) = -x(x-1)^2$

f)  $12yz^2 + 60yz + 75y = 3y(4z^2 + 20z + 25) = 3y(2z+5)^2$

g)  $-5np^2 + 30npr - 45nr^2 = -5n(p^2 + 6pr + 9r^2) = -5n(p+3r)^2$

h)  $4rs^4 - 4rs^3 + rs^2 = rs^2(4s^2 - 4s + 1) = rs^2(2s-1)^2$

\* 6. Rozlož pomocí vzorce  $A^2 - B^2$ :

a)  $d^2 - e^2 = (d-e) \cdot (d+e)$

c)  $25k^2 - 16m^2 = (5k-4m) \cdot (5k+4m)$

e)  $49s^2 - 9t^2 = (7s-3t) \cdot (7s+3t)$

g)  $100 - z^2 = (10-z) \cdot (10+z)$

b)  $k^2 - 9 = (k-3) \cdot (k+3)$

d)  $-4p^2 + q^2 = q^2 - 4p^2 = (q-2p) \cdot (q+2p)$

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

h)  $-a^2 + 81b^2 = -(a+9b) \cdot (a-9b)$

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

\* 7. Rozlož na součin:

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

c)  $q^4 - \frac{1}{4} = (q^2 - \frac{1}{2}) \cdot (q^2 + \frac{1}{2})$

e)  $o^2 - 3 = (o - \sqrt{3}) \cdot (o + \sqrt{3})$

g)  $-1 + 100a^4 = (10a^2 - 1) \cdot (10a^2 + 1)$

b)  $0,04x^2 - 0,25y^2 = (0,2x - 0,5y) \cdot (0,2x + 0,5y)$

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

f)  $\frac{16}{9}m^2 - \frac{1}{4}n^2 = (\frac{4}{3}m - \frac{1}{2}n) \cdot (\frac{4}{3}m + \frac{1}{2}n)$

h)  $d^4 - 16 = (d^2 - 4) \cdot (d^2 + 4)$

\* 8. Nejprve vytkni a potom použij vzorec  $A^2 - B^2$ :

a)  $5x^2 - 5y^2 = 5(x^2 - y^2) = 5(x-y) \cdot (x+y)$

b)  $3z^3 - 27z = 3z(z^2 - 9) = 3z(z-3) \cdot (z+3)$

c)  $7a^2c^2 - 112a^2d^2 = 7a^2(c^2 - 16d^2) = 7a^2(c-4d) \cdot (c+4d)$

d)  $9s^3 - 36s = 9s(s^2 - 4) = 9s(s-2) \cdot (s+2)$

e)  $km^3 - k^3m = km(m^2 - k^2) = km(m-k) \cdot (m+k)$

f)  $16t^4 - 16t^2u^2 = 16t^2(t^2 - u^2) = 16t^2(t-u) \cdot (t+u)$

g)  $a^3b - ab^3 = ab(a-b) \cdot (a+b)$

h)  $e^5f - ef^5 = ef(e^4 - f^4) = ef(e^2 - f^2) \cdot (e^2 + f^2)$

\* 9. Rozlož na součin:

a)  $(g+3)^2 - 4^2 = [(g+3) - 4] \cdot [(g+3) + 4] = (g-1) \cdot (g+7)$

b)  $p^2 - (r-5)^2 = (p-r+5) \cdot (p+r-5)$

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

d)  $m^2 - 2mn + n^2 - 4 = (m-n)^2 - 4 = (m-n-2) \cdot (m-n+2)$

e)  $x^2 - y^2 - 2yz - z^2 = x^2 - (y+z)^2 = (x-y-z) \cdot (x+y+z)$

f)  $t^2 - u^2 - 6u - 9 = t^2 - (u+3)^2 = (t-u-3) \cdot (t+u+3)$

g)  $r^2 - s^2 + 10s - 25 = r^2 - (s-5)^2 = (r-s+5) \cdot (r+s-5)$

h)  $c^2 - d^2 + 8d - 16 = c^2 - (d-4)^2 = (c-d+4) \cdot (c+d-4)$