

1 OPERACE S ČÍSLY, ZLOMKY

① Vypočtěte

$$a) 20 \cdot (30 - 20 \cdot 3) - 700 = 20 \cdot (30 - 60) - 700 = 20 \cdot (-30) - 700 = -600 - 700 = -1300$$

PRIORITA OPERACÍ: nejprve násobky v závorkách
málokteré, dělení
=> sčítání, odčítání

$$b) 20 - 3 \cdot (30 - 30 : 2) = 20 - 3 \cdot (30 - 15) = 20 - 3 \cdot (15) = 20 - 45 = -25$$

$$c) 5 + 3 \cdot (-2) - (5 + 2 : 2) = 5 + (-6) - (5 + 1) = 5 - 6 - 6 = 5 - 12 = -7$$

$$d) 40 - 20 \cdot (-6) : 4 - 5 \cdot (4 + 12 : 4) = 40 + 120 : 4 - 5 \cdot (4 + 3) = 40 + 30 - 5 \cdot 7 = 70 - 35 = 35$$

$$e) 0,5 \cdot 0,06 - 0,09 : 0,1 = 0,030 - 0,9 = -0,87$$

$$\begin{array}{r} 0,06 \\ \cdot 0,5 \\ \hline 0,030 \end{array}$$

$$\begin{array}{r} 0,09 : 0,1 \quad 1 \cdot 10 \\ \hline 0,9 : 1 = 0,9 \end{array}$$

$$\begin{array}{r} 0,90 \\ - 0,03 \\ \hline 0,87 \end{array}$$

$$\left[\text{NEBO } \frac{0,09}{0,1} = \frac{0,09 \cdot 100}{0,10 \cdot 100} = \frac{9}{10} = 0,9 \right]$$

$$f) 0,5 - (-0,3 + 0,5) \cdot 2,1 = 0,5 - (0,2) \cdot 2,1 = 0,5 - 0,42 = 0,08$$

$$\begin{array}{r} 2,1 \\ \cdot 0,2 \\ \hline 0,42 \end{array}$$

$$g) 5 : 0,2 - (-0,3 + 0,5) = 25 - (0,2) = 25 - 0,2 = 24,8$$

$$\begin{array}{r} 5 : 0,2 \quad 1 \cdot 10 \\ \hline 50 : 2 = 25 \end{array}$$

$$\left[\text{NEBO } \frac{5}{0,2} \cdot \frac{10}{10} = \frac{50}{2} = 25 \right]$$

② Vypočítejte a zlomek zapíše v základním tvaru

a) $\frac{1}{6} + \frac{2}{3} \cdot \frac{3}{8} = \frac{1}{6} + \frac{1 \cdot 3}{1 \cdot 4} = \frac{1}{6} + \frac{3}{4} = \frac{2+9}{12} = \frac{11}{12}$

kráčí ⇒ menší čísla
njm. spol. jmenovatel

$\left[\frac{1}{6} + \frac{2}{3} \cdot \frac{3}{8} = \frac{1}{6} + \frac{19}{24} = \frac{4+19}{24} = \frac{23}{24} = \frac{11}{12} \right]$

bez kráčí
NÁSOBENÍ ZLOMKŮ: *másovitím čísel* *kráčí*
másovitím jmenovatelů

b) $\frac{2}{3} : \frac{5}{2} - \frac{2}{3} = \frac{2}{3} \cdot \frac{2}{5} - \frac{2}{3} = \frac{4}{15} - \frac{2}{3} = \frac{4-10}{15} = \frac{-6}{15} = \frac{-2}{5}$

najevně dělit - převedeme na másovití
dělit (druhý zlomek přičítáme)
kráčí

c) $3 \cdot \frac{2}{15} + \frac{1}{3} \cdot \frac{2}{15} = \frac{3}{1} \cdot \frac{2}{15} + \frac{1}{3} \cdot \frac{2}{15} = \left[\frac{1}{1} \cdot \frac{2}{5} + \frac{2}{45} \right] = \frac{2}{5} + \frac{2}{45} = \frac{9 \cdot 2 + 2}{45} = \frac{20}{45} = \frac{4}{9}$

kráčí

d) $\frac{3}{4} : \frac{15}{2} - \left(\frac{3}{5}\right)^2 = \frac{3}{4} \cdot \frac{2}{15} - \frac{9}{25} = \frac{1}{2} \cdot \frac{1}{5} - \frac{9}{25} = \frac{1}{10} - \frac{9}{25} = \frac{5 \cdot 1 - 2 \cdot 9}{50} = \frac{5-18}{50} = \frac{-13}{50}$

3,20
MOCHINA
 $a^2 = a \cdot a$
NSJ: 25, 50

e) $\frac{7}{12} - \frac{5}{8} \cdot 1,6 = \frac{7}{12} - \frac{5}{8} \cdot \frac{16}{10} = \frac{7}{12} - \frac{1}{1} \cdot \frac{2}{2} = \frac{7}{12} - \frac{1}{1} = \frac{7-12}{12} = \frac{-5}{12}$

$\left[1,6 = \frac{16}{10} \right]$

f) $(6-4) \cdot \frac{11}{8} + \frac{9}{14} \cdot \frac{7}{6} = \frac{1}{1} \cdot \frac{11}{8} + \frac{3}{2} \cdot \frac{1}{2} = \frac{1}{1} \cdot \frac{11}{4} + \frac{3}{2} \cdot \frac{1}{2} = \frac{11}{4} + \frac{3}{4} = \frac{14}{4} = \frac{7}{2}$

najevně čísla
n jmenovatelů

PRIORITA OPERACÍ

- NEJPRVE NÁSOBIT, DĚLIT
⇒ SČÍTAT, ODČÍTAT

- V PRŮBĚHU SE SNAŽIT
KRÁČIT ZLOMKY NEBO

V SOUČINU ZLOMKŮ
(másovitím or součinnosť čísel)

ZÁKL. TVAR - číselní a jmenov. -
másovitím or kráčí
(nesoudělné čísla)

$$g) \left(\frac{3}{4} + \frac{13}{6}\right) \cdot \left(\frac{2}{5} - \frac{1}{7}\right) = \frac{3 \cdot 3 + 2 \cdot 13}{12} \cdot \frac{2 - 5 \cdot 1}{5} = \frac{9 + 26}{12} \cdot \frac{-3}{5} = \frac{35}{12} \cdot \frac{-3}{5} = \frac{7}{4} \cdot \frac{-1}{1} = -\frac{7}{4}$$

[NSN: 6, 12]

$$h) 2 - \frac{1}{3} - \frac{1}{6} \cdot \frac{16}{3} = \frac{2}{1} - \frac{1}{3} - \frac{16^8}{18^9} = \frac{2}{1} - \frac{1}{3} - \frac{8}{9} = \frac{2 \cdot 9 - 3 \cdot 1 - 8}{9} = \frac{18 - 3 - 8}{9} =$$

kráčí → metoda

$$= \frac{18 - 11}{9} = \frac{7}{9}$$

[? metoda kráčí 18 a 9]

$$ch) \frac{1}{2} + \frac{8}{5} \cdot \left(\frac{3}{8} - \frac{1}{6}\right) = \frac{1}{2} + \frac{8}{5} \cdot \frac{3 \cdot 3 - 4 \cdot 1}{24} = \frac{1}{2} + \frac{8}{5} \cdot \frac{9 - 4}{24} = \frac{1}{2} + \frac{8}{5} \cdot \frac{5}{24} = \frac{1}{2} + \frac{1}{3} =$$

[NSJ: 8, 16, 24]

$$= \frac{3 + 2}{6} = \frac{5}{6}$$

$$i) 12 \cdot \left(\frac{2}{3} - \frac{1}{2}\right) - \frac{5}{2} + \frac{2}{3} = \frac{12}{1} \cdot \frac{4 - 3}{6} - \frac{5}{2} + \frac{2}{3} = \frac{12}{1} \cdot \frac{1}{6} - \frac{5}{2} + \frac{2}{3} = \frac{2}{1} - \frac{5}{2} + \frac{2}{3} =$$

$$= \frac{2 \cdot 6 - 5 \cdot 3 + 2 \cdot 2}{6} = \frac{12 - 15 + 4}{6} = \frac{16 - 15}{6} = \frac{1}{6}$$

$$j) \frac{5}{3} \cdot \frac{9}{50} \cdot \left(\frac{1}{3} - \frac{4}{9}\right) - \frac{2}{3} = \frac{5}{3} \cdot \frac{9^3}{50^3} \cdot \frac{9 - 4}{9} - \frac{2}{3} = \frac{4}{1} \cdot \frac{9}{10} \cdot \frac{5}{3} - \frac{2}{3} = \frac{5}{30} - \frac{2}{3} = \frac{1}{6} - \frac{2}{3} =$$

5, 20

kráčí

$$= \frac{1 - 4}{6} = \frac{-3}{6} = -\frac{1}{2}$$

$$\left[\frac{5}{30} - \frac{2}{3} = \frac{5 - 20}{30} = \frac{-15}{30} = -\frac{5}{10} = -\frac{1}{2} \right]$$

$$k) \frac{1}{3} \cdot \left(5 - \frac{13}{5}\right) : 20 = \frac{1}{3} \cdot \frac{25 - 13}{5} : 20 = \frac{1}{3} \cdot \frac{12}{5} : 20 = \frac{4}{5} \cdot \frac{1}{20} = \frac{1}{25}$$

$$\begin{aligned}
 \text{ll)} \quad & \left(\frac{5}{8} - \frac{5}{12}\right) \cdot 4 - 2 \cdot \left(\frac{3}{4} - \frac{2}{3}\right) = \frac{15-10}{24} \cdot 4 - 2 \cdot \frac{9-8}{12} = \frac{5}{6} \cdot \frac{4}{1} - \frac{2}{1} \cdot \frac{1}{12} = \\
 & = \frac{5}{6} - \frac{1}{6} = \frac{4}{6} = \frac{2}{3}
 \end{aligned}$$

$$\begin{aligned}
 \text{m)} \quad & \frac{0,25}{0,025} : 0,2 = \frac{0,250}{0,025} : \frac{2}{10} = \frac{250}{25} : \frac{2}{10} = \frac{10}{1} \cdot \frac{10}{2} = \frac{100}{2} = 50 \\
 & \left[\frac{0,250}{0,025} \cdot \frac{1000}{1000} = \frac{250}{25} = \frac{10}{1} = 10 \right]
 \end{aligned}$$

$$\text{n)} \quad 6 \cdot \frac{-15 - 6 \cdot (-2)}{2} = 6 \cdot \frac{-15 + 12}{2} = 6 \cdot \frac{-3}{2} = -\frac{6}{1} \cdot \frac{3}{2} = -\frac{9}{1} = -9$$

③ Vypočítejte a zlomek zapište v základním tvaru

$$\text{a)} \quad \frac{\frac{2}{3} - \frac{5}{6}}{\frac{2}{3}} = \frac{\frac{4-5}{6}}{\frac{2}{3}} = \frac{-\frac{1}{6}}{\frac{2}{3}} = -\frac{1}{6} : \frac{2}{3} = -\frac{1}{6} \cdot \frac{3}{2} = -\frac{1}{4}$$

$$\text{b)} \quad \frac{2 - \frac{3}{5} \cdot \frac{5}{2}}{2} = \frac{2 - \frac{3}{2}}{2} = \frac{\frac{4-3}{2}}{2} = \frac{\frac{1}{2}}{2} = \frac{1}{2} : 2 = \frac{1}{2} : \frac{2}{1} = \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$$

$$c) \frac{2\frac{2}{3} - 1\frac{3}{5}}{2\frac{2}{3}} = \frac{\frac{8}{3} - \frac{8}{5}}{\frac{8}{3}} = \frac{\frac{40-24}{15}}{\frac{8}{3}} = \frac{\frac{16}{15}}{\frac{8}{3}} = \frac{16}{15} : \frac{8}{3} = \frac{16}{15} \cdot \frac{3}{8} = \frac{2}{5}$$

$$\left[\begin{array}{l} + \\ \text{K} \end{array} \frac{2\frac{2}{3}}{2\frac{2}{3}} = \frac{3 \cdot 2 + 2}{3} \right]$$

$$d) \frac{\frac{1}{5} - \frac{3}{10} + \frac{1}{4} \cdot 2}{4} = \frac{\frac{1}{5} - \frac{3}{10} + \frac{1}{2} \cdot 2}{4} = \frac{\frac{1}{5} - \frac{3}{10} + 1}{4} = \frac{\frac{2-3+5}{10}}{4} = \frac{\frac{4}{10}}{4} = \frac{4}{40} = \frac{1}{10}$$

$$= \frac{4}{10} : 4 = \frac{4}{10} : \frac{4}{1} = \frac{4}{10} \cdot \frac{1}{4} = \frac{1}{10}$$

$$e) \frac{\frac{4}{1+2} - 1}{1+2} = \frac{\frac{4}{3} - 1}{3} = \frac{\frac{4-3}{3}}{3} = \frac{\frac{1}{3}}{3} = \frac{1}{3} : \frac{3}{1} = \frac{1}{3} \cdot \frac{1}{3} = \frac{1}{9}$$

$$f) \frac{\frac{2 \cdot 3 - 4}{6} - \frac{4}{2+3}}{\frac{2+3}{6}} = \frac{\frac{6-4}{6} - \frac{4}{5}}{\frac{5}{6}} = \frac{\frac{2}{6} - \frac{4}{5}}{\frac{5}{6}} = \frac{\frac{1}{3} - \frac{4}{5}}{\frac{5}{6}} = \frac{\frac{5-12}{15}}{\frac{5}{6}} = \frac{\frac{-7}{15}}{\frac{5}{6}} = \frac{-7}{15} \cdot \frac{6}{5} = \frac{-14}{25}$$

$$\left[\frac{1}{3} \cdot \frac{6}{5} = \frac{6}{15} = \frac{2}{5} \right]$$

$$\rightarrow \frac{2}{6} : \frac{5}{6} = \frac{2}{6} \cdot \frac{6}{5} = \frac{2}{5}$$

$$g) \frac{\frac{3}{5} \cdot 2 - 4 \cdot \frac{2}{7}}{2} = \frac{\frac{3 \cdot 2}{5} - \frac{4 \cdot 2}{7}}{2} = \frac{\frac{6}{5} - \frac{8}{7}}{2} = \frac{\frac{42-40}{35}}{2} = \frac{\frac{2}{35}}{2} = \frac{2}{35} : 2 = \frac{2}{35} \cdot \frac{1}{2} = \frac{1}{35}$$

$$h) \frac{\frac{7}{10} - \frac{2}{5} \cdot \frac{1}{10}}{20 \cdot \frac{3}{10}} = \frac{\frac{7}{10} - \frac{2 \cdot 10}{5 \cdot 1}}{20 \cdot \frac{3}{10}} = \frac{\frac{7}{10} - \frac{4}{1}}{20 \cdot \frac{3}{10}} = \frac{\frac{7-40}{10}}{\frac{60}{10}} = \frac{\frac{-33}{10}}{\frac{6}{1}} = \frac{-33}{10} : \frac{6}{1} = \frac{-33}{10} \cdot \frac{1}{6} = \frac{-11}{20}$$

$$\text{ch) } \frac{\frac{7}{4} - 4}{7 - \frac{4}{7}} = \frac{\frac{7}{4} - \frac{4}{1}}{\frac{7}{1} - \frac{4}{7}} = \frac{\frac{7-16}{4}}{\frac{49-4}{7}} = \frac{\frac{-9}{4}}{\frac{45}{7}} = -\frac{9}{4} : \frac{45}{7} = -\frac{9}{4} \cdot \frac{7}{45} = -\frac{7}{20}$$

$$\text{i) } 100 - \frac{1}{0,01 \cdot 0,1} = 100 - \frac{1}{0,001} = 100 - \frac{1}{\frac{1}{1000}} = 100 - \frac{1}{1} : \frac{1}{1000} = \\ = 100 - \frac{1}{1} \cdot \frac{1000}{1} = 100 - 1000 = -900$$

$$\text{j) } 2 - 2 \cdot \frac{2 \cdot \frac{9}{10}}{3} = 2 - 2 \cdot \frac{\frac{2}{1} \cdot \frac{9}{10}}{3} = 2 - 2 \cdot \frac{\frac{2}{5}}{3} = 2 - 2 \cdot \frac{2}{5} : \frac{3}{1} = \\ = 2 - \frac{2}{1} \cdot \frac{2^3}{5^3} \cdot \frac{1}{3} = 2 - \frac{6}{5} = \frac{2}{1} - \frac{6}{5} = \frac{10-6}{5} = \frac{4}{5}$$

$$\text{k) } \frac{\frac{2}{3} - \frac{3}{2}}{\frac{2}{3} : \frac{3}{2}} = \frac{\frac{4-9}{6}}{\frac{2}{3} \cdot \frac{2}{3}} = \frac{\frac{-5}{6}}{\frac{4}{9}} = -\frac{5}{6} : \frac{4}{9} = -\frac{5}{6} \cdot \frac{9}{4} = -\frac{15}{8}$$

$$\text{l) } \frac{(\frac{27}{10} \cdot \frac{5}{9} - 4) : 3}{5} = \frac{(\frac{27}{10} \cdot \frac{5}{9} - 4) : 3}{5} = \frac{(\frac{3}{2} - 4) : 3}{5} = \frac{\frac{3-8}{2} : 3}{5} = \\ = \frac{\frac{-5}{2} \cdot \frac{1}{3}}{5} = -\frac{5}{6} : \frac{5}{1} = -\frac{5}{6} \cdot \frac{1}{5} = -\frac{1}{6}$$

4) Vypočítejte a zlomek zapíšte v základním tvaru

$$a) \frac{1 - \frac{1}{3}}{-6^2} = \frac{\frac{3-1}{3}}{-36} = \frac{\frac{2}{3}}{-36} = \frac{2}{3} : (-36) = \frac{2}{3} : \left(-\frac{36}{1}\right) = \frac{2}{3} \cdot \left(-\frac{1}{36}\right) = -\frac{2}{3} \cdot \frac{1}{36}$$

$$\left[\begin{array}{l} \text{pozor!} \\ -6^2 = -6 \cdot 6 = -36 \\ (-6)^2 = (-6) \cdot (-6) = +36 \end{array} \right] = -\frac{1}{3} \cdot \frac{1}{18} = -\frac{1}{54}$$

$$b) \frac{0,3^2}{0,1} : 0,01 = \frac{0,09}{0,1} : 0,01 = \frac{9}{10} : \frac{1}{100} = \frac{9}{10} \cdot \frac{100}{1} = 9 \cdot 10 = 90$$

$$\left[0,3^2 = 0,3 \cdot 0,3 = 0,09 \right] \left[\frac{0,09}{0,10} = \frac{9}{10} \right]$$

$$c) 0,5 : 0,5^2 = 0,5 : 0,25 = 2$$

$$\left[0,5^2 = 0,5 \cdot 0,5 = 0,25 \right] \left[\frac{0,50}{0,25} = \frac{50}{25} = 2 \right]$$

$$d) 1 : 0,2^2 = 1 : 0,04 = 25 \quad \left[\frac{1}{0,04} = \frac{1,00}{0,04} = \frac{100}{4} = 25 \right]$$

$$\left[0,2^2 = 0,2 \cdot 0,2 = 0,04 \right] \quad \frac{1 : 0,04 \cdot 1,00}{100 : 4 = 25}$$

$$e) \frac{3^2}{5} - \frac{3}{5^2} + \left(-\frac{3}{5}\right)^2 = \frac{9}{5} - \frac{3}{25} + \frac{9}{25} = \frac{45 - 3 + 9}{25} = \frac{51}{25}$$

$$\left[\left(-\frac{3}{5}\right)^2 = \left(-\frac{3}{5}\right) \cdot \left(-\frac{3}{5}\right) = +\frac{3}{5} \cdot \frac{3}{5} = \frac{9}{25} = \frac{9}{25} \right]$$

$$f) \frac{\frac{5}{3} - \frac{2}{5}}{(-7)^2} = \frac{\frac{25-4}{10}}{49} = \frac{21}{49} = \frac{21}{10} : 49 = \frac{21}{10} \cdot \frac{1}{49} = \frac{3}{10} \cdot \frac{1}{7} = \frac{3}{70}$$

$$\left[(-7)^2 = (-7) \cdot (-7) = +49 \right]$$

$$g) \frac{10^2 \cdot (10^2 - 1)}{10 \cdot 10^2 + 10^2} = \frac{100 \cdot (100 - 1)}{10 \cdot 100 + 100} = \frac{100 \cdot 99}{1000 + 100} = \frac{100 \cdot 99}{1100} = \frac{99}{11} = \frac{9}{1} = \underline{9}$$

$$h) \sqrt{4 \cdot 0,25} = \sqrt{1} = \underline{1}$$

$$\left[\begin{array}{r} 0,25 \\ \cdot 4 \\ \hline 1,00 \end{array} \right]$$

$$ch) 1 - \sqrt{\frac{25}{64}} = 1 - \frac{\sqrt{25}}{\sqrt{64}} = 1 - \frac{5}{8} = \frac{8-5}{8} = \underline{\frac{3}{8}}$$

$$l) (9 - \sqrt{9})^2 - (\sqrt{9})^2 = (9 - 3)^2 - (3)^2 = 6^2 - 3^2 = 36 - 9 = \underline{27}$$

$$i) \sqrt{1^2 - 0,6^2} = \sqrt{1 - 0,36} = \sqrt{0,64} = \sqrt{\frac{64}{100}} = \left[\frac{\sqrt{64}}{\sqrt{100}} \right] = \underline{\frac{8}{10}}$$

$$[0,6^2 = 0,6 \cdot 0,6 = 0,36] \quad \begin{array}{r} 1,00 \\ -0,36 \\ \hline 0,64 \end{array}$$

$$k) \sqrt{10^2 \cdot 0,0025} = \sqrt{100 \cdot \frac{25}{10000}} = \sqrt{\frac{25^2}{100}} = \frac{\sqrt{25}}{\sqrt{100}} = \frac{5}{10} = \underline{\frac{1}{2}}$$

$$\left[\rightarrow \sqrt{100 \cdot 0,0025} = \sqrt{0,25^2} = \sqrt{\frac{25^2}{100}} \right]$$

$$n) \sqrt{14,4 : 0,001} = \sqrt{14400} = \sqrt{144 \cdot 100} = \sqrt{144} \cdot \sqrt{100} = 12 \cdot 10 = \underline{120}$$

$$\left[\frac{14,4}{\frac{1}{1000}} = 14,4 : \frac{1}{1000} = 14,4 \cdot \frac{1000}{1} = 14,4 \cdot 1000 = 14400 = \right]$$

$$= 144 \cdot 100$$