

Výrazy a mnohočleny

jméno:

třída:

Řešení : sedovamatika.cz

Výpočty:

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Výrazy 1 - Základní operace s výrazy

$$\begin{array}{c} a \\ \square \\ a \end{array} \quad \sigma = a + a + a + a = 4a \quad \begin{array}{c} a \\ \square \\ a \end{array} \quad \sigma = a + b + a + b = 2a + 2b$$

$2cm + 3cm = 5cm$

$$1a = a$$

$$2 + 2 = 4$$

Dvě dvojky

$$a + a + a = 3a$$

$$a + a = 2a$$

Dvě a dva

$$1a + 1a$$

$$2a + a = 3a$$

$$2a + 1a$$

$$b + b = 2b$$

$$a + a + 1 = 2a + 1$$

$$a + a + b = 2a + b$$

$$a + 1 + a = 2a + 1$$

$$a + 1 + b + a = 2a + b + 1$$

$$2a + 2 + 5 = 2a + 7$$

$$2a + 3 + 3a + 1 = 5a + 4$$

$$2a + b + 3a + 2b = 5a + 3b$$

$$a - a = 0a = 0$$

$$1a - 1a$$

$$2a - 1a$$

$$2a - a = 1a = a$$

$$Pz: 2cm - 1cm = 1cm$$

$$a - 2a = -1a$$

$$1a - 2a$$

$$3b - 4a - 2b = b - 4a$$

$$1b - 4a$$

$$a^2 - 2a + a = a^2 - a$$

$$3^2 - 2 = 9 - 2 = 7$$

Pozn: Dokud neumíme násobit, tak jsme nemohli sečíst

$$10a - 2b - 5 - 3a + 8b + 4 = 7a + 6b - 1$$

$$a^2 + 3a - 5 + 4 + 6a = a^2 + 9a - 1$$

$$x^2 - 5x + 3 - 12x + 5x^2 = 6x^2 - 17x + 3$$

$$2 \cdot 3^2 - 2 = 2 \cdot 9 - 2 = 18 - 2 = 16$$

$$ab^2 - 2a + 3a = ab^2 + a$$

$$a^2b - 5 + 4 + ab^2 = a^2b + ab^2 - 1$$

$$x^2 + xy - 2xy + y^2 = x^2 + y^2 - 1xy$$

$$1xy - 2xy$$

$$\begin{array}{l} + (+) \rightarrow + \\ - (+) \rightarrow - \end{array}$$

$$\begin{array}{l} - (-) \Rightarrow + \\ + (-) \Rightarrow - \end{array}$$

$$2 + (-2) = 2 - 2 = 0$$

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

$$b - (+b) = b - b = 0$$

Takže dokud nás nemohli:

$$5 - 1 - 2 = 5 - 3 = 2$$

$$5 - (1 + 2) = 5 - 3 = 2$$

$$5 - (1 + 2) = 5 - 3 = 2$$

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

$$-(a) = -a \quad -(b) = -b$$

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

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

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

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

$$-(2a) = -2a \quad -(3) = -3$$

$$-(2a) = -2a$$

$$2 + (3 + 4) = 2 + 7 = 9$$

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

$$(2a + 3) + (3a + 1) = 5a + 4$$

$$4 - (3 - 1) = 4 - (2) = 4 - 2 = 2$$

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

$$4a - (2b - 2b) = 4a - (0) = 4a$$

$$\begin{array}{l} + a - b \\ -(a) = -a \\ -(-b) = +b \end{array}$$

$$\rightarrow 4a - 2b + 2b$$

$$-(2 - x) + (3x + 2) = -2 + x + 3x + 2 = 4x$$

$$+2 - x$$

$$-(x^2 + xy) - (2xy + y^2) + (xy + 1) = -x^2 - 2xy - y^2 + 1$$

$$-x^2 - xy - 2xy - y^2 + xy + 1$$

Výrazy 2 – Procvičování sčítání a závorek

$$1) \quad 6b^2 - 24ab + 5b^2 + 32ab = \underline{11b^2 + 8ab}$$

$$2) \quad (a^2b + 5) - (4 + a^2b) = \underline{0a^2b + 1 = 1}$$

$$a^2b + 5 - 4 - a^2b$$

$$3) \quad pq^2 + 45p - p^2q - pq^2 - 20p = \underline{0p^2 + 25p - p^2q = 25p - p^2q}$$

$$4) \quad 2a - (b + 3a + 2b) = \underline{2a - b - 3a - 2b = -3b - a}$$

$$5) \quad 12a^2 + 6a - 15b^2 - 5ab + 15b^2 + 8a^2 = \underline{20a^2 + 6a - 5ab}$$

$$-15b^2 + 15b^2 = 0$$

$$6) \quad 12a^3 + 6a^2 - 15b^3 - 5ab + 15b^3 + 8a^3 = \underline{20a^3 + 6a^2 - 5ab}$$

$$-(a^2) = -a^2$$

$$7) \quad -(a^2 + 3a - 5 + 4) + 6a = \underline{-a^2 + 3a + 1}$$

$$-a^2 - 3a + 5 - 4 + 6a$$

$$8) \quad 12a^2 + (6a - 15b^2 - 5ab) - (15b^2 + 8a^2) = \underline{4a^2 + 6a - 30b^2 - 5ab}$$

$$12a^2 + 6a - 15b^2 - 5ab - 15b^2 - 8a^2$$

$$-(15b^2) = -15b^2 \quad -(-5ab) = +5ab$$

$$9) \quad (12a^3 + 6a^2) - (15b^3 - 5ab) - (15b^3 + 8a^3) = \underline{4a^3 + 6a^2 - 30b^3 + 5ab}$$

$$12a^3 + 6a^2 - 15b^3 + 5ab - 15b^3 - 8a^3$$

$$10) \quad (3x^2 + 3) - (11x + 7y^2 - 2x^2 + xy) - (4xy + 2y^2) = \underline{5x^2 + 3 - 11x - 9y^2 - 5xy}$$

$$3x^2 + 3 - 11x - 7y^2 + 2x^2 - xy - 4xy - 2y^2$$

Výrazy 3 - Procvičování sčítání (bez videa)

$$1) \quad a - 3b + 14a - 6b + 4a - 15 + 2b + 6 = 19a - 7b - 9$$

$$2) \quad 2xy - 2x + 4y + 24 - y + 5x - 8 - xy = xy + 3x + 3y + 16$$

$$3) \quad 5ab + 4a + 12b + 3ab - 2 - 3b - 2ab = 6ab + 4a + 9b - 2$$

$$4) \quad 2 + 4xy - 3xy - 5 + 15y + 6x - 4 - 3y = -7 + xy + 12y + 6x$$

$$5) \quad 5a^2 + 3a - 6 + 4a + 6a - 3a^2 - 5a + 3 + 4a - 6a = 2a^2 + 6a - 3$$

$$6) \quad 6b^2 - 16ab + 5b^2 + 35ab + a^2b - 5 + 4 + ab^2 = 11b^2 + 19ab + a^2b + ab^2 - 1$$

$$7) \quad 2pq^2 + 5p - p^2q - 2pq^2 - 20p - 3pq^2 + 41 - 3pq^2 + 15p = -6pq^2 - p^2q + 41$$

$$8) \quad x^2 - 5x + 3 - 12x + 5y^2 - x^2 + 2xy - 3xy + y^2 = -17x + 3 + 6y^2 - xy$$

$$9) \quad 3a^3 + 8a - 6a + 16 + 6 - 4a^2 - 12a + 3 + 7a + 8 = 3a^3 - 3a + 33 - 4a^2$$

$$10) \quad 10x^2 - 15xy^2 + 5x^3 + 14x^2 + 2xy^2 - 3xy + x^3 = 24x^2 - 13xy^2 + 6x^3 - 3xy$$

Výrazy 4 - Procvičování sčítání a závorek (bez videa)

$$1) \quad (3x-1)-(2x-y+4)-(5y-2) = x-3-4y$$

$$3x-1-2x+y-4-5y+2$$

$$2) \quad (3c+1)+(4b+4)-(2b-5c-2) = 8c+7+2b$$

$$3c+1+4b+4-2b+5c+2$$

$$3) \quad -(2x-y)-(3x+4)+(7x+2y-2) = 2x+3y-6$$

$$-2x+y-3x-4+7x+2y-2$$

$$4) \quad -(4x+2y-7)+(7x+2y-5) = 3x+2$$

$$-4x-2y+7+7x+2y-5$$

$$5) \quad xy-(2xy+3x)+3x+(xy+7) = 7$$

$$xy-2xy-3x+3x+xy+7$$

$$6) \quad (2b^2+a)-(3ab+b^2)+(2b^2-5b+3a) = 3b^2+4a-3ab-5b$$

$$2b^2+a-3ab-b^2+2b^2-5b+3a$$

$$7) \quad (2x^2+2y^2-7)+3x^2+7y^2+10-(x^2-11+y^2) = 4x^2+8y^2+14$$

$$2x^2+2y^2-7+3x^2+7y^2+10-x^2+11-y^2$$

$$8) \quad (3x^2-5x)+3-12x+5y^2-(2x^2+xy-7xy+y^2) = x^2-17x+3+4y^2+6xy$$

$$3x^2-5x+3-12x+5y^2-2x^2-xy+7xy-y^2$$

$$9) \quad (9z^2+3z)-(6z^2+z^2)+(6zb^2-5+3z) = 2z^2+6z+6zb^2-5$$

$$9z^2+3z-6z^2-z^2+6zb^2-5+3z$$

Výrazy 5 - Násobení výrazů



$$s = a \cdot a = a^2$$

$$pr: 3^3 = 3 \cdot 3 \cdot 3$$

$$a \cdot a = a^2$$

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

$$a \cdot a \cdot a = a^3$$

$$pr: 5^2 \cdot 5^3 = 5^{2+3} = 5^5$$

$$a^2 \cdot a^1 = a^3$$

$$a \cdot a \cdot b = a^2 b$$

$$a^2 \cdot a^3 = a^{2+3} = a^5$$

$$ab \cdot b = ab^2$$

$$ab \cdot a = a^2 b$$

$$2a \cdot a = 2a^2$$

$$pr: ab^2 + a^2 b \neq a^3 b^2$$

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

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

$$2a \cdot 2a = 4a^2$$

$$3a^2 \cdot 4a = 12a^3$$

$$3a^2 \cdot a^3 b^2 = 3a^5 b^2$$

$$5a^2 b^3 \cdot 2ab = 10a^3 b^4$$

$$3 \cdot 4 = 12$$

$$a^2 \cdot a = a^3$$

$$-2a^2 \cdot (-3a^2) \cdot 2a = 12a^5$$

$$a^2 \cdot a^2 \cdot a^1 = a^5$$

$$1abc \cdot 2a^2 c^3 = 2a^3 b c^4$$

$$1 \cdot 2 = 2$$

$$a^1 \cdot a^2 = a^3$$

$$6xyb^2 \cdot 5x^4 yb^2 = 30x^5 y^2 b^4$$

$$-3qp^2 \cdot 3q^2 p^2 = -9q^3 p^4$$

$$0,5xy \cdot 0,4x^3 = 0,2x^4 y$$

$$0,5 \cdot 0,4 = 0,2$$

$$10a \cdot 3a^3 b^2 c = 30a^4 b^2 c$$

$$(-2ab) \cdot (-2a^2) = 4a^3 b$$

$$(4a)^2 = (4a) \cdot (4a) = 4 \cdot 4 \cdot a \cdot a = 4^2 \cdot a^2 = 16a^2$$

Mochníme i díš b
- celou záorkou

$$(-3a)^2 = 9a^2$$

$$(-3a)(-3a)$$

$$-(5b)^2 = -25b^2$$

Minus nemochíme
je před záorkou

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

Mochníme jenom a

$$(-a)^3 = -a^3$$

$$(-a)(-a)(-a)$$

$$\frac{1}{2}a \cdot 2a = 1a^2$$

$$\frac{2}{3}z^2 \cdot \frac{3}{2}z = \frac{2}{3}z^3$$

$$\frac{1}{2} \cdot 2 = 1$$

$$\frac{2}{3} \cdot \frac{3}{2} = 1$$

$$-\frac{4}{17}a^3 \cdot \frac{17}{8}x^3 = -\frac{1}{2}a^3 x^3$$

$$\frac{4}{17} \cdot \frac{17}{8}$$

$$-\frac{3a^2 b}{12} \cdot \frac{-8ab^2}{6} = \frac{1}{3}a^3 b^3$$

$$\frac{3}{12} \cdot \frac{8}{6} = \frac{1}{1} \cdot \frac{4}{3} = \frac{4}{3}$$

$$\ominus \cdot \ominus \rightarrow +$$

Výrazy 6 Násobení mnohočlenu členem

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

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

$$3 \cdot (a^2+a) = 3a^2 + 3a$$

správný postup
→ začít

$$a \cdot (2+3) = a \cdot 5 = 5a$$

pozn: $\rightarrow 2a+3a \rightarrow$

$$a \cdot (2b+3b) = a \cdot 5b = 5ab$$

$$a \cdot (2b+3c) = 2ab + 3ac$$

$$a^2 \cdot (a+1) = a^3 + a^2$$

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

$$6a \cdot (4-2a) = 24a - 12a^2$$

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

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

$$-2 \cdot (2a+3) = -4a - 6$$

$$(-2a) \cdot (5a+12b) = -10a^2 - 24ab$$

$\ominus \cdot \ominus \rightarrow \oplus$

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

$\ominus \cdot \ominus \rightarrow \oplus$

$$-2a^2 \cdot (-3+2a) = 6a^2 - 4a^3$$

$\ominus \cdot \ominus \rightarrow \oplus$

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

$$-3 \cdot (2a+b+c) = -6a - 3b - 3c$$

$$(-a) \cdot (3x+2y-2) = -3ax - 2ay + 2a$$

$$-2y \cdot (4y+3-2y) = -4y^2 - 6y$$

$$-2y(2y+3)$$

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

$$\frac{1}{2} \cdot (2a+4b) = a + 2b$$

$$\frac{1}{2} \cdot 2a \quad \frac{1}{2} \cdot 4b$$

$$\frac{x}{5} \cdot (10x+20) = 2x^2 + 4x$$

$$\frac{x}{5} \cdot 10x \quad \frac{x}{5} \cdot 20$$

$$\frac{3}{14}x^2 \cdot (7x+6y) = \frac{3}{2}x^3 + \frac{9}{7}x^2y$$

$$2 \cdot \frac{3}{14}x^2 \cdot 7x \quad 3 \cdot \frac{3}{14}x^2 \cdot 6y$$

$$\frac{y^2}{3} \cdot (9y^2+6y+1) = 3y^4 + 2y^3 + \frac{y^2}{3}$$

$$\frac{y^2}{3} \cdot 9y^2 \quad \frac{y^2}{3} \cdot 6y$$

Výrazy 7 - Násobení mnohočlenu mnohočlenem

$$5 \cdot (a+b) = 5a + 5b$$

$$2 \cdot (a+b) + 3 \cdot (a+b) = 2a + 2b + 3a + 3b = 5a + 5b$$

$$(2+3) \cdot (a+b) = 5 \cdot (a+b) = 5a + 5b$$

$$(2a+3) \cdot (1+b) = 2a + 2ab + 3 + 3b$$

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

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

$$(b-5) \cdot (3+b) = 3b + b^2 - 15 - 5b = b^2 - 2b - 15$$

$$(b-4) \cdot (6+b) = 6b + b^2 - 24 - 4b = b^2 + 2b - 24$$

$$(2b+1) \cdot (b+2) = 2b^2 + 4b + b + 2 = 2b^2 + 5b + 2$$

$$(a+1) \cdot (2a^2+3) = 2a^3 + 3a + 2a^2 + 3 = 2a^3 + 2a^2 + 3a + 3$$

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

$$(a+2) \cdot (2b+3c) = 2ab + 3ac + 4b + 6c$$

$$(a^2-2b) \cdot (a-2b) = a^3 - 2a^2b - 2ab + 4b^2$$

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

$$(2a+4) \cdot (4-2a) = 8a - 4a^2 + 16 - 8a = -4a^2 + 16$$

$$-(2a+1) \cdot 4 = -4 \cdot (2a+1) = -8a - 4$$

$$1, \quad [2 \cdot (a-1)] \cdot (2a+1) = [2a-2] \cdot (2a+1) = 4a^2 + 2a - 4a - 2 = 4a^2 - 2a - 2$$

$$2, \quad 2 \cdot (3x+2) \cdot (3x-4) = 2 \cdot [9x^2 - 12x + 6x - 8] = 2 \cdot [9x^2 - 6x - 8] = 18x^2 - 12x - 16$$

$$[(2a) \cdot (5a+12)] \cdot (a-1) = [10a^2 + 24a] \cdot (a-1) = 10a^3 - 10a^2 + 24a^2 - 24a = 10a^3 + 14a^2 - 24a$$

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

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

$$[(x-3) \cdot (x-2)] \cdot (x+2) = [x^2 - 2x - 3x + 6] \cdot (x+2) = [x^2 + 6] \cdot (x+2) = x^3 + 2x^2 + 6x + 12$$

$$3, \quad -(x+1) \cdot (x-2) \cdot 3 = -3 \cdot (x+1) \cdot (x-2) = [-3x - 3] \cdot (x-2) = -3x^2 + 6x - 3x + 6 = -3x^2 + 3x + 6$$

Výrazy 8 – Procvičování násobení (bez videa)

$$3x^2 \cdot (-2x^2) = -6x^4$$

$$-4xy^3 \cdot (-3x^2y^2) = 12x^3y^5$$

$$5x^2yz \cdot (-12xy^4) = -60x^3y^5z$$

$$13abc^2d^4 \cdot 5a^2bcd^2 = 65a^3b^2c^3d^6$$

$$-\frac{4}{11}x^4y \cdot \frac{22}{8}x^3y = -x^7y^2$$

$$\frac{81a^2}{8} \cdot 10a^3b = 162a^5b$$

$$2b \cdot (5b - 2c) = 10b^2 - 4bc$$

$$-2x \cdot (2x - 5y) = -4x^2 + 10xy$$

$$5xy \cdot (2x - 3xy) = 10x^2y - 15x^2y^2$$

$$3ab \cdot (2a - 5b) = 6a^2b - 15ab^2$$

$$2xyz \cdot (4xy - x^2) = 8x^2y^2z - 2x^3yz$$

$$(2ab - 3b^2) \cdot 2a = 4a^2b - 6ab^2$$

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

$$(5x - 3y) \cdot (3x + 2) = 15x^2 + 10x - 9xy - 6y$$

$$(3d - 15) \cdot (2d + 4) = 6d^2 + 12d - 30d - 60 = 6d^2 - 18d - 60$$

$$(5 - 2b) \cdot (b - 3) = 5b - 15 - 2b^2 + 6b = -2b^2 + 11b - 15$$

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

$$(2b - 5) \cdot (3 + b) = 6b + 2b^2 - 15 - 5b = 2b^2 + b - 15$$

$$(5x - 3y) \cdot (-x + 2y) = -5x^2 + 10xy + 3xy - 6y^2 = -5x^2 + 13xy - 6y^2$$

$$(2y^2 - 3) \cdot (4y - 2) = 8y^3 - 4y^2 - 12y + 6$$

$$(2y - 3) \cdot (y - 2) \cdot (y + 2) = [2y^2 - 4y - 3y + 6] \cdot (y + 2) = [2y^2 - 7y + 6] \cdot (y + 2) = 2y^3 + 4y^2 - 7y^2 - 14y + 6y + 12 = 2y^3 - 3y^2 - 8y + 12$$

$$(x + 1) \cdot (4y + 3 - 2y) = (x + 1) \cdot (2y + 3) = 2xy + 3x + 2y + 3$$

Výrazy 9 – Zjednodušování v přijímacích zkouškách

$$1) \quad \underline{2x} - 3 - \underline{x} = x - 3$$

$$2) \quad (\underline{y-3y}) \cdot (y+3y) = -2y \cdot 4y = -8y^2$$

$$3) \quad (5n-2) \cdot (-4n) = -20n^2 + 8n$$

$$4) \quad (3a-2) \cdot (-2a) = -6a^2 + 4a$$

$$5) \quad (\underline{2-x}) \cdot \underline{3x} - 2x = 6x - 3x^2 - 2x = -3x^2 + 4x$$

$$6) \quad (3x+y) \cdot (3x-2) = 9x^2 - 6x + 3xy - 2y$$

$$7) \quad (2+y) (\underline{y+2-2y}) = (\underline{2+y}) \cdot (\underline{2-y}) = 4 - 2y + 2y - y^2 = 4 - y^2$$

$$8) \quad (a+a) \cdot (1-a) - a \cdot a = \underline{2a} \cdot (\underline{1-a}) - a^2 = 2a - \underline{2a^2 - a^2} = -3a^2 + 2a$$

$$9) \quad 5a \cdot (0,4b - 2a + 3) = 2ab - 10a^2 + 15a$$

$5 \cdot 0,4 = 2$

$$10) \quad \underline{2x(x-3)} - (\underline{x^2+3x}) = \underline{2x^2 - 6x} - \underline{x^2 + 3x} = x^2 - 9x$$

$2x^2 - (x^2) = x^2$ $-(6x) - 3x = -9x$

$$11) \quad \underline{-3y(y-2)} - (\underline{2y^2+5y}) = \underline{-3y^2 + 6y} - \underline{2y^2 + 5y} = -5y^2 + y$$

$-(3y^2) = -3y^2$ $-(2y^2 + 5y) = -2y^2 - 5y$

$$12) \quad y(3y-1) - \underline{3(y^2-y)} = \underline{3y^2 - y} - \underline{3y^2 - 3y} = 2y$$

$$13) \quad [2 \cdot (3y-x)] \cdot (5-y) = \underline{[6y-2x]} \cdot (\underline{5-y}) = 30y - 6y^2 - 10x + 2xy$$

$$14) \quad \underline{(4-y+3)} \cdot x - (\underline{y+5}) \cdot 5 = (\underline{7-y}) \cdot x - \underline{5 \cdot (y+5)} = 7x - xy - 5y - 25$$

Výrazy 10 – Zjednodušování v přijímacích zkouškách

$$1) (2-b) \cdot (2+b) - 7 \cdot (-b+b) + b \cdot b = 4 + 2b - 2b - b^2 + b^2 = 4$$

$$2) a \cdot 2a - 2 \cdot (3a-1) \cdot a - a(7-4) = 2a^2 - 2a \cdot (3a-1) - 3a = 2a^2 - 6a^2 + 2a - 3a = -4a^2 - a$$

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

$$4) (4n-1) \cdot (4n+1) - 8n \cdot (n-1) = 16n^2 + 4n - 4n - 1 - 8n^2 + 8n = 8n^2 + 8n - 1$$

$$5) (2n-3) \cdot (4n-2) + (n-3)(n+3) = 8n^2 - 4n - 12n + 6 + n^2 + 3n - 3n - 9 = 9n^2 - 16n - 3$$

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

$$7) (2b+1)(2b-1) - b(-b+b) + 1 = 4b^2 - 2b + 2b - 1 + 1 = 4b^2$$

$$8) 3e \cdot (2-f) - 2f \cdot (e-3f) = 6e - 3ef - 2ef + 6f^2 = 6e - 5ef + 6f^2$$

$$9) (2+y) \cdot (y-2) - 2(y^2-1) = 2y - 4 + y^2 - 2y - 2y^2 + 2 = -y^2 - 2$$

$$10) (2-5) \cdot (2b-1) - (4b-2b) \cdot (-2) = -3 \cdot (2b-1) - 2b \cdot (-2) = -6b + 3 + 4b = -2b + 3$$

$$11) (4+n) \cdot (4-n) + (3n-2) \cdot (-3) = 16 - 4n + 4n - n^2 - 9n + 6 = -n^2 - 9n + 22$$

$$1) \quad a - a^2 + 2 - 2 \cdot (a+1) \cdot (1-a) = a - a^2 + 2 + [-2a - 2] \cdot (1-a) = \underline{a - a^2 + 2 - 2a - 2} + \underline{2a^2 - 2a} = a^2 + a$$

$$2) \quad (2+n) \cdot (3n-3) + (3n-n) \cdot 2 - n \cdot (3-5) = \underline{6n - 6 + 3n^2 - 3n} + \underline{4n + 2n} = 3n^2 + 9n - 6$$

$$3) \quad \frac{-2+3a}{2b} + \frac{(1+2a) \cdot 2}{1 \cdot b} = \frac{-2+3a}{2b} + \frac{2+4a}{2b} = \frac{-2+3a+2+4a}{2b} = \frac{7a}{2b}$$

rozšíříme

$$4) \quad (10x-8) - x \cdot \sqrt{100-64} = 10x-8 - x \cdot \sqrt{36} = 10x-8-6x = 4x-8$$

$$5) \quad (2n+6) \cdot (2n-6) + (3-5) \cdot 2n - 5n \cdot (n-2n) = \underline{4n^2 - 12n + 12n - 36} - \underline{4n} + \underline{5n^2} = 9n^2 - 4n - 36$$

$$6) \quad \frac{2 \cdot 2}{1 \cdot 3} \cdot a + \frac{a}{6} - \frac{4a}{12} = \frac{4a}{6} + \frac{a}{6} - \frac{2a}{6} = \frac{3a}{6} = \frac{1}{2}a = \underline{\underline{\frac{a}{2}}}$$

$$7) \quad \frac{(y+3)}{3} - \frac{y}{4} - 1 = \frac{4(y+3)}{12} - \frac{3y}{12} - \frac{12}{12} = \frac{4y+12-3y-12}{12} = \frac{y}{12}$$

$$8) \quad \frac{(b-3)}{3} + 4 - \frac{2b}{2} - 1 = \frac{b-3}{3} + 3 - b = \frac{b-3}{3} + \frac{9}{3} - \frac{3b}{3} = \frac{b-3+9-3b}{3} = \frac{-2b+6}{3}$$

$$9) \quad \frac{2(n-1)}{2 \cdot 2} - \frac{2n-3}{4} = \frac{2(n-1)}{4} - \frac{2n-3}{4} = \frac{2(n-1) - (2n-3)}{4} = \frac{2n-2-2n+3}{4} = \frac{1}{4}$$

$$10) \quad (5-y) \cdot (5+y) + 3 \cdot (y^2-10) - (2y-3) \cdot y = \underline{25+5y-5y-y^2} + \underline{3y^2-30} - \underline{2y^2-3y} = 3y-5$$

$$11) \quad 2a \left(2 - \frac{a}{2} \right) - \left(\frac{2a}{3} + a^2 \right) \cdot 3 = \underline{4a - a^2} - \underline{2a - 3a^2} = -4a^2 + 2a$$

$$2a \cdot \left(-\frac{a}{2} \right) - 3 \cdot \frac{2a}{3}$$

$$12) \quad \frac{1}{2} \cdot n \cdot (2-3n) + 3 \cdot (n+2n) - n \cdot (3-n) = \underline{n - \frac{3}{2}n^2} + \underline{9n - 3n} + \underline{n^2} = -\frac{1}{2}n^2 + 7n$$

$\frac{1}{2}n \cdot 2$

$$-\frac{3}{2}n^2 + n^2 = -\frac{3}{2}n^2 + \frac{2}{2}n^2 = -\frac{1}{2}n^2$$

Výrazy 12 – Dělení výrazů

$$2 \cdot 3 = 6 \quad \begin{matrix} \hookrightarrow 6:2=3 \\ \hookrightarrow 6:3=2 \end{matrix} \quad \begin{matrix} a^2 \cdot a^3 = a^5 \\ \hookrightarrow a^5 : a^2 = a^3 \\ a^5 : a^3 = a^2 \end{matrix}$$

$$a : a = a^1$$

$$a : a = 1$$

$$a : (-a) = -1$$

$$a^2 : a^1 = a^{2-1} = a$$

$$a^2 \cdot a^3 = a^{2+3} = a^5$$

$$a^5 : a^3 = a^{5-3} = a^2$$

$$2a : 2a = 1 \cdot 1 = 1$$

Dejme si každé číslo a písmenko
2:2=1 a:a=1

$$2a : (-2a) = -1$$

$$2b : b = 2$$

$$2b : (-b) = -2$$

$$ab : a = b$$

$$-ab : a = -b$$

$$2a^2 : 2 = a^2$$

2:2=1

$$2a^2 : 2a^1 = 1a = a$$

$$9ab^2 : 3ab = 3b$$

9:3=3 a:a=1
b^2:b=b

$$25a^2b^3 : 5ab = 5ab^2$$

25:5=5 b^3:b=b^2
a^2:a=a

$$30x^4yb^2 : 5x^4b = 6yb$$

$$24a^2bc^3 : 2ac = 12abc^2$$

$$\frac{1}{2}a^2 : \frac{1}{4}a = 2a$$

$$\frac{3}{14}x^4 : \frac{9}{21}x^3 = \frac{1}{2}x$$

$$\frac{1}{2} : \frac{1}{4} = \frac{1}{1} \cdot \frac{4}{1} = 4$$

$$\frac{4}{25} : \frac{8}{15} = \frac{4}{1} \cdot \frac{15}{25} = \frac{12}{5}$$

$$\frac{3}{14} : \frac{9}{21} = \frac{3}{14} \cdot \frac{21}{9} = \frac{1}{2}$$

$$\frac{5}{49} : \frac{35}{7} = \frac{5}{49} \cdot \frac{7}{35} = \frac{1}{49}$$

$$\frac{4}{25}a^3bc^2d : \frac{8}{15}a^3bcd = \frac{3}{10}c$$

$$\frac{5}{49}x^2y^3 : \frac{7}{35}y^3 = \frac{25}{49}x^2$$

$$(2a+2b) : 2 = a+b$$

$$(4a+8b) : 2 = 2a+4b$$

Jako $(2a+2b) \cdot \frac{1}{2} \rightarrow$ stejný princip

$$(16x+8) : 4 = 4x+2$$

$$(15x+30y^2) : 5 = 3x+6y^2$$

$$(a^2+a) : a = a+1$$

$$(a^2+a) : (-a) = -a-1$$

$$a^5 : a^3 = a^{5-3} = a^2$$

$$(a^5+a^4) : a^3 = a^2+a$$

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

$$(-2a-2a^2) : (-2a) = 1+a$$

Kontrola $(1+a) \cdot (-2a)$

$$(b^2-2b) : b = b-2$$

$$(b^2-8b+ab) : (-b) = -b+8-a$$

$$(8a^2+12a+4-12b+20b^2) : (4) = 2a^2+3a+1-3b+5b^2$$

$$(2a+2b) : 2 + (a+b) : (-1) = a+b-a-b = 0$$

$$4a \cdot (a+2b) : 4a = \begin{cases} [4a^2+8ab] : 4a = a+2b \\ a+2b \end{cases}$$

Výrazy 13 - Vytknutí před závorku

Odstraň závorku

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

$$-(b) = -b$$

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

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

Vytkní mínus před závorku

$$-a+b = -(\overset{\text{nepíše se}}{+}a-b) = -(a-b)$$

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

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

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

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

$$3x-2y = -(-3x+2y)$$

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

$$-2a-1 = -(2a+1)$$

$$-12a+4b+8 = -(-12a+4b+8)$$

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

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

$$-9c+2x+4 = -(-9c+2x-4)$$

$$-6a^2+5a-3 = -(-6a^2+5a+3)$$

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

$$-4c+a+b+d = -(\overset{+4c \text{ a } +d \text{ nepíše se}}{4c}-a-b-d)$$

Vytkní před závorku (mínus když jsou záporné oba členy)

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

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

$$2a:2=a$$

$$2b:2=b$$

kontrola - roznačsobit

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

$$3a^2:3a=a$$

$$3a:3a=1$$

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

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

$$8a-16 = 8(a-2)$$

$$16:8=2$$

$$16x^2-4 = 4(4x^2-1)$$

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

společně a

$$2ab+3ac = a(2b+3c)$$

$$2ab:a=2b$$

$$3ac:a=3c$$

$$24a-12a^2 = 12a(2-a)$$

společný dělitel 12a

$$24a:12a=2$$

$$12a^2:12a=a$$

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

roznačsobit
↑
pro kontrolu

$$-12a^2-12a = -12a(a+1)$$

$$6a^2-4a^3 = 2a^2(3-2a)$$

$$6a^2-4a^3 = 2a^2(3-2a)$$

$$8a^2b+2ab = 2ab(4a+1)$$

$$-10a^2-24ab = -2a(5a+12b)$$

$$-24abc-12a^2c = -12ac(2b+a)$$

$$-6a-3b-3c = -3(2a-b-c)$$

$$-3a^4+3a^3+3a^2 = 3a^2(-a^2+a+1)$$

$$6b^2 \cdot x^2 + 2b \cdot x^2 - x^2 = \underset{\substack{\text{všechny} \\ \text{členy } x^2}}}{x^2} (6b^2+2b-1)$$

$$12a^2b-4ab+8abc = 4ab(3a-1+2c)$$

Z daného výrazu vytkněte (-3x) (Cermat)

$$-6x^2-3x+9xy = -3x(2x+1-3y)$$

Z daného výrazu vytkněte (-3y)

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

Výrazy 14 – Zjednodušení pomocí vzorce

Roznásob pomocí vzorce $(a+b)^2 = a^2 + 2ab + b^2$

$$(a+b)^2 = (a+b) \cdot (a+b) = a^2 + \underbrace{ab+ab}_{2ab} + b^2 = a^2 + 2ab + b^2$$

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

$2ab \rightarrow 2 \cdot a \cdot 1$

$$(a+5)^2 = a^2 + 10a + 25$$

$2 \cdot a \cdot 5$

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

$2 \cdot 2a \cdot b$

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

$2 \cdot 2a \cdot 3$

$$(6a+5b)^2 = 36a^2 + 60ab + 25b^2$$

$2 \cdot 6a \cdot 5b$

Roznásob pomocí vzorce $(a-b)^2 = a^2 - 2ab + b^2$

$$(a-b)^2 = (a-b) \cdot (a-b) = a^2 - \underbrace{ab+ab}_{2ab} + b^2 = a^2 - 2ab + b^2$$

$$(a-1)^2 = a^2 - 2a + 1$$

$2 \cdot a \cdot 1$

$$(a-4)^2 = a^2 - 8a + 16$$

$2 \cdot a \cdot 4$

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

$2 \cdot 2x \cdot 1$

*Prost: $(1-2x)^2$
 $1 - 4x + 4x^2$
 To same*

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

$2 \cdot 3a \cdot 2$

$$(6-7b)^2 = 36 - 84b + 49b^2$$

$2 \cdot 6 \cdot 7b$

Zjednoduš (Cermat)

$$(2x+5)^2 = 4x^2 + 20x + 25$$

$2 \cdot 2x \cdot 5$

$$(3x-4)^2 = 9x^2 - 24x + 16$$

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

$$(5b-0,4a)^2 = 25b^2 - 4ab + 0,16a^2$$

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

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

$$a=x$$

$$b=y$$

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

$$2ab \dots 2 \cdot x \cdot 2$$

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

$2 \cdot 2x \cdot 1$

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

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

$\hookrightarrow 2 \cdot x \cdot 3y = 6xy$
 $2ab$

$$(2x+2y)^2 = 4x^2 + 8xy + 4y^2$$

$2 \cdot 2x \cdot 2y$

$$(5x+4y)^2 = 25x^2 + 40xy + 16y^2$$

$2 \cdot 5x \cdot 4y$

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

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

$$(x-2)^2 = x^2 - 4x + 4$$

$2 \cdot x \cdot 2$

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

$2 \cdot 1 \cdot 2x$

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

$2 \cdot x \cdot 3y$

$$(5x-5y)^2 = 25x^2 - 50xy + 25y^2$$

$2 \cdot 5x \cdot 5y =$

$$(3x+10)^2 = 9x^2 + 60x + 100$$

$2 \cdot 3x \cdot 10$

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

$$(0,3x+0,5)^2 = 0,09x^2 + 0,3x + 0,25$$

$2 \cdot 0,3 \cdot 0,5$

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

$2 \cdot 2x \cdot \frac{1}{2}$

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

$2 \cdot \frac{2}{3} \cdot 3$

Výrazy 15 – Úprava na součin pomocí vzorce

Pokud lze, uprav na součin pomocí vzorce $(a+b)(a+b)$
 $a^2 \pm 2ab + b^2 = (a \pm b)^2$

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

$$\text{kont: } 2 \cdot a \cdot b = 2ab \quad \checkmark$$

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

$$\text{kont: } 2 \cdot x \cdot 2 = 4x \quad \checkmark$$

$$x^2 + 8x + 16 = (x + 4)^2$$

$$\text{kont: } 2 \cdot x \cdot 4 = 8x \quad \checkmark$$

$$x^2 + 16x + 36 \neq (x + 6)^2$$

$$\text{kont: } 2 \cdot x \cdot 6 = 12x \quad \text{NELEŽE}$$

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

$$\text{kont: } 2 \cdot x \cdot 3y = 6xy \quad \checkmark$$

$$4x^2 + 16xy + 4y^2 \neq (2x + 2y)^2$$

$$\text{kont: } 2 \cdot 2x \cdot 2y = 8xy \quad \text{NELEŽE}$$

$$9x^2 - 12x + 4 = (3x - 2)^2$$

$$\text{kont: } 2 \cdot 3x \cdot 2 = 12x \quad \checkmark$$

$$16x^2 - 8x + 1 = (4x - 1)^2$$

$$\text{kont: } 2 \cdot 4x \cdot 1 = 8x \quad \checkmark$$

$$81a^2 - 18a + 1 = (9a - 1)^2$$

$$\text{kont: } 2 \cdot 9a \cdot 1 = 18a \quad \checkmark$$

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

$$\text{kont: } 2 \cdot x \cdot \frac{1}{2} = x \quad \checkmark$$

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

$$\text{kont: } 2 \cdot x \cdot 1 = 2x \quad \checkmark$$

$$x^2 - 8x + 4 \neq (x - 2)^2$$

$$\text{kont: } 2 \cdot x \cdot 2 = 4x \quad \text{NELEŽE}$$

$$z^2 + 10z + 25 = (z + 5)^2$$

$$\text{kont: } 2 \cdot z \cdot 5 = 10z \quad \checkmark$$

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

$$\text{kont: } 2 \cdot 2x \cdot 1 = 4x \quad \checkmark$$

$$25y^2 + 30y + 9 = (5y + 3)^2$$

$$\text{kont: } 2 \cdot 5y \cdot 3 = 30y \quad \checkmark$$

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

$$\text{kont: } 2 \cdot 2x \cdot 5 = 20x \quad \checkmark$$

$$4y^2 - 6y + 4 \neq (2y - 2)^2$$

$$\text{kont: } 2 \cdot 2y \cdot 2 = 8y \quad \text{NELEŽE}$$

$$25x^2 + 40xy + 16y^2 \neq (5x + 4y)^2$$

$$\text{kont: } 2 \cdot 5x \cdot 4y = 40xy \quad \text{NELEŽE}$$

$$100b^2 - 100bc + 25c^2 = (10b - 5c)^2$$

$$\text{kont: } 2 \cdot 10b \cdot 5c = 100bc \quad \checkmark$$

$$9x^2 - x + \frac{1}{9} \neq \left(x - \frac{1}{3}\right)^2$$

$$\text{kont: } 2 \cdot 3x \cdot \frac{1}{3} = 2x \quad \text{NELEŽE}$$

Doplň čísla aby rovnost dávala smysl

$$(x + 3)^2 = x^2 + 6x + 9$$

$$2 \cdot x \cdot 3 = 6x$$

$$(x - 3)^2 = x^2 - 6x + 9$$

$$2 \cdot x \cdot 3 = 6x$$

$$(a - 5)^2 = a^2 - 10a + 25$$

$$2 \cdot a \cdot 5$$

$$(y + 6)^2 = y^2 + 12y + 36$$

$$\downarrow$$

$$2 \cdot a \cdot b \quad 2 \cdot y \cdot 6 = 12y \quad 12y = 2y = 6$$

$$\left(\frac{1}{2}c + 5\right)^2 = \frac{1}{4}c^2 + 5c + 25$$

$$\downarrow$$

$$2 \cdot a \cdot b \quad 2 \cdot \frac{1}{2}c \cdot 5 = 5c \quad 20c : 10 = 2c$$

$$\left(k + \frac{3}{4}\right)^2 = k^2 + \frac{3}{2}k + \frac{9}{16}$$

$$2 \cdot k \cdot \frac{3}{4}$$

Výrazy 16 – Úprava na součin pomocí vzorce

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

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

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

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

$x^2 - \cancel{xy} + \cancel{xy} - y^2$

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

kontrola: $4 + 2b - 2b - b^2$

$$(5a+1) \cdot (5a-1) = 25a^2 - 1$$

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

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

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

$y^2 - 2x^2 + 2x^2 + y^2$

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

$-x^2 + 2xy + 2xy + 4y^2$

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

$(\sqrt{b})^2 = b \quad b \geq 0$

$$(5+\sqrt{5}) \cdot (5-\sqrt{5}) = 25 - 5 = 20$$

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

kontrola: $a^2 - \cancel{a} + \cancel{a} - 1 = a^2 - 1$

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

kontrola: $4 - 2b + 2b - b^2$

$$(5a-1) \cdot (5a+1) = 25a^2 - 1$$

$$(3a+2b) \cdot (3a-2b) = 9a^2 - 4b^2$$

$$(5y-6) \cdot (5y+6) = 25y^2 - 36$$

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

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

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

$\hookrightarrow \text{kontrola: } a^2 + \cancel{ab} - \cancel{ab} - b^2$

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

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

$(\sqrt{2})^2 = 2$

$$(300+\sqrt{1000}) \cdot (300-\sqrt{1000}) = 90000 - 1000 = 89000$$

Uprav na součin pomocí vzorce $a^2 - b^2 = (a+b) \cdot (a-b)$

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

$$y^2 - 4 = (y-2)(y+2)$$

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

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

$$4z^2 - 9 = (2z-3)(2z+3)$$

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

$$1 - 81a^2 = (1+9a)(1-9a)$$

$$144x^2 - 169 = (12x+13)(12x-13)$$

$$-4 + 9y^2 = (3y+2)(3y-2)$$

$9y^2 - 4$

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

$9y^2 - x^2$

$$36z^2 - 25x^2 = (6z+5x)(6z-5x)$$

$$100a^2 - 25b^2 = (10a+5b)(10a-5b)$$

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

$\sqrt{\frac{1}{4}} = \frac{1}{2}$

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

$$\frac{1}{36}b^2 - \frac{1}{16}c^2 = \left(\frac{1}{6}b + \frac{1}{4}c\right)\left(\frac{1}{6}b - \frac{1}{4}c\right)$$

$$-\frac{9}{25}x^2 + \frac{1}{4}y^2 = \left(\frac{1}{2}y + \frac{3}{5}x\right)\left(\frac{1}{2}y - \frac{3}{5}x\right)$$

$\frac{1}{4}y^2 - \frac{9}{25}x^2$

Výrazy 17 – Součinný tvar

Doplň tabulku

Tvar bez závorek	Součinný tvar	Tvar bez závorek	Součinný tvar
$x^2 + x$ 1. vytknutí (1. do výzkonu)	VZOR: $x(x+1)$	$y^2 - 6y + 9$	$(y-3)^2$ kontrola: $2 \cdot y \cdot 3 = 6y$ ✓
VZOR: $a^2 + 2ab + b^2$ 2. vzorec – pokud jsou tři – 1. číslo zkontroluj, poslední člen!	$(a+b)^2$	$2y^2 - 2$	$2 \cdot (y^2 - 1)$ $2 \cdot (y+1)(y-1)$
$y^2 - 1$ 3. zda obě odmocnit a je tam minus	VZOR: $(y-1)(y+1)$	$y^2 - 10y + 25$	$(y-5)^2$ kontrola: $2 \cdot y \cdot 5 = 10y$ ✓
$2y^2 + 4y$	$2y(y+2)$	$9a^2 - 30a + 25$	$(3a-5)^2$
$9 - a^2$	$(3-a) \cdot (3+a)$	$a^2 - 81$	$(a-9) \cdot (a+9)$
$y^2 - 4y + 4$	$(y-2)^2$ kontrola: $2 \cdot y \cdot 2 = 4y$ ✓	$8b^2 - 8$	$8 \cdot (b^2 - 1)$ $8 \cdot (b-1)(b+1)$
$y^2 - 4$	$(y+2)(y-2)$	$64b^2 - 16b + 1$	$(8b-1)^2$ kontrola: $2 \cdot 8b \cdot 1 = 16b$ ✓
$y^2 - 4y$	$y \cdot (y-4)$	$b^2 + 20b + 100$	$(b+10)^2$ kontrola: $2 \cdot b \cdot 10 = 20b$ ✓
$9a^2 - 25$	$(3a-5) \cdot (3a+5)$	$4b^2 - 4b + 1$	$(2b-1)^2$
$16a^2 - 81$	$(4a-9) \cdot (4a+9)$	$1 - x^2$	$(1+x)(1-x)$
$9b^2 - 4$	$(3b+2)(3b-2)$	$25 - 30b + 9b^2$	$(5-3b)^2$
$b^2 - 4b + 4$	$(b-2)^2$ kontrola: $2 \cdot b \cdot 2 = 4b$ ✓	$\frac{x^2}{9} + x + \frac{9}{4}$	$\left(\frac{x}{3} + \frac{3}{2}\right)^2 =$
$4b^2 - 4b + 1$	$(2b-1)^2$ kontrola: $2 \cdot 2b \cdot 1 = 4b$ ✓	$y^2 + y + \frac{1}{4}$	$\left(y + \frac{1}{2}\right)^2$ kontrola: $2 \cdot y \cdot \frac{1}{2} = y$
$b^2 - 6b + 9$	$(b-3)^2$	$4 - 25b$	$(2-5b) \cdot (2+5b)$
$4x^2 + 2x$	$2x(2x+1)$	$25y^2 - 40y + 16$	$(5y-4)^2$ kontrola: $2 \cdot 5y \cdot 4 = 40y$ ✓
$25 + 10b + b^2$	$(5+b)^2$	$-7y^2 + 28$ $28 - 7y^2$	$7 \cdot (4 - y^2)$ $7 \cdot (2-y)(2+y)$
$16y^2 - 9$	$(4y+3)(4y-3)$	$a^2 - 10a + 25$	$(a-5)^2$
$4y^2 + 4y$	$4y(y+1)$	$\frac{9y^2}{4} + 6y + 4$ $2 \cdot \frac{3y}{2} \cdot 2$	$\left(\frac{3y}{2} + 2\right)^2 =$
$9 - 25b$	$(3-5b) \cdot (3+5b)$	$(ab)^2 - 1$ $a^2b^2 - 1$	$(ab-1)(ab+1)$

Výrazy 18 – Součinný tvar

Zjednodušte a rozložte na součin (Cermat)

$$1) \quad 4a^2 - 9 = (2a+3)(2a-3)$$

$$2) \quad p^2 - 16 = (p-4)(p+4)$$

$$3) \quad (4a)^2 - 9 \cdot 9 = (4a-9)(4a+9) \\ 16a^2 - 81$$

$$4) \quad 9a^2 - 30a + 25 = (3a-5)^2 \\ \text{kontrola: } 2 \cdot 3a \cdot 5 = 30a \quad \checkmark$$

$$5) \quad 49 - (-4a)^2 = 49 - 16a^2 = (7-4a)(7+4a) \\ (-4a)^2 = 16a^2$$

$$6) \quad (4+x) \cdot x + 2x^2 = 4x + x^2 + 2x^2 = 3x^2 + 4x = x \cdot (3x+4)$$

$$7) \quad x \cdot x - x + 2x^2 = x^2 - x + 2x^2 = 3x^2 - x = x \cdot (3x-1)$$

$$8) \quad 5^2 - (a^2 + 16) = 25 - a^2 - 16 = 9 - a^2 = (3-a)(3+a)$$

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

$$10) \quad (3+a)^2 - (3 \cdot a)^2 - 3^2 = \underline{9} + \underline{6a} + \underline{a^2} - \underline{9a^2} - \underline{9} = 6a - 8a^2 = 2a(3-4a)$$

$$11) \quad x \cdot (y-3) + 3 \cdot (x-2y) = xy - \underline{3x} + \underline{3x} - 6y = xy - 6y = y \cdot (x-6)$$

$$12) \quad a \cdot (-a) - 2^2 \cdot \overset{4 \cdot 3a}{3a} + 6a^2 = -a^2 - 12a + 6a^2 = 5a^2 - 12a = a \cdot (5a-12)$$

$$13) \quad 5 - (1-x^2) - x \cdot 2x = 5 - 1 + x^2 - 2x^2 = 4 - x^2 = (2-x)(2+x)$$

$$14) \quad (3n+7) \cdot \overset{-n}{(-4n+3n)} + n \cdot (4n+9) = \underline{-3n^2} - \underline{7n} + \underline{4n^2} + \underline{9n} = n^2 + 2n = n \cdot (n+2) \\ -n \cdot (3n+7)$$

Doplň čísla aby rovnost dávala smysl

$$15) \quad a + b \quad a^2 + 2ab + b^2 \\ (y + \underline{5})^2 = y^2 + 10y + \underline{25}$$

$$17) \quad (x + y)^2 = x^2 - 2xy + 16b^2 \\ (-\underline{7} \cdot a + \underline{4} \cdot b)^2 = \underline{49} \cdot a^2 - 56ab + (\underline{4 \cdot b})^2 \\ 2 \cdot -7b = -14b = 56ab \\ 56ab : 8b = 7a$$

$$16) \quad (y + \underline{6}) \cdot (2y + 3) = 2y^2 + 15y + \underline{18} \\ \text{musí být } 12y \quad 12y : 2y = 6 \\ \text{chybí } 12y$$

Výrazy 19 – Zjednodušování v přijímacích zkouškách

$$1) \quad (x+4-2x)^2 = (4-x)^2 = 16 - 8x + x^2$$

$$2) \quad (x-4)^2 + (8-2x) \cdot 2x = x^2 - 8x + 16 + 16x - 4x^2 = -3x^2 + 8x + 16$$

$$3) \quad (4n+1)^2 + 3 \cdot (n-1) - (3n+n) \cdot 2n = 16n^2 + 8n + 1 + 3n - 3 - 8n^2 = 8n^2 + 11n - 2$$

$$4) \quad [(a-4a)^2 - 3a(3a+2)]^2 = [9a^2 - 9a^2 - 6a]^2 = [-6a]^2 = 36a^2$$

Na konci

$$5) \quad (a+b)(a-b) = a^2 - b^2$$

$$(50 + \sqrt{2000}) \cdot (50 - \sqrt{2000}) = 2500 - 2000 = 500$$

$$(\sqrt{2000})^2 = 2000 \quad \uparrow$$

$$6) \quad (2+3a)^2 - (2-3a)^2 = 4 + 12a + 9a^2 - 4 + 12a - 9a^2 = 24a$$

do mí vyjde
tak změním znaménko

$$7) \quad (3a+1)^2 - 3a(2+5a) = 9a^2 + 6a + 1 - 6a - 15a^2 = -6a^2 + 1$$

$$8) \quad 6y^2 - 9y + 0,25 - (2y - 0,1)^2 = 6y^2 - 9y + 0,25 - 4y^2 + 0,4y - 0,01 = 2y^2 - 8,6y + 0,24$$

$$9) \quad 2 \cdot (1-n)^2 + (n+2)^2 - 3 \cdot (2+n \cdot n) = 2 - 4n + 2n^2 + n^2 + 4n + 4 - 6 - 3n^2 = 0$$

2x větší

$$10) \quad \frac{5x \cdot x + 8}{2 \cdot 4} - 5 \cdot \frac{x \cdot x - 8}{8} = \frac{5x \cdot (x+8)}{2 \cdot 4} - \frac{5 \cdot (x^2 - 8)}{8} = \frac{5x \cdot (x+8) - 5 \cdot (x^2 - 8)}{8} = \frac{5x^2 + 40x - 5x^2 + 40}{8} = \frac{40x + 40}{8}$$

$\rightarrow (40x + 40) : 8 = 5x + 5$
 $\rightarrow \frac{8 \cdot (5x + 5)}{8} = 5x + 5$

$$11) \quad (-n-1)^2 + (1+4n) \cdot (1+4n) = n^2 + 2n + 1 + 1 + 8n + 16n^2 = 17n^2 + 10n + 2$$

$$(-n-1)(-n-1)$$

$$n^2 + n + n + 1$$

$$12) \quad \frac{(1+2b) \cdot b}{2} - \frac{(2-b)}{2} = \frac{(1+2b) \cdot b}{2} - \frac{(2-b)}{2} = \frac{(1+2b) \cdot b - (2-b)}{2} = \frac{b + 2b^2 - 2 + b}{2} = \frac{2b^2 + 2b - 2}{2}$$

$\rightarrow (2b^2 + 2b - 2) : 2 = b^2 + b - 1$
 $\rightarrow \frac{2 \cdot (b^2 + b - 1)}{2} = b^2 + b - 1$