# NÁSOBENÍ LOMENÝCH VÝRAZŮ

1) Vynásobte:

a) $\frac{14a^3x}{15b^4y} \cdot \frac{5b^3y^2}{7a^4x^2} = \frac{2}{3b} \cdot \frac{y}{ax} = \frac{2y}{3abx}$ podm.: $a \neq 0, b \neq 0, x \neq 0, y \neq 0$

b) $\frac{8ab}{3c^2d^2} \cdot \left(-\frac{21c^4d^4}{32a^3b^3}\right) = -\frac{1}{1} \cdot \frac{7c^2d^2}{4a^2b^2} = -\frac{7c^2d^2}{4a^2b^2}$ podm.: $a \neq 0, b \neq 0, c \neq 0, d \neq 0$

c) $\frac{2a^3x^5}{3b^2y^4} \cdot \frac{6ay^4}{5bx^4} \cdot \frac{by}{a^3x^2} = \frac{2x}{b^2} \cdot \frac{2a}{5} \cdot \frac{y}{x^2} = \frac{4axy}{5b^2x^2} = \frac{4ay}{5b^2x}$ podm.: $a \neq 0, b \neq 0, x \neq 0, y \neq 0$

d) $\frac{2as}{3d} \cdot \left(-\frac{3dm}{5c}\right) \cdot \left(-\frac{2c}{s}\right) = \frac{2as}{3d} \cdot \frac{3dm}{5c} \cdot \frac{2c}{s} = \frac{2a}{1} \cdot \frac{m}{5} \cdot \frac{2}{1} = \frac{4am}{5}$ podm.: $d \neq 0, c \neq 0, s \neq 0$

e) $7x \cdot \frac{13x}{14y} \cdot \left(-\frac{12y^2}{13x^2}\right) = -\frac{7x}{1} \cdot \frac{13x}{14y} \cdot \frac{12y^2}{13x^2} = -\frac{x}{1} \cdot \frac{1}{1} \cdot \frac{6y}{x} = -\frac{6xy}{x} = -6y$ podm.: $x \neq 0, y \neq 0$

f) $\frac{9xy}{5ab} \cdot \frac{3ab}{4yz} \cdot \frac{4bz}{3axy} = \frac{9}{5a} \cdot \frac{1}{y} \cdot \frac{b}{1} = \frac{9b}{5ay}$ podm.: $a \neq 0, b \neq 0, x \neq 0, y \neq 0, z \neq 0$

g) $-\frac{25x^4y^3}{14a^2} \cdot \left(-\frac{21ab}{10x^3y^3}\right) = \frac{25x^4y^3}{14a^2} \cdot \frac{21ab}{10x^3y^3} = \frac{5x}{2a} \cdot \frac{3b}{2} = \frac{15xb}{4a}$ podm.: $a \neq 0, x \neq 0, y \neq 0$

2) Násobte:

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

podm. $a \neq 0, b \neq 0, a \neq 2b$

b) $\frac{x^2-xy}{x^2+xy} \cdot \frac{x^2y+xy^2}{xy} = \frac{x(x-y)}{x(x+y)} \cdot \frac{xy(x+y)}{xy} = \frac{x-y}{1} \cdot \frac{1}{1} = x - y$ podm. $x \neq 0, y \neq 0, x \neq -y$

c) $\frac{a^2-b^2}{a^2} \cdot \frac{a^4}{(a+b)^2} = \frac{(a-b)(a+b)}{1} \cdot \frac{a^2}{(a+b)^2} = \frac{(a-b)}{1} \cdot \frac{a^2}{a+b} = \frac{a^2(a-b)}{a+b}$ podm. $a \neq -b, a \neq 0$

d) $\frac{x^2-4y^2}{x^2-xy} \cdot \frac{x-y}{x^2+2xy} = \frac{(x-2y)(x+2y)}{x(x-y)} \cdot \frac{x-y}{x(x+2y)} = \frac{x-2y}{x} \cdot \frac{1}{x} = \frac{x-2y}{x^2}$

podm. $x \neq 0, x \neq y, x \neq -2y$

e) $\frac{a^2-b^2}{(a+b)^2} \cdot \frac{3a+3b}{4a-4b} = \frac{(a-b)(a+b)}{(a+b)^2} \cdot \frac{3(a+b)}{4(a-b)} = \frac{1}{1} \cdot \frac{3}{4} = \frac{3}{4}$ podm. $a \neq \pm b$

f) $-\frac{(a+b)^2}{(a-b)^2} \cdot \frac{3(a-b)^2}{4(a+b)^3} = -\frac{1}{1} \cdot \frac{3}{4(a+b)} = \frac{-3}{4(a+b)}$ podm. $a \neq \pm b$

3) Násobte:

a) $\frac{ax+ay}{x^2-2xy+y^2}\cdot\frac{2x+2y}{ax^2+2axy+ay^2}=\frac{a(x+y)}{(x-y)^2}\cdot\frac{2(x+y)}{a(x^2+2xy+y^2)}=\frac{x+y}{(x-y)^2}\cdot\frac{2(x+y)}{(x+y)^2}=\frac{1}{(x-y)^2}\cdot\frac{2}{1}=\frac{\mathbf{2}}{\mathbf{(x-y)^2}}$

podm. $a\neq 0, x\neq \pm y$

b) $\frac{2a^3-2b^3}{3a+3b}\cdot\frac{6a^2-6b^2}{a^2-2ab+b^2}=\frac{2(a^3-b^3)}{3(a+b)}\cdot\frac{6(a^2-b^2)}{(a-b)^2}=\frac{2(a-b)(a^2+ab+b^2)}{a+b}\cdot\frac{2(a-b)(a+b)}{(a-b)^2}=$

$=\frac{2(a^2+ab+b^2)}{1}\cdot\frac{2}{1}=\mathbf{4(a^2+ab+b^2)}$ podm. $a\neq \pm b$

c) $\frac{2x^2+8x+8}{x-2}\cdot\frac{x^3-8}{4(x+2)}=\frac{2(x^2+4x+4)}{x-2}\cdot\frac{(x-2)(x^2+2x+4)}{4(x+2)}=\frac{(x+2)^2}{1}\cdot\frac{x^2+2x+4}{2(x+2)}=\frac{\mathbf{(x+2)(x^2+2x+4)}}{\mathbf{2}}$

podm. $x\neq \pm 2$

d) $\frac{3}{4}\cdot\left(\frac{2a^2b^3}{3x^3y^2}\right)^2\cdot\left(\frac{3x^2y}{5a^2b}\right)^3=\frac{3}{4}\cdot\frac{4a^4b^6}{9x^6y^4}\cdot\frac{27x^6y^3}{125a^6b^3}=\frac{1}{1}\cdot\frac{b^3}{3y}\cdot\frac{27}{125a^2}=\frac{1}{1}\cdot\frac{b^3}{y}\cdot\frac{9}{125a^2}=\frac{\mathbf{9b^3}}{\mathbf{125a^2y}}$

podm.: $a\neq 0, b\neq 0, x\neq 0, y\neq 0$

4) Vypočtěte:

a) $\frac{xy}{x^2-y^2}\cdot\left(\frac{x}{y}-\frac{y}{x}\right)=\frac{xy}{(x-y)(x+y)}\cdot\frac{x^2-y^2}{xy}=\frac{1}{x^2-y^2}\cdot\frac{x^2-y^2}{1}=\mathbf{1}$ podm. $x\neq \pm y, x\neq 0, y\neq 0$

b) $\left(\frac{1}{m}-\frac{1}{n}\right)\cdot\frac{m^2}{m-n}=\frac{n-m}{mn}\cdot\frac{m^2}{m-n}=\frac{-1}{n}\cdot\frac{m}{1}=-\frac{\mathbf{m}}{\mathbf{n}}$ podm. $m\neq n, m\neq 0, n\neq 0$

c) $\left(1-\frac{x^2}{y^2}\right)\cdot\left(\frac{x^2}{y^2-x^2}+1\right)=\frac{y^2-x^2}{y^2}\cdot\frac{x^2+y^2-x^2}{y^2-x^2}=\frac{1}{y^2}\cdot\frac{y^2}{1}=\mathbf{1}$ podm. $y\neq \pm x, y\neq 0$

d) $\left(\frac{1}{a+1}-\frac{2a}{a^2-1}\right)\cdot\left(\frac{1}{a}-1\right)=\left(\frac{1}{a+1}-\frac{2a}{(a-1)(a+1)}\right)\cdot\frac{1-a}{a}=\frac{a-1-2a}{(a-1)(a+1)}\cdot\frac{1-a}{a}=\frac{-1-a}{a+1}\cdot\frac{-1}{a}=$

$=\frac{(-1)(1+a)}{a+1}\cdot\frac{-1}{a}=\frac{\mathbf{1}}{\mathbf{a}}$ podm. $a\neq \pm 1, a\neq 0$

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

$=2-x^2+1=\mathbf{3-x^2}$ podm. $x\neq \pm 1$

f) $\left(\frac{a}{x-a}-\frac{a}{x+a}\right)\cdot\frac{x^2+2ax+a^2}{2a^2}=\frac{a(x+a)-a(x-a)}{(x-a)(x+a)}\cdot\frac{(x+a)^2}{2a^2}=\frac{ax+a^2-ax+a^2}{x-a}\cdot\frac{x+a}{2a^2}=\frac{2a^2}{x-a}\cdot\frac{x+a}{2a^2}=$

$=\frac{\mathbf{x+a}}{\mathbf{x-a}}$ podm. $x\neq \pm a, a\neq 0$

g) $\left[\frac{3}{(x-3)^2}+\frac{1}{x-3}-\frac{6}{x^2-9}\right]\cdot\frac{x^2-6x+9}{2}=\left[\frac{3}{(x-3)^2}+\frac{1}{x-3}-\frac{6}{(x-3)(x+3)}\right]\cdot\frac{(x-3)^2}{2}=$

$=\frac{3(x+3)+(x-3)(x+3)-6(x-3)}{(x-3)^2(x+3)}\cdot\frac{(x-3)^2}{2}=\frac{3x+9+x^2-9-6x+18}{(x+3)}\cdot\frac{1}{2}=\frac{x^2-3x+18}{x+3}\cdot\frac{1}{2}=\frac{x^2-3x+18}{2(x+3)}$

podm. $x\neq\pm3$

h) $\left(\frac{b}{a^2-ab}+\frac{a}{b^2-ab}\right)\cdot\frac{a^2b+ab^2}{a^2-b^2}=\left(\frac{b}{a(a-b)}+\frac{a}{b(b-a)}\right)\cdot\frac{ab(a+b)}{(a-b)(a+b)}=\frac{b^2-a^2}{ab(a-b)}\cdot\frac{ab}{a-b}=$

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

podm. $a\neq\pm b, a\neq0, b\neq0$