

POČÍTÁNÍ S LOMENÝMI VÝRAZY

1. Sečtěte a pak upravte:

a) $\frac{2x}{3} - 5$ $//\frac{2x-15}{3}//$

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

c) $x + 1 - \frac{x}{3}$ $//\frac{2x+3}{3}//$

d) $\frac{2x}{3} + \frac{x}{4} - \frac{5x}{6}$ $//\frac{x}{12}//$

e) $a + \frac{3a}{4} - \frac{2a}{3} - \frac{a}{6}$ $//\frac{11}{12}a//$

f) $2x + \frac{3-2x}{5}$ $//\frac{8x+3}{5}//$

g) $3a - \frac{2a-3}{2}$ $//\frac{4a+3}{2}//$

h) $\frac{x-1}{3} + \frac{x+2}{2}$ $//\frac{5x+4}{6}//$

i) $\frac{2a+3}{4} - \frac{a+6}{2} + 5$ $//\frac{11}{4}//$

j) $\frac{5x+3}{6} - \frac{2-3x}{3} + \frac{x-5}{2}$ $//\frac{7x-8}{3}//$

k) $\frac{a+1}{2} + \frac{b-1}{3} + \frac{a-b+2}{4} + \frac{b-a-1}{6} + \frac{3b-a}{12}$ $//\frac{a+b+1}{2}//$

2. Sečtěte, upravte a určete podmínky řešitelnosti:

a) $\frac{5}{x} - \frac{2}{x}$ $//\frac{3}{x}, x \neq 0//$

b) $3 - \frac{1}{a}$ $//\frac{3a-1}{a}, a \neq 0//$

c) $\frac{3}{2x} + \frac{5}{3x} - \frac{7}{6x}$ $//\frac{2}{x}, x \neq 0//$

d) $\frac{x}{3y} + \frac{3x}{4y} + \frac{x}{8y}$ $//\frac{29x}{24y}, y \neq 0//$

e) $\frac{2x-1}{x} + \frac{5x+3}{x}$ $//\frac{7x+2}{x}, x \neq 0//$

f) $\frac{7a-2}{a} - \frac{2a-5}{a}$ $//\frac{5a+3}{a}, a \neq 0//$

g) $\frac{5x+2}{x} - 2 - \frac{1-x}{x}$ $//\frac{4x+1}{x}, x \neq 0//$

h) $\frac{2-3a}{2a} + \frac{5a+1}{3a} - \frac{2a+3}{6a}$ $//\frac{5-a}{6a}, a \neq 0//$

i) $\frac{2a+b}{3a} - \frac{a+b}{3a}$ $//\frac{1}{3}, a \neq 0//$

j) $\frac{7a-2b}{7a} - \frac{2a+b}{2a} + \frac{a+b}{a}$ $//\frac{14a+3b}{14a}, a \neq 0//$

3. Sečtěte, upravte a určete podmínky:

a) $\frac{2x}{x-3} + 2$ $//\frac{4x-6}{x-3}, x \neq 3//$

b) $\frac{2x-1}{x-4} - \frac{x-3}{x-4}$ $//\frac{x+2}{x-4}, x \neq 4//$

$$\begin{array}{ll}
\text{c) } \frac{x+2}{2x+1} - \frac{2-x}{2x+1} & // \frac{2x}{2x+1}, x \neq -\frac{1}{2} // \\
\text{d) } \frac{2x+1}{3x-2} + \frac{4x-5}{3x-2} & // 2, x \neq \frac{2}{3} // \\
\text{e) } \frac{5a-1}{3a-1} - \frac{2a-3}{3a-1} - 1 & // \frac{3}{3a-1}, a \neq \frac{1}{3} // \\
\text{f) } \frac{5}{2x-2} + \frac{3}{4x-4} & // \frac{13}{4(x-1)}, x \neq 1 // \\
\text{g) } \frac{5x-2}{4x-2} - \frac{2x-3}{6x-3} & // \frac{11x}{6(2x-1)}, x \neq \frac{1}{2} // \\
\text{h) } \frac{6a-4}{a+1} - \frac{6a-10}{2a+2} + \frac{a+3}{5a+5} & // \frac{8(2a+1)}{5(a+1)}, a \neq -1 //
\end{array}$$

4. Sečtěte, upravte a určete podmínky:

$$\begin{array}{ll}
\text{a) } \frac{6}{x-1} + \frac{4}{1-x} & // \frac{2}{x-1}, x \neq 1 // \\
\text{b) } \frac{5x}{x-2} - \frac{2x+1}{2-x} & // \frac{7x+1}{x-2}, x \neq 2 // \\
\text{c) } \frac{5a+1}{3a-2} - \frac{2a}{2-3a} + \frac{a-2}{2-3a} & // \frac{3(2a+1)}{3a-2}, a \neq \frac{2}{3} // \\
\text{d) } \frac{2x-y}{y-x} + \frac{x}{x-y} & // -1, x \neq y // \\
\text{e) } \frac{2a}{a-5b} + \frac{a+1}{5b-a} - \frac{a+3}{a-5b} & // \frac{4}{5b-a}, a \neq 5b // \\
\text{f) } \frac{3x-y}{2x-y} + \frac{x-2}{y-2x} - \frac{x-2y}{2x-y} & // \frac{2(x+1)}{2x-y}, x \neq \frac{1}{2}y // \\
\text{g) } 3x - \frac{4}{x} & // \frac{3x^2-4}{x}, x \neq 0 // \\
\text{h) } x - \frac{x^2-y^2}{x} & // \frac{y^2}{x}, x \neq 0 // \\
\text{i) } \frac{a^2+b^2}{a} - a - b & // \frac{b(b-a)}{a}, a \neq 0 // \\
\text{j) } \frac{x^2+1}{x+1} - x & // \frac{1-x}{x+1}, x \neq -1 // \\
\text{k) } x + \frac{y^2}{x-y} + y & // \frac{x^2}{x-y}, x \neq y //
\end{array}$$

5. Sečtěte, upravte a určete podmínky:

$$\begin{array}{ll}
\text{a) } \frac{a-b}{ab} - \frac{c-b}{bc} + \frac{a+c}{ac} & // \frac{2}{c}, a \neq 0, b \neq 0, c \neq 0 // \\
\text{b) } \frac{x-3y}{6x} + \frac{4x-y}{2y} + \frac{5x+3z}{9z} - \frac{x^2-yz}{2xz} - \frac{2x}{y} & // \frac{x}{18z}, x \neq 0, y \neq 0, z \neq 0 // \\
\text{c) } \frac{x-1}{x^2y} - \frac{2}{xy} + \frac{y+2}{xy^2} & // \frac{2x-y}{x^2y^2}, x \neq 0, y \neq 0 // \\
\text{d) } \frac{2a+b}{a^3b} - \frac{a-3b}{a^2b^2} - \frac{b^2-a^2}{a^3b^2} & // \frac{5}{a^2b}, a \neq 0, b \neq 0 // \\
\text{e) } \frac{x}{x+3} - \frac{x-1}{x} & // \frac{3-2x}{x(x+3)}, x \neq 0, x \neq -3 // \\
\text{f) } \frac{1}{x+1} - \frac{1}{x-1} & // \frac{2}{1-x^2}, x \neq \pm 1 // \\
\text{g) } \frac{1+5a}{1-5a} - \frac{1-5a}{1+5a} & // \frac{20a}{1-25a^2}, a \neq \pm \frac{1}{5} //
\end{array}$$

$$\begin{aligned}
 \text{h)} \quad & \frac{1}{(x-y)(y-z)} - \frac{1}{(x-z)(y-z)} - \frac{1}{(y-x)(z-x)} && //0, x \neq y, x \neq z, y \neq z// \\
 \text{i)} \quad & \frac{x}{x^2+x} + \frac{2}{x+1} && //\frac{3}{x+1}, x \neq 0, x \neq -1// \\
 \text{j)} \quad & \frac{1-3x}{x^2-3x} + \frac{8}{3x-9} && //-\frac{1}{3x}, x \neq 0, x \neq 3// \\
 \text{k)} \quad & \frac{x-1}{x} - \frac{x}{x-1} - \frac{1}{x^2-x} && //\frac{2}{1-x}, x \neq 0, x \neq 1// \\
 \text{l)} \quad & \frac{2x+y}{x^2+xy} + \frac{1}{x} - \frac{1}{x+y} && //\frac{2}{x}, x \neq 0, x \neq -y// \\
 \text{m)} \quad & \frac{a^2}{ab+b^2} + \frac{a^2+b^2}{ab} + \frac{b^2}{a^2+ab} && // -1, a \neq 0, b \neq 0, a \neq -b// \\
 \text{n)} \quad & \frac{1}{x+2} + \frac{1}{x-2} - \frac{4}{x^2-4} && //\frac{2}{x+2}, x \neq \pm 2// \\
 \text{o)} \quad & \frac{x+y}{x-y} - \frac{4xy}{x^2-y^2} && //\frac{x-y}{x+y}, x \neq \pm y// \\
 \text{p)} \quad & \frac{x-2}{x^2-1} - \frac{3}{2x+2} + \frac{1}{x-1} && //\frac{1}{2(x-1)}, x \neq \pm 1//
 \end{aligned}$$

6. Upravte a určete podmínky:

$$\begin{aligned}
 \text{a)} \quad & \frac{3}{4x} \cdot \frac{2x^2}{3} && //\frac{x}{2}, x \neq 0// \\
 \text{b)} \quad & \frac{27a^2}{81b^2} \cdot \frac{-3b}{a} && //-\frac{a}{b}, a \neq 0, b \neq 0// \\
 \text{c)} \quad & -\frac{ab}{2} \cdot \left(-\frac{6b}{a^2}\right) && //\frac{3b^2}{a}, a \neq 0// \\
 \text{d)} \quad & \frac{2x}{7yz^3} \cdot (-14y^2z^3) && // -4xy, y \neq 0, z \neq 0// \\
 \text{e)} \quad & \frac{3a}{2b} \cdot \frac{5b^2}{6a^2} \cdot \frac{9a}{10b} && //\frac{9}{8}, a \neq 0, b \neq 0// \\
 \text{f)} \quad & \frac{9c}{a^3} \cdot \frac{-d}{32b^2} \cdot \frac{4a}{-27cd} \cdot 24a^2b^3 && //b, a \neq 0, b \neq 0, c \neq 0, d \neq 0// \\
 \text{g)} \quad & \frac{2x-9}{9x} \cdot 3x && //\frac{2x-9}{3}, x \neq 0// \\
 \text{h)} \quad & \frac{6x-1}{6x+1} \cdot (12x+2) && //2(6x-1), x \neq -\frac{1}{6}// \\
 \text{i)} \quad & (2x-y) \cdot \frac{-6x}{7y-14x} && //\frac{6x}{7}, x \neq -\frac{1}{2}y// \\
 \text{j)} \quad & \frac{x^2}{x^2-9} \cdot (2x+6) && //\frac{2x^2}{x-3}, x \neq \pm 3// \\
 \text{k)} \quad & \frac{a}{a^2b^3-ab^2} \cdot (ab-1) && //\frac{1}{b^2}, a \neq 0, b \neq 0, a \neq \frac{1}{b}// \\
 \text{l)} \quad & \frac{x-y}{4x^2-8xy+4y^2} \cdot (4x^2-4xy) && //x, x \neq y//
 \end{aligned}$$

7. Upravte a určete podmínky řešitelnosti:

$$\begin{aligned}
 \text{a)} \quad & \frac{3x}{4} \cdot \frac{16}{3+x} && //\frac{12x}{x+3}, x \neq -3// \\
 \text{b)} \quad & -\frac{9x}{y} \cdot \frac{x-2y}{3x-6y} && //-\frac{3x}{y}, y \neq 0, x \neq 2y// \\
 \text{c)} \quad & \frac{6}{x-7} \cdot \frac{7-x}{12} && //-\frac{1}{2}, x \neq 7//
 \end{aligned}$$

$$\begin{aligned}
 \text{d)} \quad & \frac{2x-7}{x^6} \cdot \frac{x^5}{10x-35} && //\frac{1}{5x}, x \neq 0, x \neq \frac{7}{2}// \\
 \text{e)} \quad & \frac{x^2-6x+9}{x^3} \cdot \frac{x^2}{3-x} && //\frac{3-x}{x}, x \neq 0, x \neq 3// \\
 \text{f)} \quad & \frac{14+7x}{5-x} \cdot \frac{x-5}{x^2+4x+4} && //-\frac{7}{x+2}, x \neq -2, x \neq 5// \\
 \text{g)} \quad & \frac{5x-10y}{4x+4y} \cdot \frac{8x+8y}{15x-30y} && //\frac{2}{3}, x \neq -y, x \neq 2y// \\
 \text{h)} \quad & \frac{2a^2-ab}{b^2} \cdot \frac{ab^2+b^3}{2a^3-a^2b} && //\frac{a+b}{a}, a \neq 0, b \neq 0, a \neq \frac{1}{2}b// \\
 \text{i)} \quad & \frac{5x+5y}{3x-3y} \cdot \frac{x^2-y^2}{(x+y)^2} && //\frac{5}{3}, x \neq \pm y// \\
 \text{j)} \quad & \frac{x+1}{x-1} \cdot \frac{2x^2-4x+2}{x^2-1} && //2, x \neq \pm 1// \\
 \text{k)} \quad & \frac{a^2+ab}{(a-b)^2} \cdot \frac{a^2-b^2}{ab} \cdot \frac{b^2-ab}{(a+b)^2} && // -1, a \neq 0, b \neq 0, a \neq \pm b// \\
 \text{l)} \quad & \frac{3a^2+3ab+3b^2}{4a+4b} \cdot \frac{2a^2-2b^2}{9a^3-9b^3} && //\frac{1}{6}, a \neq \pm b//
 \end{aligned}$$

8. Upravte a určete podmínky:

$$\begin{aligned}
 \text{a)} \quad & \left(\frac{1}{x} + 3\right) \cdot x && //1 + 3x, x \neq 0// \\
 \text{b)} \quad & \left(\frac{1}{x} - \frac{1+x}{x}\right) \cdot (-2x) && //2x, x \neq 0// \\
 \text{c)} \quad & \left(\frac{1}{2x} + \frac{2}{x^2} + \frac{2}{x^3}\right) \cdot 2x^3 && //(x+2)^2, x \neq 0// \\
 \text{d)} \quad & \left(\frac{a+1}{a} - \frac{a}{a+1}\right) \cdot (a+1) && //\frac{2a+1}{a}, a \neq 0, a \neq -1// \\
 \text{e)} \quad & \left(\frac{a+1}{2a-2} - \frac{6}{2a^2-2} - \frac{a+3}{2a+2}\right) \cdot \frac{4a^2-4}{3} && //\frac{20}{3}, a \neq \pm 1// \\
 \text{f)} \quad & \left(\frac{1}{x} + \frac{1}{y}\right) \cdot \frac{2y}{x+y} && //\frac{2}{x}, x \neq 0, y \neq 0, x \neq -y// \\
 \text{g)} \quad & \left(\frac{x+1}{x+2} - \frac{x-1}{x-2}\right) \cdot \frac{x^2-4}{2x} && // -1, x \neq 0, x \neq \pm 2// \\
 \text{h)} \quad & \left(\frac{y}{x-y} - \frac{y}{x+y}\right) \cdot \frac{x^2+2xy+y^2}{2y^2} && //\frac{x+y}{x-y}, y \neq 0, x \neq \pm y// \\
 \text{i)} \quad & \left(\frac{2x}{3} - 1\right) \cdot \left(\frac{5x}{2} + 3\right) && //\frac{10x^2-3x-18}{6}// \\
 \text{j)} \quad & \left(x - \frac{x}{x+1}\right) \cdot \left(1 - \frac{1}{x^2}\right) && //x-1, x \neq 0, x \neq -1// \\
 \text{k)} \quad & \left(a + 1 + \frac{1}{2a-1}\right) \cdot \left(a - 1 + \frac{1}{2a+1}\right) && //a^2, a \neq \pm \frac{1}{2}// \\
 \text{l)} \quad & \left(5x + \frac{5}{x-2}\right) \cdot \left(1 - \frac{1}{x^2-2x+1}\right) && //5x, x \neq 1, x \neq 2// \\
 \text{m)} \quad & \left(\frac{1}{x+1} - \frac{2x}{x^2-1}\right) \cdot \left(\frac{1}{x} - 1\right) && //\frac{1}{x}, x \neq 0, x \neq \pm 1//
 \end{aligned}$$

9. Upravte a určete podmínky řešitelnosti:

$$\text{a)} \quad 3x \div \frac{6x}{5} \qquad //\frac{5}{2}, x \neq 0//$$

b) $\frac{5a}{3} \div 2a$ $//\frac{5}{6}, a \neq 0//$

c) $\frac{x^2}{5} \div \frac{x}{10}$ $//2x, x \neq 0//$

d) $-\frac{4a^2}{b} \div \left(-\frac{5a^2}{b}\right)$ $//\frac{4}{5}, a \neq 0, b \neq 0//$

e) $\left(\frac{7x^2}{3y^3} \cdot \frac{z}{2x^3y}\right) \div \left(\frac{3x^2}{2y^2z^2} \cdot \frac{14z^3}{9x^3y^3}\right)$ $//\frac{y}{2}, x \neq 0, y \neq 0, z \neq 0//$

f) $\frac{4+3a}{7a} \div \frac{12+9a}{21a}$ $//1, a \neq 0, a \neq -\frac{4}{3}//$

g) $\frac{8x-12y}{6y} \div \frac{4x^2-9y^2}{3xy}$ $//\frac{2x}{2x+3y}, x \neq 0, y \neq 0, x \neq \pm\frac{3}{2}y//$

h) $\frac{x-y}{y+1} \div \frac{y-x}{2y+2}$ $//-2, y \neq -1, x \neq y//$

i) $\frac{a^2+ab}{b-b^2} \div \frac{b^2+ab}{a-ab}$ $//\frac{a^2}{b^2}, a \neq 0, b \neq 0, b \neq 1, a \neq -b//$

j) $\frac{x^2+6x+9}{4x-20} \div \frac{x+3}{x-5}$ $//\frac{x+3}{4}, x \neq -3, x \neq 5//$

k) $\frac{2a^2-18}{a^2+3a} \div \frac{a-3}{a+3}$ $//\frac{2(a+3)}{a}, a \neq 0, a \neq \pm 3//$

l) $\frac{64-16a+a^2}{9-b^2} \div \frac{a-8}{b+3}$ $//\frac{a-8}{3-b}, a \neq 8, b \neq \pm 3//$

10. Upravte a určete podmínky:

a) $\left(6 - \frac{x^2}{6}\right) \div (6 - x)$ $//\frac{x+6}{6}, x \neq 6//$

b) $\frac{a-2}{a} \div \left(\frac{a}{2} - \frac{2}{a}\right)$ $//\frac{2}{a+2}, a \neq 0, a \neq \pm 2//$

c) $\left(1 - \frac{x}{x-1}\right) \div \frac{1+x}{1-x}$ $//\frac{1}{x+1}, x \neq \pm 1//$

d) $\left(a + \frac{1}{a+1}\right) \div \frac{a^3-1}{a^2-1}$ $//1, a \neq \pm 1//$

e) $\left(\frac{2x+1}{2x-1} - \frac{2x-1}{2x+1}\right) \div \frac{4x}{10x-5}$ $//\frac{10}{2x+1}, x \neq 0, x \neq \pm\frac{1}{2}//$

f) $\left(\frac{3}{x} - \frac{x}{3}\right) \div \left(\frac{3}{x} - 1\right)$ $//\frac{x+3}{3}, x \neq 0, x \neq 3//$

g) $\left(\frac{4a}{2-a} - a\right) \div \left(2 + \frac{a^2+4}{a-2}\right)$ $//-1, a \neq 0, a \neq \pm 2//$

h) $\left(\frac{x+3}{x-3} - \frac{x}{x+3}\right) \div \left(1 - \frac{2}{x+3}\right)$ $//\frac{-9}{x-3}, x \neq -1, x \neq \pm 3//$

i) $\left(\frac{a+2}{a-2} - \frac{a-2}{a+2}\right) \div \left(1 - \frac{a^2+4}{a^2-4}\right)$ $//-a, a \neq \pm 2//$

j) $\left(\frac{a}{b^2+ab} + \frac{b}{a^2+ab} + \frac{2}{a+b}\right) \div \frac{a^2-b^2}{4ab}$ $//\frac{4}{a-b}, a \neq 0, b \neq 0, a \neq \pm b//$

11. Upravte a určete podmínky:

a) $\frac{x}{\frac{y}{3}}$ $//\frac{3x}{y}, y \neq 0//$

b) $\frac{\frac{5x}{3}}{\frac{x^2}{9}}$ $//\frac{15}{x}, x \neq 0//$

- c) $\frac{\frac{15}{x-y}}{x-y}$ $//\frac{5}{4}, x \neq y//$
- d) $\frac{\frac{x^4-x^2y^2}{y}}{x^2y-y^3}$ $//x^2, x \neq 0, x \neq \pm y//$
- e) $\frac{\frac{x+y}{x-y}}{(x+y)^2}$ $//1, x \neq \pm y//$
- f) $\frac{1}{1-\frac{1}{x}}$ $//\frac{x}{x-1}, x \neq 0, x \neq 1//$
- g) $\frac{\frac{5}{x} \frac{1}{y}}{\frac{1}{xy}}$ $//5y-x, x \neq 0, y \neq 0//$
- h) $\frac{\frac{3}{x}+1}{\frac{3}{x}-1}$ $//\frac{3+x}{3-x}, x \neq 0, x \neq 3//$
- i) $\frac{\frac{1}{x} \frac{1}{2x}}{\frac{1}{x^2} \frac{1}{2x^2}}$ $//x, x \neq 0//$
- j) $\frac{1-a}{1-\frac{a}{a+1}}$ $//1-a^2, a \neq -1//$
- k) $\frac{\frac{x+y-1}{x-y}}{\frac{x+y}{x-y}+1}$ $//\frac{y}{x}, x \neq 0, x \neq y//$
- l) $\frac{\frac{a}{a+b} + \frac{b}{a-b}}{a-b}$ $//1, a \neq \pm b//$