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J. GRÜNTALI
TOIMETUSEL

ETVERK, E.

MATHISEN, R.

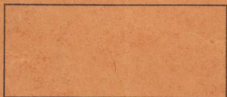
P A A S, O.

RATASSEPP, K.

PEH 2657
VSP

MATEMAATIKA KESKKOOLIS

III K L A S S I 3
HARJUTUS
VIHIK №



K/Ü. KOOLI-KOOPERATIIV TALLINNAS 1935

39-96-15

Murrud.

Väljenda jagatised murdudena! Täanda!

1. $3:5 = \frac{3}{5};$

2. $a:3 = \frac{a}{3};$

$2:(-6) = -\frac{2}{6} = -\frac{1}{3};$

$4:x = \frac{4}{x};$

$(-20):30 = \frac{-20}{30} = -\frac{2}{3};$

$(-2b):(-4) = \frac{-2b}{-4} = +\frac{b}{2};$

$8:6 = \frac{8}{6} = \frac{4}{3} = 1\frac{1}{3};$

$10:5c = \frac{10}{5c} = \frac{2}{c};$

$100:45 = \frac{100}{45} = \frac{20}{9} = 2\frac{2}{9};$

$36p^2:24 = \frac{36p^2}{24} = \frac{3p^2}{2};$

3. $3a:2a = \frac{3a}{2a} = \frac{3}{2} = 1\frac{1}{2};$

4. $18x^2:20x = \frac{18x^2}{20x} = \frac{9x}{10};$

$8b:6b = \frac{8b}{6b} = \frac{4b}{3b} = \frac{4}{3} = 1\frac{1}{3};$

$25z:(-35z^2) = \frac{25z}{-35z^2} = -\frac{5}{7z};$

$15xy:(-16x) = \frac{15xy}{-16x} = -\frac{15y}{16};$

$(-1):(-2x) = \frac{-1}{-2x} = +\frac{1}{2x};$

$25xz:35z = \frac{25xz}{35z} = \frac{5x}{7};$

$(-40uv):60u^2v^2 = \frac{-40uv}{60u^2v^2} = -\frac{2}{3uv};$

$(-42pq):24pq = \frac{-42pq}{24pq} = -\frac{7}{4} = -1\frac{3}{4};$

$(-56st):(-56st) = \frac{-56st}{-56st} = -\frac{1}{456};$

5. $(a+b):3 = \frac{a+b}{3};$

$4(x-y):12 = \frac{4(x-y)}{12} = \frac{x-y}{3};$

$(12p-16q):32 = \frac{12p-16q}{32} = \frac{4(3p-4q)}{32} = \frac{3p-4q}{8};$

$(x^2+xy):4x = \frac{x^2+xy}{4x} = \frac{x(x+y)}{4x} = \frac{x+y}{4};$

$(3p^2-6p^2q):9p^2 = \frac{3p^2-6p^2q}{9p^2} = \frac{3p^2(p-2q)}{9p^2} = \frac{p-2q}{3};$

Murdude liitmine ja lahutamine.

$$\begin{aligned}
 1. \quad \frac{1}{3} + \frac{1}{3} &= \frac{1+1}{3} = \frac{2}{3}; \quad \frac{a}{3} + \frac{a}{3} = \frac{a+a}{3} = \frac{2a}{3}; \quad \frac{a}{2} + \frac{b}{2} = \frac{a+b}{2}; \\
 \frac{4}{9} + \frac{3}{9} &= \frac{4+3}{9} = \frac{7}{9}; \quad \frac{3c}{5} - \frac{c}{5} = \frac{3c-c}{5} = \frac{2c}{5}; \quad \frac{c}{3} - \frac{d}{3} = \frac{c-d}{3}; \\
 \frac{7}{8} - \frac{3}{8} &= \frac{7-3}{8} = \frac{4}{8} = \frac{1}{2}; \quad \frac{3x}{4} - \frac{x}{4} = \frac{3x-x}{4} = \frac{2x}{4} = \frac{x}{2}; \quad \frac{2m}{7} - \frac{n}{7} = \frac{2m-n}{7}; \\
 \frac{5}{6} - \frac{1}{6} &= \frac{5-1}{6} = \frac{4}{6} = \frac{2}{3}; \quad \frac{7p}{10} - \frac{3p}{10} = \frac{7p-3p}{10} = \frac{4p}{10} = \frac{2p}{5}; \quad \frac{x}{9} - \frac{2}{9} = \frac{x-2}{9}; \\
 \frac{7}{12} + \frac{1}{12} &= \frac{7+1}{12} = \frac{8}{12} = \frac{2}{3}; \quad \frac{5g}{16} + \frac{3g}{16} = \frac{5g+3g}{16} = \frac{8g}{16} = \frac{g}{2}; \quad \frac{3z}{11} + \frac{5}{11} = \frac{3z+5}{11}; \\
 4. \quad \frac{2}{x} + \frac{4}{x} &= \frac{2+4}{x} = \frac{6}{x}; \quad \frac{a}{x} + \frac{a}{x} = \frac{a+a}{x} = \frac{2a}{x}; \quad \frac{a}{x} + \frac{b}{x} = \frac{a+b}{x}; \\
 \frac{6}{a} - \frac{5}{a} &= \frac{6-5}{a} = \frac{1}{a}; \quad \frac{b}{x} + \frac{3b}{x} = \frac{b+3b}{x} = \frac{4b}{x}; \quad \frac{2b}{x} - \frac{3d}{x} = \frac{2b-3d}{x}; \\
 \frac{10}{3n} - \frac{8}{3n} &= \frac{10-8}{3n} = \frac{2}{3n}; \quad \frac{2m}{3n} + \frac{m}{3n} = \frac{2m+m}{3n} = \frac{3m}{3n} = \frac{m}{n}; \quad \frac{k^2}{9p} + \frac{p}{9p} = \frac{k^2+p}{9p}; \\
 \frac{14}{5m} - \frac{9}{5m} &= \frac{14-9}{5m} = \frac{5}{5m} = \frac{1}{m}; \quad \frac{15p}{16q} - \frac{7p}{16q} = \frac{15p-7p}{16q} = \frac{8p}{16q} = \frac{p}{2q}; \quad \frac{15p}{2r^2} - \frac{3q}{2r^2} = \frac{15p-3q}{2r^2}; \\
 \frac{3}{p^2} + \frac{7}{p^2} &= \frac{3+7}{p^2} = \frac{10}{p^2}; \quad \frac{10a}{7x^2} + \frac{4a}{7x^2} = \frac{10a+4a}{7x^2} = \frac{14a}{7x^2} = \frac{2a}{x^2}; \quad \frac{x}{z^2} + \frac{2y}{z^2} = \frac{x+2y}{z^2}; \\
 7. \quad \frac{2}{15} + \frac{1}{15} + \frac{3}{15} &= \frac{2+1+3}{15} = \frac{6}{15} = \frac{2}{5}; \quad \frac{a}{b} + \frac{a}{b} + \frac{a}{b} = \frac{a+a+a}{b} = \frac{3a}{b}; \\
 \frac{17}{18} - \frac{13}{18} + \frac{5}{18} &= \frac{17-13+5}{18} = \frac{9}{18} = \frac{1}{2}; \quad \frac{a^2}{3} + \frac{2b^2}{3} - \frac{4c^2}{3} = \frac{a^2+2b^2-4c^2}{3}; \\
 \frac{4}{9} - \frac{5}{9} + \frac{4}{9} &= \frac{4-5+4}{9} = \frac{3}{9} = \frac{1}{3}; \quad \frac{a}{x} + \frac{3a}{x} + \frac{5a}{x} = \frac{a+3a+5a}{x} = \frac{9a}{x}; \\
 \frac{2}{10} - \frac{8}{10} + \frac{1}{10} &= \frac{2-8+1}{10} = \frac{-5}{10} = -\frac{1}{2}; \quad \frac{10x}{9a} - \frac{5x}{9a} + \frac{2y}{9a} = \frac{10x-5x+2y}{9a} = \frac{5x+2y}{9a}; \\
 \frac{3}{28} + \frac{9}{28} - \frac{5}{28} &= \frac{3+9-5}{28} = \frac{7}{28} = \frac{1}{4}; \quad \frac{9}{10a^2} - \frac{3}{10a^2} + \frac{1}{10a^2} = \frac{9-3+1}{10a^2} = \frac{7}{10a^2} = \frac{1}{2a^2};
 \end{aligned}$$

Murdude liitmine ja lahutamine.

$$\begin{aligned}
 1. \quad \frac{2a+5}{6} + \frac{3a+2}{6} &= \frac{(2a+5)+(3a+2)}{6} = \frac{5a+7}{6}; \\
 \frac{4m+8}{3} + \frac{2m-6}{3} &= \frac{(4m+8)+(2m-6)}{3} = \frac{6m+2}{3}; \\
 \frac{6x-10}{5} + \frac{3x+2}{5} &= \frac{(6x-10)+(3x+2)}{5} = \frac{9x-8}{5}; \\
 \frac{7n+12}{8} - \frac{3n+12}{8} &= \frac{(7n+12)-(3n+12)}{8} = \frac{7n+12-3n-12}{8} = \frac{4n}{8} = \frac{n}{2}; \\
 \frac{14p-9}{10} - \frac{6p+2}{10} &= \frac{(14p-9)-(6p+2)}{10} = \frac{14p-9-6p-2}{10} = \frac{8p-11}{10}; \\
 2. \quad \frac{m+n}{2} + \frac{m-n}{2} &= \frac{(m+n)+(m-n)}{2} = \frac{2m}{2} = m; \\
 \frac{m+n}{4p} - \frac{m-n}{4p} &= \frac{(m+n)-(m-n)}{4p} = \frac{m+n-m+n}{4p} = \frac{2n}{4p} = \frac{n}{2p}; \\
 \frac{3+11x}{3} + \frac{6-22x}{3} &= \frac{(3+11x)+(6-22x)}{3} = \frac{3+11x+6-22x}{3} = \frac{9-11x}{3}; \\
 \frac{7a+2b}{3a} - \frac{4a+17b}{3a} &= \frac{(7a+2b)-(4a+17b)}{3a} = \frac{7a+2b-4a-17b}{3a} = \frac{3a-15b}{3a} = \frac{a-5b}{a}; \\
 \frac{24x-6y}{7} - \frac{10x-48y}{7} &= \frac{(24x-6y)-(10x-48y)}{7} = \frac{24x-6y-10x+48y}{7} = \frac{14x+42y}{7} = \frac{2(7x+21y)}{7} = 2x+6y; \\
 3. \quad \frac{3a+2b}{a} + \frac{5a+8b}{a} &= \frac{3a+2b+5a+8b}{a} = \frac{8a+10b}{a}; \\
 \frac{15x+10y}{2x} - \frac{7x+4y}{2x} &= \frac{(15x+10y)-(7x+4y)}{2x} = \frac{15x+10y-7x-4y}{2x} = \frac{8x+6y}{2x} = \frac{2(4x+3y)}{2x} = \frac{4x+3y}{x}; \\
 \frac{7m+8n}{3m} - \frac{3m-5n}{3m} &= \frac{(7m+8n)-(3m-5n)}{3m} = \frac{7m+8n-3m+5n}{3m} = \frac{4m+13n}{3m}; \\
 \frac{20p-9}{6q} - \frac{8p-3}{15q} &= \frac{(20p-9)-(8p-3)}{6q} = \frac{20p-9-8p+3}{6q} = \frac{12p-6}{6q} = \frac{6(2p-1)}{6q} = \frac{2p-1}{q}; \\
 \frac{7x+5}{2y} + \frac{7x-5}{2y} &= \frac{7x+5+7x-5}{2y} = \frac{14x}{2y} = \frac{7x}{y};
 \end{aligned}$$

Si murde peaar e hia nimetaja alla, selles viis tjaat nimetajat korrutada
 4 nense taputitja, mis tental pinduvad teiste nimetajete oadlita.

Näide: $\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5} = (\frac{1}{2} \text{ on viis korrut. } 3 \cdot 2 \cdot 3 \cdot 4 \cdot 5 = 360, \text{ sel tein pinduvad nel}$

Murdude liitmine ja lahutamine. $\frac{125}{3} + \frac{125}{4} + \frac{125}{5} = \frac{30+20+15+12}{60} = \frac{77}{60}$

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$$1. \frac{2}{3} + \frac{1}{6} = \frac{2+1}{6} = \frac{3}{6} = \frac{1}{2};$$

$$\frac{6}{12} + \frac{3}{4} = \frac{7-3}{12} = \frac{4}{12} = \frac{1}{3};$$

$$\frac{6}{18} - \frac{2}{9} = \frac{11-12}{18} = -\frac{1}{18};$$

$$\frac{5}{20} + \frac{3}{5} = \frac{7+12}{20} = \frac{19}{20};$$

$$\frac{4}{9} - \frac{5}{36} = \frac{16-5}{36} = \frac{11}{36};$$

$$3. \frac{1}{2a} + \frac{1}{a} = \frac{1+2}{2a} = \frac{3}{2a};$$

$$\frac{5}{5} - \frac{4}{56} = \frac{53-4}{56} = \frac{49}{56} = \frac{7}{8};$$

$$\frac{7}{36x^2} + \frac{2}{36x^2} = \frac{7+2}{36x^2} = \frac{9}{36x^2} = \frac{1}{4x^2};$$

$$\frac{1}{2a} - \frac{1}{2a} = \frac{1-a}{2a};$$

$$\frac{11}{10x} - \frac{2}{5} = \frac{11-4x}{10x};$$

$$5. \frac{10}{mn} - \frac{3l}{10mn} = \frac{20K-3l}{10mn};$$

$$\frac{p}{p} - \frac{4n}{p^2} = \frac{p^2-4n}{p^2};$$

$$\frac{4y}{3y} + \frac{z^2}{12y^2} = \frac{4y^2+z^2}{12y^2};$$

$$\frac{9p}{32r} + \frac{5q}{8r} = \frac{9p+20q}{32r};$$

$$\frac{13a^2}{42s} - \frac{5b^2}{6} = \frac{13a^2-35b^2}{42s};$$

$$2. \frac{3}{2} + \frac{a}{6} = \frac{3a+a}{6} = \frac{4a}{6} = \frac{2a}{3};$$

$$\frac{5b}{6} - \frac{3}{3} = \frac{5b-6}{6} = \frac{5b-6}{6};$$

$$\frac{3x^2}{8} - \frac{5x^2}{8} = \frac{6x^2-5x^2}{8} = \frac{x^2}{8};$$

$$\frac{5a}{4} + \frac{3}{8} = \frac{2a+3}{8};$$

$$\frac{m}{21} + \frac{2n}{7} = \frac{m+6n}{21} = \frac{m+6n}{21};$$

$$4. \frac{1}{ab} + \frac{1}{a} = \frac{1+b}{ab};$$

$$\frac{2q}{10} - \frac{3}{2pq} = \frac{2q^2-3}{2pq};$$

$$\frac{1}{x^2} - \frac{1}{x^2} = \frac{1x-1}{x^2};$$

$$\frac{12}{u^2} + \frac{4}{u} = \frac{12+4u^2}{u^2};$$

$$\frac{6}{35a^3} - \frac{2}{7u} = \frac{6-10u^2}{35u^3};$$

$$6. \frac{a^2}{4x} + \frac{b}{4x} = \frac{a^2+b}{4x};$$

$$\frac{a^2}{4x} - \frac{b}{4x} = \frac{a^2-b}{4x};$$

$$\frac{4y}{3y} - \frac{z^2}{12y^2} = \frac{4y^2-z^2}{12y^2};$$

$$\frac{16a^3}{49x^2} + \frac{7}{7} = \frac{16a^3+76x^2}{49x^2};$$

$$\frac{16z^2}{4z} - \frac{17}{64z^2} = \frac{16z^2-17}{64z^2};$$

Murdude liitmine ja lahutamine.

$$1. \frac{3}{2} + \frac{2}{3} = \frac{3+2}{6} = \frac{5}{6};$$

$$\frac{5}{2} - \frac{4}{5} = \frac{5-2}{10} = \frac{3}{10};$$

$$\frac{4}{3} + \frac{3}{4} = \frac{8+3}{12} = \frac{11}{12};$$

$$\frac{7}{8} - \frac{4}{7} = \frac{21-12}{56} = \frac{9}{56};$$

$$\frac{10}{9} - \frac{17}{10} = \frac{20-153}{90} = -\frac{133}{90};$$

$$3. \frac{a}{3} + \frac{1}{a} = \frac{a+3}{3a};$$

$$\frac{5}{x} - \frac{3}{5} = \frac{20+3x}{5x};$$

$$\frac{2}{x^2} - \frac{10}{21} = \frac{42-10x^2}{21x^2};$$

$$\frac{b}{a} + \frac{1}{ab} = \frac{b+a}{ab};$$

$$\frac{2a}{x} - \frac{13a}{y} = \frac{2ay-13ax}{xy};$$

$$5. \frac{1}{ab} + \frac{1}{c} = \frac{c+ab}{abc};$$

$$\frac{1}{2} - \frac{1}{xy} = \frac{xy-2}{2xy};$$

$$\frac{7pq}{15} + \frac{3}{7pq} = \frac{105pq+3r}{7pq};$$

$$\frac{2}{9} - \frac{m}{n} = \frac{18+mn}{2mn};$$

$$\frac{d}{10} - \frac{16}{ab} = \frac{10cd-16ab}{abcd};$$

$$2. \frac{3}{2} + \frac{2}{3} = \frac{3a+2a}{6} = \frac{5a}{6};$$

$$\frac{5}{4} - \frac{2x}{5} = \frac{52+20x}{20} = \frac{13x}{20};$$

$$\frac{7m^2}{8} - \frac{3m^2}{4} = \frac{7m^2-6m^2}{8} = \frac{m^2}{8};$$

$$\frac{7}{2} + \frac{2b}{7} = \frac{7a+2b}{14};$$

$$\frac{5}{5} - \frac{3a}{8} = \frac{48a+15w}{40};$$

$$4. \frac{b}{3a} + \frac{1}{b} = \frac{b+3a}{3ab};$$

$$\frac{5}{3} - \frac{4m}{5} = \frac{15n-32m}{30mn};$$

$$\frac{10}{3p^2} - \frac{1}{11q^2} = \frac{110q^2-3p^2}{33p^2q^2};$$

$$\frac{1}{8u^3} + \frac{2}{u^3} = \frac{15a+56b}{8u^3};$$

$$\frac{23x}{81p^2} - \frac{6}{27} = \frac{132-15p^2}{81p^2};$$

$$6. \frac{a}{b} + \frac{b}{a} = \frac{a^2+b^2}{ab};$$

$$\frac{2}{x} + \frac{1}{2x} = \frac{2a+a}{2x};$$

$$\frac{b}{x} - \frac{1}{x} = \frac{b-x}{x^2};$$

$$\frac{2}{x^2} - \frac{4}{y} = \frac{2y-4x^2}{x^2y};$$

$$\frac{4y^3}{3x} + \frac{2}{4y} = \frac{4my^3+3n}{12xy^3};$$

Murdude liitmine ja lahutamine.

$$1. \frac{\frac{3}{4} - \frac{2}{6}}{\frac{5}{6} + 9} = \frac{\frac{3-2}{12}}{\frac{15+4}{18}} = \frac{\frac{1}{12}}{\frac{19}{18}} = 1\frac{1}{8};$$

$$\frac{\frac{3}{8} - \frac{2}{5}}{\frac{8}{8} - 12} = \frac{\frac{3-2}{40}}{-\frac{1}{24}} = -\frac{1}{24};$$

$$\frac{\frac{2}{15} - \frac{5}{6}}{\frac{15}{15} - 6} = \frac{\frac{4-25}{30}}{-\frac{11}{30}} = -\frac{11}{30};$$

$$\frac{\frac{5}{4} - \frac{2}{7}}{\frac{21}{4} + 15} = \frac{\frac{20+49}{105}}{\frac{69}{105}} = \frac{69}{105};$$

$$3. \frac{\frac{2}{8a} - \frac{3}{2a}}{\frac{5}{8x} + 10x} = \frac{\frac{2-3}{6a}}{\frac{25+12}{40x}} = -\frac{1}{6a};$$

$$\frac{\frac{5}{8x} - \frac{3}{10x}}{\frac{8x}{8x} + 10x} = \frac{\frac{25+12}{40x}}{\frac{40x}{8x}} = \frac{17}{5};$$

$$\frac{\frac{2}{4x} - \frac{3}{8}}{\frac{4x}{4x} + 8} = \frac{\frac{6+5x}{8x}}{\frac{8x}{4x}} = \frac{6+5x}{8x};$$

$$\frac{\frac{24}{10x^2} - \frac{5}{42x^2}}{\frac{10x^2}{10x^2} + 42x^2} = \frac{\frac{147-156}{210x^2}}{\frac{42x^2}{10x^2}} = \frac{147-156}{210x^2};$$

$$\frac{\frac{29}{9} - \frac{35}{2}}{\frac{34p}{9} - \frac{51q}{2}} = \frac{\frac{27q-4p}{102pq}}{\frac{102pq}{102pq}} = \frac{27q-4p}{102pq};$$

$$5. \frac{\frac{c}{ab} - \frac{1}{ac}}{\frac{2}{2xy} - \frac{4}{2xz}} = \frac{\frac{c+b}{abc}}{\frac{2+4}{2xy}} = \frac{c+b}{abc};$$

$$\frac{\frac{2}{2xy} - \frac{4}{2xz}}{\frac{2}{2xy} - \frac{4}{2xz}} = \frac{\frac{2+4}{2xy}}{\frac{2+4}{2xy}} = \frac{2+4}{2xy};$$

$$\frac{\frac{2r}{15pq} - \frac{5p}{6qr}}{\frac{2r}{15pq} - \frac{5p}{6qr}} = \frac{\frac{4p^2+5p^2}{30pqr}}{\frac{4p^2+5p^2}{30pqr}} = \frac{4p^2+5p^2}{30pqr};$$

$$\frac{\frac{2}{18} - \frac{5}{100uv}}{\frac{100uv}{100uv} - 40uv} = \frac{\frac{26-35}{200uv}}{-\frac{9}{200uv}} = -\frac{9}{200uv};$$

$$\frac{\frac{4}{20st} - \frac{5}{16t}}{\frac{20st}{20st} + 16t} = \frac{\frac{4+155}{80st}}{\frac{80st}{20st}} = \frac{4+155}{80st};$$

$$2. \frac{\frac{4}{x} - \frac{3}{8}}{\frac{6}{10} - \frac{5}{12}} = \frac{\frac{4x+3x}{24}}{\frac{18a-5a}{60}} = \frac{7x}{24};$$

$$\frac{\frac{6}{10} - \frac{5}{12}}{\frac{18a-5a}{60}} = \frac{\frac{18a-5a}{60}}{\frac{18a-5a}{60}} = \frac{13a}{60};$$

$$\frac{\frac{3}{14} - \frac{2}{21}}{\frac{9m}{14} - \frac{2m}{21}} = \frac{\frac{9m-2m}{42}}{\frac{7m}{42}} = \frac{7m}{42};$$

$$\frac{\frac{3}{18} - \frac{2}{27}}{\frac{18}{18} + \frac{27}{27}} = \frac{\frac{3a+2b}{54}}{\frac{54}{54}} = \frac{3a+2b}{54};$$

$$\frac{\frac{15}{4} - \frac{2}{30}}{\frac{4}{4} + \frac{30}{30}} = \frac{\frac{45a-2b}{60}}{\frac{60}{60}} = \frac{45a-2b}{60};$$

$$4. \frac{\frac{b}{2a} - \frac{a}{2b}}{\frac{2b}{5} - \frac{3}{4b}} = \frac{\frac{b+a}{2ab}}{\frac{10b-9a}{4b}} = \frac{b+a}{2ab};$$

$$\frac{\frac{2b}{5} - \frac{3}{4b}}{\frac{10b-9a}{4b}} = \frac{\frac{10b-9a}{4b}}{\frac{10b-9a}{4b}} = \frac{10b-9a}{4b};$$

$$\frac{\frac{16}{8} - \frac{23}{30a^2}}{\frac{15m^2}{8} - \frac{30a^2}{30a^2}} = \frac{\frac{16a^2-23m^2}{80a^2}}{\frac{15m^2-30a^2}{80a^2}} = \frac{16a^2-23m^2}{15m^2-30a^2};$$

$$\frac{\frac{4x}{2} - \frac{3x}{32p}}{\frac{39x}{2} - \frac{52p}{32p}} = \frac{\frac{84+9x}{156xy}}{\frac{156xy}{156xy}} = \frac{84+9x}{156xy};$$

$$\frac{\frac{30}{3} - \frac{5}{42a^3}}{\frac{28a^3}{3} - \frac{42a^3}{42a^3}} = \frac{\frac{9x^3-10u^3}{84u^3w^3}}{\frac{84u^3w^3}{84u^3w^3}} = \frac{9x^3-10u^3}{84u^3w^3};$$

$$6. \frac{\frac{1}{x^2} - \frac{1}{x}}{\frac{1}{x^2} - \frac{1}{x}} = \frac{1-x}{x^2};$$

$$\frac{\frac{2}{3} - \frac{4}{4x^2}}{\frac{4x^2}{4x^2} - 8x} = \frac{\frac{6+7x}{8x^2}}{\frac{4x^2-8x}{4x^2}} = \frac{6+7x}{8x^2};$$

$$\frac{\frac{2}{5} - \frac{2}{12y}}{\frac{12y}{12y} - \frac{6y^2}{12y^2}} = \frac{\frac{54-2x}{124y^2}}{\frac{124y^2}{124y^2}} = \frac{54-2x}{124y^2};$$

$$\frac{\frac{5}{8} - \frac{3}{56}}{\frac{5}{8} - \frac{3}{56}} = \frac{\frac{55+36^2}{56^2}}{\frac{56^2}{56^2}} = \frac{55+36^2}{56^2};$$

$$\frac{\frac{p}{p} - \frac{3}{8}}{\frac{p}{p} - \frac{3}{8}} = \frac{\frac{p^2-24q^3}{15pq^3}}{\frac{15pq^3}{15pq^3}} = \frac{p^2-24q^3}{15pq^3};$$

Murdude liitmine ja lahutamine.

$$1. \frac{\frac{3}{a+4} - \frac{2}{a+5}}{\frac{3}{4} + \frac{x-18}{12}} = \frac{\frac{3a+12+2a+10}{6}}{\frac{4a+9}{12}} = \frac{5a+22}{6};$$

$$\frac{\frac{3}{x+7} - \frac{x-18}{12}}{\frac{7}{6} - \frac{x-4}{21}} = \frac{\frac{4x+21+x-13}{12}}{\frac{7x-7+21x-8}{42}} = \frac{4x+9}{12};$$

$$\frac{\frac{7}{x-1} - \frac{2}{x-4}}{\frac{8}{6} - \frac{7q}{24}} = \frac{\frac{7x-7+21x-8}{42}}{\frac{8p+24-5p+7q}{24}} = \frac{9x-15}{42};$$

$$\frac{\frac{8}{p+2q} - \frac{5p+7q}{24}}{\frac{3}{5a-3b} - \frac{a-b}{6}} = \frac{\frac{8(p+2q)-(5p+7q)}{24}}{\frac{15a-9b-7a+7b}{42}} = \frac{8p+9q-5p-7q}{42} = \frac{3p+2q}{42};$$

$$\frac{\frac{3}{5a-3b} - \frac{a-b}{6}}{\frac{14}{42} - \frac{6}{42}} = \frac{\frac{15a-9b-7a+7b}{42}}{\frac{8a-2b}{42}} = \frac{8a-2b}{42} = \frac{4a-b}{21};$$

$$2. \frac{\frac{3}{6u+5v} - \frac{4u-5v}{15}}{\frac{5}{9m^2-7n^2} - \frac{6m^2-17n^2}{15m}} = \frac{\frac{18u+15v-(4u-5v)}{30}}{\frac{45m^2-35n^2-(42m^2-119n^2)}{105m}} = \frac{18u+15v-4u+5v}{30} = \frac{14u+20v}{30} = \frac{7u+10v}{15};$$

$$\frac{\frac{5}{9m^2-7n^2} - \frac{6m^2-17n^2}{15m}}{\frac{21m}{21m} - \frac{15m}{15m}} = \frac{\frac{45m^2-35n^2-(42m^2-119n^2)}{105m}}{\frac{45m^2-35n^2-42m^2+119n^2}{105m}} = \frac{3m^2+84n^2}{105m};$$

$$\frac{\frac{2}{6s+10t} - \frac{8t}{21a}}{\frac{12s+20t}{42a} - \frac{6s+14t}{42a}} = \frac{\frac{12s+20t-(6s+14t)}{42a}}{\frac{12s+20t-6s-14t}{42a}} = \frac{6t-5s}{42a} = \frac{6t-5s}{42a};$$

$$\frac{\frac{m}{m} - \frac{n}{n}}{\frac{m}{m} - \frac{n}{n}} = \frac{mn-n^2+mn-mn}{mn} = \frac{m^2-n^2}{mn};$$

$$\frac{\frac{p}{p} - \frac{q}{q}}{\frac{p}{p} - \frac{q}{q}} = \frac{(p^2-pq)-(q^2-pq)}{pq} = \frac{p^2-pq-q^2+pq}{pq} = \frac{p^2-q^2}{pq};$$

$$3. \frac{\frac{a}{am+bn} - \frac{b}{am+cn}}{\frac{a^2+1}{2a} - \frac{a^2-1}{2a}} = \frac{\frac{ame+bne+amb+ben}{abe}}{\frac{a^2+1-a^2-1}{2a}} = \frac{ame+bne+amb+ben}{abe} = \frac{ame+bne+amb+ben}{abe};$$

$$\frac{\frac{1}{a^2+1} - \frac{a^2-1}{2a}}{\frac{a^2+1}{2a} - \frac{a^2-1}{2a}} = \frac{\frac{a^2+1-a^2-1}{2a}}{\frac{a^2+1-a^2-1}{2a}} = \frac{1+a}{2a};$$

$$\frac{\frac{m^2+n^2}{mn} - \frac{m-n}{m}}{\frac{m^2+n^2}{mn} - \frac{m-n}{m}} = \frac{\frac{m^2+n^2+mn-m^2}{mn}}{\frac{m^2+n^2+mn-m^2}{mn}} = \frac{mn^2+mn}{mn^2+mn};$$

$$\frac{\frac{p^2+q^2}{pq} - \frac{p}{q}}{\frac{p^2+q^2}{pq} - \frac{p}{q}} = \frac{(p^2+q^2)(p^2-pq)}{pq} = \frac{p^2+q^2-p^2-pq}{pq} = \frac{q^2-pq}{pq};$$

$$\frac{\frac{b}{a} - \frac{b+1}{ab}}{\frac{b}{a} - \frac{b+1}{ab}} = \frac{\frac{b-b-1}{ab}}{\frac{b-b-1}{ab}} = \frac{1}{ab};$$

Murdude Hittmine ja lahutamine.

$$\begin{aligned}
 1.) \frac{3}{a} + \frac{a}{3} &= \frac{3a+a}{3} = \frac{4a}{3} = 1\frac{1}{3}a; & 2. \frac{7}{2a} + \frac{3b}{7} &= \frac{14a+6b}{14} = \frac{2a+3b}{2} = 2a+3b; \\
 \frac{4}{b} - \frac{3b}{4} &= \frac{4b-3b}{4} = \frac{b}{4}; & \frac{5}{5x} - \frac{7}{4}y &= \frac{2ax-7y}{4}; \\
 \frac{3}{3c} + \frac{2}{3}c &= \frac{9c+2c}{3} = \frac{11c}{3} = 3\frac{2}{3}c; & 6\frac{1}{2}u + 2\frac{1}{3}v &= \frac{13u+2v}{2}; \\
 \frac{4x}{9} - \frac{9}{x} &= \frac{4x-9x}{9} = -\frac{5x}{9}; & \frac{6}{4p} + \frac{4q}{3} + 1\frac{5}{6}r &= \frac{24p+8q+11r}{6}; \\
 \frac{5}{4}y^2 - \frac{1}{4}y^2 &= \frac{5y^2-1y^2}{4} = \frac{4y^2}{4} = y^2; & \frac{12x}{x} + \frac{3x^2}{4} + \frac{7x^2}{12} &= \frac{12x+3x^2+7x^2}{12};
 \end{aligned}$$

$$\begin{aligned}
 3. \frac{c}{a} + \frac{b}{c} &= \frac{ac+b}{c}; & 4. \frac{x}{x} - 6x &= \frac{x^2-6x^2}{x}; \\
 \frac{a}{b} - \frac{c}{c} &= \frac{a-bc}{c}; & \frac{n^2}{7} - \frac{m^2}{n^2} &= \frac{7n^2-m^2}{n^2}; \\
 \frac{x}{a} + \frac{a}{3} &= \frac{x+3a}{3}; & \frac{a^2}{a} + \frac{1}{a} + \frac{1}{a^2} &= \frac{a^2+a+1}{a^2}; \\
 \frac{10h}{5} - \frac{g}{2h} &= \frac{10h-g}{2h}; & \frac{2}{12} - \frac{x}{x} + 10 &= \frac{2-3x+10x^2}{x^2}; \\
 \frac{9m}{12m} + \frac{5}{9m} &= \frac{108m^2+5}{9m^2}; & \frac{4x^2}{12} - \frac{8}{42} + \frac{3}{x^2} &= \frac{4x^2-4/52+136}{4x^2} = \frac{932+136}{4x^2};
 \end{aligned}$$

$$\begin{aligned}
 5. \frac{3}{a} + \frac{3}{2} + \frac{a+1}{3} &= \frac{3a+6+a+1}{3} = \frac{4a+7}{3}; \\
 \frac{4}{3m} + \frac{4}{4} - \frac{2m-5}{4} &= \frac{12m+16-(2m-5)}{4} = \frac{12m+16-2m+5}{4} = \frac{10m+21}{4}; \\
 \frac{2(a-2)}{5} - \frac{5}{3(n-1)} &= \frac{2n-4-(15n-15)}{5} = \frac{2n-4-15n+15}{5} = \frac{11-13n}{5}; \\
 \frac{6x}{x} + \frac{1}{6} - \frac{x^2+0.5x}{3x} &= \frac{6x^2+x-(2x^2+x)}{6x} = \frac{6x^2+x-2x^2-x}{6x} = \frac{4x^2}{6x} = \frac{2x}{3}; \\
 \frac{p_{2.9}}{p} - \frac{p^2-5.6}{p^2} &= \frac{2.9p-(p^2-5.6)}{p^2} = \frac{2.9p-p^2+5.6}{p^2};
 \end{aligned}$$

*) Siin ja edasi tähed a ja x tähistavad üht ja sama arvu, samuti tähed a ja x .

Murdude korratamine.

$$\begin{aligned}
 1. \quad 3. \frac{1}{7} &= \frac{3 \cdot 1}{7} = \frac{3}{7}; & 2. \quad 4. \frac{a}{5} &= \frac{4a}{5}; & 3. \quad \frac{3}{5} \cdot a &= \frac{3a}{5}; \\
 2. \frac{2}{5} &= \frac{2 \cdot 2}{5} = \frac{4}{5}; & -3 \cdot \frac{x}{8} &= -\frac{3x}{8}; & \frac{4}{9} \cdot x &= \frac{4x}{9}; \\
 \frac{4}{15} \cdot 7 &= \frac{4 \cdot 7}{15} = \frac{28}{15}; & -\frac{2p}{15} \cdot (-7) &= \frac{14p}{15}; & -2\frac{1}{3} \cdot u &= -2\frac{u}{3}; \\
 3. \frac{1}{3} \cdot 8 &= \frac{10.8}{3} = 26\frac{2}{3}; & \frac{9^2}{28} \cdot 9 &= \frac{9 \cdot 9^2}{28}; & 3\frac{1}{4} \cdot 3v &= 9\frac{3}{4}v; \\
 -10 \cdot 2\frac{3}{7} &= -\frac{10 \cdot 17}{7} = -\frac{170}{7}; & \frac{3y^2}{17} \cdot (-12) &= -\frac{3y^2 \cdot 12}{17}; & -5\frac{1}{2} \cdot (-9n^2) &= +\frac{11.9n^2}{2} = \frac{99n^2}{2} = 49\frac{1}{2}n^2; \\
 4. \quad 10 \cdot \frac{3}{5} &= \frac{10 \cdot 3}{5} = 2 \cdot 3 = 6; & 6. \frac{a}{6} &= \frac{6 \cdot a}{6} = a; & 6. \quad x \cdot \frac{2}{x} &= \frac{x \cdot 2}{x} = 2; \\
 \frac{5}{6} \cdot 30 &= \frac{5 \cdot 30}{6} = 5 \cdot 5 = 25; & 8. \frac{x}{4} &= \frac{8 \cdot x}{4} = 2x; & \frac{3}{5p} \cdot p &= \frac{3p}{5p} = \frac{3}{5}; \\
 -6 \cdot \frac{4}{9} &= -\frac{6 \cdot 4}{9} = -\frac{2 \cdot 4}{3} = -\frac{8}{3}; & \frac{12p^2}{36} &= \frac{12p^2}{36} = \frac{p^2}{3}; & 2v \cdot \frac{u}{4v} &= \frac{2v \cdot u}{4v} = \frac{u}{2}; \\
 16 \cdot 2\frac{1}{4} &= \frac{16 \cdot 9}{4} = 4 \cdot 9 = 36; & \frac{5q}{18} \cdot 27 &= \frac{5q \cdot 27}{18} = \frac{5 \cdot 3}{2}; & -\frac{a}{b} \cdot ab &= -\frac{a \cdot b}{b} = -a; \\
 -1\frac{1}{5} \cdot (-25) &= \frac{6.25}{5} = 25; & \frac{4x^3}{9} \cdot 15 &= \frac{4x^3 \cdot 15}{9} = \frac{20x^3}{3}; & 3q \cdot \frac{4p}{21q^2} &= \frac{3q \cdot 4p}{21q^2} = \frac{4p}{7q}; \\
 7. \quad a^2 \cdot \frac{1}{a} &= \frac{a^2}{a} = a; & 8. \quad \frac{8ab}{15xy} \cdot 5xy &= \frac{8ab \cdot 5xy}{15xy} = \frac{8ab}{3}; \\
 a \cdot \frac{1}{a^2} &= \frac{a}{a^2} = \frac{1}{a}; & 15pq \cdot \frac{7p}{9q} &= \frac{15pq \cdot 7p}{9q} = \frac{35p^2}{3}; \\
 3x \cdot \frac{5x}{6y} &= \frac{3x \cdot 5x}{6y} = \frac{5x^2}{2y}; & -19ax \cdot \frac{3xy}{95ab} &= -\frac{19ax \cdot 3xy}{95ab} = -\frac{3x^2y}{5b}; \\
 -x^3 \cdot (-\frac{8}{x}) &= \frac{x^3 \cdot 8}{x} = 8x^2; & 5ab^2 \cdot \frac{14mn}{45a^2b} &= \frac{5ab^2 \cdot 14mn}{45a^2b} = \frac{14bmn}{9a}; \\
 \frac{7u}{10v} \cdot 40v^3 &= \frac{7u \cdot 40v^3}{10v} = 28uv^2; & \frac{13}{21a^2b} \cdot (-7u^2v^2) &= -\frac{13 \cdot 7u^2v^2}{21a^2b} = -\frac{13v^2}{3a^2b};
 \end{aligned}$$

Murdude korratamine.

- $$\frac{a}{5} \cdot (a+3) = \frac{a(a+3)}{5} = \frac{a^2+3a}{5};$$

$$\frac{3b}{4} \cdot (5b-6) = \frac{3b \cdot (5b-6)}{4} = \frac{15b^2-18b}{4};$$

$$\frac{2x}{3} \cdot 3(2x-3) = \frac{2x \cdot 3(2x-3)}{3} = 2x \cdot (2x-3) = 4x^2-6x;$$

$$m \cdot \frac{m-1}{3} = \frac{m(m-1)}{3} = \frac{m^2-m}{3};$$

$$-2a \cdot \frac{3-a}{8} = -\frac{2a \cdot (3-a)}{8} = -\frac{a \cdot (3-a)}{4} = -\frac{3a-a^2}{4};$$
- $$6p \cdot \frac{q+r}{18p} = \frac{6p(q+r)}{18p} = \frac{q+r}{3};$$

$$9x^2 \cdot \frac{x^3-7}{6x} = \frac{9x^2(x^3-7)}{6x} = \frac{3x(x^3-7)}{2} = \frac{3x^4-21x}{2};$$

$$5x^3 \cdot \left(-\frac{2x+9}{x^2}\right) = -\frac{5x^3(2x+9)}{x^2} = -5x(2x+9) = -10x^2-45x;$$

$$\frac{3}{b} \cdot b(a+1) = \frac{3b(a+1)}{b} = 3(a+1) = 3a+1;$$

$$\frac{2x}{9y} \cdot y(y-x) = \frac{2x \cdot y(y-x)}{9y} = \frac{2x(y-x)}{9} = \frac{2xy-2x^2}{9};$$
- $$\frac{a+b}{3} \cdot (a-b) = \frac{(a+b)(a-b)}{3} = \frac{a^2-b^2}{3};$$

$$\frac{m+4}{n} \cdot 2(m-4) = \frac{(m+4) \cdot 2(m-4)}{n} = \frac{(m+4)(m-4)}{n} = \frac{m^2-4^2}{n};$$

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

$$\left(\frac{1}{p} - \frac{1}{q}\right) \cdot (p+q) = \frac{(q-p)(p+q)}{pq} = \frac{(q-p)(q+p)}{pq} = \frac{q^2-p^2}{pq};$$

$$\left(\frac{x}{3y} + \frac{y}{4z} + \frac{z}{6x}\right) \cdot 12xyz = \frac{(4x^2z-3y^2x+2yz^2) \cdot 12xyz}{12xyz} = 4x^2z-3xy^2+2yz^2;$$

Murdude korratamine.

- $$\frac{4}{5} \cdot \frac{2}{3} = \frac{4 \cdot 2}{5 \cdot 3} = \frac{8}{15};$$

$$\frac{3}{8} \cdot \frac{5}{8} = \frac{3 \cdot 5}{8 \cdot 8} = \frac{15}{64};$$

$$\frac{7}{8} \cdot \frac{x}{3} = \frac{7 \cdot x}{8 \cdot 3} = \frac{7x}{24};$$

$$\frac{9}{4} \cdot \frac{3}{7} = \frac{9 \cdot 3}{4 \cdot 7} = \frac{27}{28};$$

$$\frac{6}{11} \cdot \left(-\frac{4}{5}\right) = -\frac{6 \cdot 4}{11 \cdot 5} = -\frac{24}{55};$$

$$-\frac{7}{11} \cdot \left(-\frac{1}{3}\right) = \frac{7 \cdot 1}{11 \cdot 3} = \frac{7}{33};$$
- $$\frac{a}{3} \cdot \frac{2}{5} = \frac{a \cdot 2}{3 \cdot 5} = \frac{2a}{15};$$

$$\frac{4}{9} \cdot \frac{2x}{5} = \frac{4 \cdot 2x}{9 \cdot 5} = \frac{8x}{45};$$

$$\frac{a}{3} \cdot \left(-\frac{b}{4}\right) = -\frac{a \cdot b}{3 \cdot 4} = -\frac{ab}{12};$$

$$\frac{3x}{7} \cdot \frac{9y}{13} = \frac{3x \cdot 9y}{7 \cdot 13} = \frac{27xy}{91};$$
- $$\frac{a}{b} \cdot \frac{c}{d} = \frac{ac}{bd};$$

$$\frac{3a}{b} \cdot \frac{6c}{d} = \frac{3a \cdot 6c}{b \cdot d} = \frac{18ac}{bd};$$

$$\frac{4x}{7y} \cdot \frac{4a}{9b} = \frac{4x \cdot 4a}{7y \cdot 9b} = \frac{16xa}{63yb};$$

$$\frac{15x}{10y} \cdot \frac{5z}{4y} = \frac{15x \cdot 5z}{10y \cdot 4y} = \frac{3xz}{4y^2};$$
- $$\frac{1}{3} \cdot \frac{3}{4} = \frac{1 \cdot 3}{3 \cdot 4} = \frac{1}{4};$$

$$\frac{3}{4} \cdot \frac{4}{5} = \frac{3 \cdot 4}{4 \cdot 5} = \frac{3}{5};$$

$$\frac{4}{7} \cdot \frac{8}{8} = \frac{4 \cdot 8}{7 \cdot 8} = \frac{1}{2};$$

$$\frac{2}{5} \cdot \frac{3}{4} = \frac{2 \cdot 3}{5 \cdot 4} = \frac{3}{10};$$

$$\frac{3}{8} \cdot \frac{4}{9} = \frac{3 \cdot 4}{8 \cdot 9} = \frac{1}{6};$$
- $$\frac{a}{b} \cdot \frac{b}{a} = \frac{ab}{ba} = 1;$$

$$\frac{x^2}{3} \cdot \frac{3}{x} = \frac{x^2 \cdot 3}{3 \cdot x} = x;$$

$$\frac{6m^2}{7} \cdot \frac{14}{m} = \frac{6m^2 \cdot 14}{7 \cdot m} = 12m;$$

$$\frac{n}{4} \cdot \frac{2}{n^2} = \frac{n \cdot 2}{4 \cdot n^2} = \frac{1}{2n};$$

$$\frac{z}{3} \cdot \frac{3}{10z^2} = \frac{z \cdot 3}{3 \cdot 10z^2} = \frac{1}{10z};$$
- $$\frac{36a^2}{49b^2} \cdot \frac{7c^2}{68} = \frac{36a^2 \cdot 7c^2}{49b^2 \cdot 68} = \frac{6}{7};$$

$$\frac{28xy}{33ab} \cdot \frac{44a^2}{35xy} = \frac{28xy \cdot 44a^2}{33ab \cdot 35xy} = \frac{16a}{15b};$$

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

$$\frac{5x^2}{y} \cdot \frac{y^2}{10x} \cdot \frac{12z}{xy} = \frac{5x^2 \cdot y^2 \cdot 12z}{y \cdot 10x \cdot xy} = \frac{12z}{x};$$

$$\frac{2p^2}{3qr} \cdot \left(-\frac{15q^2}{7pr}\right) \cdot \left(-\frac{14r^2}{8pq}\right) = \frac{2p^2 \cdot 15q^2 \cdot 14r^2}{3qr \cdot 7pr \cdot 8pq} = \frac{10}{H};$$

$$\begin{aligned}
 1. \quad & \frac{2}{3} \cdot \left(\frac{a}{4} - \frac{3a}{2} \right) = \frac{2a}{3 \cdot 4} - \frac{3a \cdot 2}{2 \cdot 3} = \frac{a}{6} - \frac{a}{1} = \frac{a}{6} - a; \\
 & \frac{12a}{5} \cdot \left(\frac{1}{3a} - \frac{3}{2a} \right) = \frac{1 \cdot 12a}{3a \cdot 5} - \frac{3 \cdot 12a}{2a \cdot 5} = \frac{4}{5} - \frac{18}{5} = -\frac{14}{5}; \\
 & \frac{x}{a} \cdot \left(\frac{a}{x^2} - \frac{1}{x} \right) = \frac{a \cdot x^2}{x^2 \cdot a} - \frac{1 \cdot x^2}{x \cdot a} = 1 - \frac{x}{a}; \\
 & \frac{x}{2} \cdot \frac{4x}{7} \cdot \frac{14x+21}{8} = \frac{x \cdot 4x \cdot (14x+21)}{2 \cdot 7 \cdot 8} = \frac{x^2(14x+21)}{4 \cdot 7} = \frac{7(2x^3+3x^2)}{4 \cdot 7} = \frac{2x^3+3x^2}{4}; \\
 & \frac{4}{9} p \cdot \frac{27p}{16} \cdot \frac{p-1}{10} = \frac{4p \cdot 27p(p-1)}{9 \cdot 16 \cdot 10} = \frac{p^2(p-1)}{4 \cdot 5} = \frac{p^3-p^2}{20};
 \end{aligned}$$

$$\begin{aligned}
 2. \quad & \frac{a}{b} \cdot \frac{2a}{3b} \cdot \frac{ab^2-b^3}{2a^2} = \frac{a \cdot 2a \cdot (ab^2-b^3)}{b \cdot 3b \cdot 2a^2} = \frac{ab^2-b^3}{3b^2} = \frac{b^2(a-b)}{3b^2} = \frac{a-b}{3}; \\
 & \frac{a+2}{3} \cdot \frac{a+3}{4} = \frac{(a+2)(a+3)}{3 \cdot 4} = \frac{a^2+5a+6}{12}; \\
 & \frac{m-3}{5} \cdot \frac{m+7}{5} = \frac{(m-3)(m+7)}{5 \cdot 5} = \frac{m^2+4m-21}{25}; \\
 & \left(\frac{x}{10} - \frac{2}{5} \right) \cdot \left(\frac{x}{8} + \frac{1}{2} \right) = \frac{x \cdot x}{10 \cdot 8} - \frac{2 \cdot x}{5 \cdot 8} + \frac{x \cdot 1}{10 \cdot 2} - \frac{2 \cdot 1}{5 \cdot 2} = \frac{x^2}{80} - \frac{x}{20} + \frac{x}{20} - \frac{1}{5} = \frac{x^2}{80} - \frac{1}{5} = \frac{x^2-16}{80}; \\
 & \left(\frac{x}{4a} - \frac{y}{4} \right) \cdot \left(\frac{x}{5a} - \frac{y}{5} \right) = \frac{x^2}{20a^2} - \frac{xy}{20a} - \frac{xy}{20} + \frac{y^2}{20} = \frac{x^2}{20a^2} - \frac{xy}{10a} + \frac{y^2}{20} = \frac{x^2-2axy+a^2y^2}{20a^2};
 \end{aligned}$$

$$\begin{aligned}
 3. \quad & \frac{a+b}{7} \cdot \frac{a-b}{14} = \frac{a^2-b^2}{98}; \text{ valem: } (a+b)(a-b) = a^2-b^2; \\
 & \frac{m-n}{5} \cdot \frac{m+n}{16} = \frac{m^2-n^2}{80}; \\
 & \left(\frac{p}{6} - \frac{q}{2} \right) \left(\frac{p}{9} + \frac{q}{3} \right) = \frac{p^2}{54} - \frac{pq}{18} + \frac{pq}{18} - \frac{q^2}{6} = \frac{p^2}{54} - \frac{q^2}{6} = \frac{p^2-9q^2}{54}; \\
 & \frac{a^2+ab}{x} \cdot \frac{x^2+xy}{a} = \frac{a^2x^2+abx^2+a^3xy+abxy}{ax}; \\
 & \left(\frac{u^2}{4} - \frac{v^2}{2} \right) \left(\frac{u^2}{8} + \frac{v^2}{4} \right) = \frac{u^4}{32} - \frac{u^2v^2}{16} + \frac{u^2v^2}{16} - \frac{v^4}{8} = \frac{u^4}{32} - \frac{v^4}{8};
 \end{aligned}$$

$$\begin{aligned}
 1. \quad & \left(\frac{1}{2} \right)^2 = \frac{1^2}{2^2} = \frac{1}{4}; \quad 2. \quad \left(\frac{a}{2} \right)^2 = \frac{a}{2} \cdot \frac{a}{2} = \frac{a^2}{4}; \quad 3. \quad \left(\frac{x}{y} \right)^2 = \frac{x}{y} \cdot \frac{x}{y} = \frac{x^2}{y^2}; \\
 & \left(\frac{2}{3} \right)^2 = \frac{2^2}{3^2} = \frac{4}{9}; \quad \left(\frac{b}{6} \right)^2 = \frac{b}{6} \cdot \frac{b}{6} = \frac{b^2}{36}; \quad \left(\frac{m}{n} \right)^2 = \frac{m}{n} \cdot \frac{m}{n} = \frac{m^2}{n^2}; \\
 & \left(-\frac{3}{4} \right)^2 = \left(-\frac{3}{4} \right) \left(-\frac{3}{4} \right) = \frac{9}{16}; \quad \left(\frac{2x}{9} \right)^2 = \frac{2x}{9} \cdot \frac{2x}{9} = \frac{4x^2}{81}; \quad \left(-\frac{3x}{4y} \right)^2 = \left(-\frac{3x}{4y} \right) \left(-\frac{3x}{4y} \right) = \frac{9x^2}{16y^2}; \\
 & \left(\frac{1}{3} \right)^3 = \frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{3} = \frac{1}{27}; \quad \left(\frac{a}{2} \right)^3 = \frac{a}{2} \cdot \frac{a}{2} \cdot \frac{a}{2} = \frac{a^3}{8}; \quad \left(-\frac{10p}{3q} \right)^3 = \left(-\frac{10p}{3q} \right) \left(-\frac{10p}{3q} \right) \left(-\frac{10p}{3q} \right) = -\frac{1000p^3}{27q^3}; \\
 & \left(\frac{4}{5} \right)^3 = \frac{4}{5} \cdot \frac{4}{5} \cdot \frac{4}{5} = \frac{64}{125}; \quad \left(-\frac{3m}{4} \right)^3 = \left(-\frac{3m}{4} \right) \left(-\frac{3m}{4} \right) \left(-\frac{3m}{4} \right) = -\frac{27m^3}{64}; \quad \left(\frac{a^3}{3b} \right)^3 = \frac{a^3}{3b} \cdot \frac{a^3}{3b} \cdot \frac{a^3}{3b} = \frac{a^9}{27b^3}; \\
 4. \quad & \left(-\frac{5p^2}{6q^3} \right)^2 = \left(-\frac{5p^2}{6q^3} \right) \left(-\frac{5p^2}{6q^3} \right) = \frac{25p^4}{36q^6}; \quad 5. \quad \left(\frac{a+2}{2} \right)^2 = \frac{(a+2)(a+2)}{2 \cdot 2} = \frac{a^2+4a+4}{4}; \\
 & \left(\frac{3x^2}{10y^3} \right)^3 = \left(\frac{3x^2}{10y^3} \right) \left(\frac{3x^2}{10y^3} \right) \left(\frac{3x^2}{10y^3} \right) = \frac{27x^6}{1000y^9}; \quad \left(\frac{x-5}{10} \right)^2 = \frac{(x-5)(x-5)}{10 \cdot 10} = \frac{x^2-10x+25}{100}; \\
 & \left(-\frac{b^3}{6a^2} \right)^3 = \left(-\frac{b^3}{6a^2} \right) \left(-\frac{b^3}{6a^2} \right) \left(-\frac{b^3}{6a^2} \right) = -\frac{b^9}{216a^6}; \quad \left(\frac{3a-2b}{3} \right)^2 = \frac{(3a-2b)(3a-2b)}{3 \cdot 3} = \frac{9a^2-12ab+4b^2}{9}; \\
 & \left(\frac{a}{b} \right)^2 \cdot \left(\frac{b}{a} \right)^2 = \frac{a}{b} \cdot \frac{b}{a} \cdot \frac{a}{b} \cdot \frac{b}{a} = \frac{6}{a}; \quad \left(\frac{a+b}{4m} \right)^2 = \frac{(a+b)(a+b)}{4m \cdot 4m} = \frac{a^2+2ab+b^2}{16m^2}; \\
 & \left(\frac{7x}{3} \right)^3 \cdot \left(\frac{3x}{2} \right)^2 = \frac{7x}{3} \cdot \frac{7x}{3} \cdot \frac{7x}{3} \cdot \frac{3x}{2} \cdot \frac{3x}{2} = \frac{36x^6}{36} = x^6; \quad \left(\frac{5p-2q}{4q} \right)^2 = \frac{(5p-2q)(5p-2q)}{4q \cdot 4q} = \frac{25p^2-20pq+4q^2}{16q^2}; \\
 6. \quad & \left(\frac{x+1}{3} \right)^2 = \frac{(x+1)(x+1)}{27} = \frac{(x^2+2x+1)(x+1)}{27} = \frac{x^3+3x^2+3x+1}{27}; \\
 & \left(\frac{z-1}{2} \right)^3 = \frac{(z-1)(z-1)(z-1)}{2 \cdot 2 \cdot 2} = \frac{(z^2-2z+1)(z-1)}{2 \cdot 2 \cdot 2} = \frac{z^3-3z^2+3z-1}{8}; \\
 & \left(\frac{x+y}{4} \right)^3 = \frac{(x+y)(x+y)(x+y)}{4 \cdot 4 \cdot 4} = \frac{(x^2+2xy+y^2)(x+y)}{64} = \frac{x^3+3x^2y+3xy^2+y^3}{64}; \\
 & \left(\frac{2a-b}{a} \right)^3 = \frac{(2a-b)(2a-b)(2a-b)}{a \cdot a \cdot a} = \frac{8a^3-12a^2b+6ab^2-b^3}{a^3}; \\
 & \left(\frac{1}{a} + \frac{1}{b} \right)^3 = \left(\frac{1}{a} + \frac{1}{b} \right) \left(\frac{1}{a} + \frac{1}{b} \right) \left(\frac{1}{a} + \frac{1}{b} \right) = \frac{1}{a^3} + 3\frac{1}{a^2b} + 3\frac{1}{ab^2} + \frac{1}{b^3} \text{ ehv} \\
 & \left(\frac{1}{a} + \frac{1}{b} \right)^3 = \frac{(b+a)^3}{a^3b^3} = \frac{b^3+3b^2a+3ba^2+a^3}{a^3b^3};
 \end{aligned}$$

Murdude jagamine.

$$\begin{aligned}
 1. \quad \frac{8}{9} : 3 &= \frac{8}{9 \cdot 3} = \frac{8}{27}; \\
 \frac{4}{7} : 11 &= \frac{4}{7 \cdot 11} = \frac{4}{77}; \\
 -\frac{12}{25} : 4 &= -\frac{12}{25 \cdot 4} = -\frac{3}{25}; \\
 \frac{8}{9} : 24 &= \frac{8}{9 \cdot 24} = \frac{1}{27}; \\
 3\frac{3}{4} : (-45) &= -\frac{15}{4 \cdot 45} = -\frac{1}{12};
 \end{aligned}$$

$$\begin{aligned}
 3. \quad 2\frac{1}{4} a : 3 &= \frac{9a}{4 \cdot 3} = \frac{3a}{4}; \\
 6\frac{1}{2} b^2 : 26 &= \frac{13b^2}{2 \cdot 26} = \frac{b^2}{4}; \\
 -3\frac{1}{3} xy : (-10) &= +\frac{10xy}{3 \cdot 10} = \frac{xy}{3}; \\
 4\frac{1}{6} x^2 y : 50 &= \frac{25x^2 y}{6 \cdot 50} = \frac{x^2 y}{12}; \\
 1\frac{1}{2} m^3 : 15 &= \frac{3m^3}{2 \cdot 15} = \frac{m^3}{10};
 \end{aligned}$$

$$\begin{aligned}
 5. \quad \frac{a}{b} : c &= \frac{a}{b \cdot c}; \\
 \frac{a^2}{b^2} : ab &= \frac{a^2}{b^2 \cdot ab} = \frac{a}{b^3}; \\
 \frac{16b}{a^2} : 4b^2 &= \frac{16b}{a^2 \cdot 4b^2} = \frac{4}{a^2 b}; \\
 (-\frac{p^2}{q}) : (-5p^3) &= +\frac{p^2}{5p^3} = \frac{1}{5p}; \\
 \frac{x^3}{y^2} : 2x^2 &= \frac{x^3}{y^2 \cdot 2x^2} = \frac{x}{2y^2};
 \end{aligned}$$

$$\begin{aligned}
 6. \quad 3\frac{3}{5} a^2 : 6b &= \frac{18a^2}{5 \cdot 6b} = \frac{3a^2}{5b}; \\
 4\frac{1}{5} ab : 28ab^2 &= \frac{21ab}{5 \cdot 28ab^2} = \frac{3a}{20b}; \\
 -\frac{57x^4 y^5}{11a^2} : 95x^3 z &= -\frac{57x^4 y^5}{11a^2 \cdot 95x^3 z} = -\frac{3x^2 y^5}{55a^2 z}; \\
 1\frac{2}{7} \frac{a^2 c}{b} : 6abc &= \frac{9a^2 c}{7 \cdot 6abc} = \frac{3a}{14b^2}; \\
 2\frac{1}{2} \frac{pq}{r} : 10pqr &= \frac{5pq}{2r \cdot 10pqr} = \frac{1}{4r^2};
 \end{aligned}$$

Murdude jagamine.

$$\begin{aligned}
 1. \quad 4 : \frac{3}{5} &= \frac{4 \cdot 5}{3} = \frac{20}{3} = 6\frac{2}{3}; \\
 12 : \frac{1}{7} &= \frac{12 \cdot 7}{1} = 84; \\
 36 : \frac{9}{16} &= \frac{36 \cdot 16}{9} = 64; \\
 15 : 2\frac{1}{2} &= \frac{15 \cdot 2}{5} = 6; \\
 26 : 4\frac{1}{3} &= \frac{26 \cdot 3}{13} = 6;
 \end{aligned}$$

$$\begin{aligned}
 3. \quad a : 2\frac{1}{2} &= \frac{a \cdot 2}{5} = \frac{2a}{5}; \\
 4x : 1\frac{1}{3} &= \frac{4x \cdot 3}{4} = 3x; \\
 18xy : 7\frac{1}{5} &= \frac{18xy \cdot 5}{7} = \frac{57xy}{7}; \\
 42a^2 b : 8\frac{2}{5} &= \frac{42a^2 b \cdot 5}{42} = 5a^2 b; \\
 64z^3 : 2\frac{2}{15} &= \frac{64z^3 \cdot 15}{32} = 30z^3;
 \end{aligned}$$

$$\begin{aligned}
 5. \quad x : \frac{y}{2} &= \frac{x \cdot 2}{y}; \\
 5p : \frac{15p}{16r} &= \frac{5p \cdot 16r}{15p} = \frac{16r}{3}; \\
 35a^2 : \frac{7a}{5b} &= \frac{35a^2 \cdot 5b}{7a} = 25ab; \\
 m^2 n : \frac{m}{n} &= \frac{m^2 n \cdot n}{m} = mn^2; \\
 12pq^3 : \frac{8pq}{r} &= \frac{12pq^3 \cdot r}{8pq} = \frac{3q^2 r}{2};
 \end{aligned}$$

$$\begin{aligned}
 6. \quad a^2 : 1\frac{1}{4} a &= \frac{a^2 \cdot 4}{5a} = \frac{4a}{5}; \\
 3x : 4\frac{1}{2} x^2 &= \frac{3x \cdot 2}{9x^2} = \frac{2}{3x}; \\
 27a^2 b : 2\frac{1}{4} ab^2 &= \frac{27a^2 b \cdot 4}{9ab^2} = \frac{12a}{b}; \\
 45a : 3\frac{3}{4} b &= \frac{45a \cdot 4}{15b} = \frac{12a}{b}; \\
 1 : 1\frac{1}{2} x &= \frac{1 \cdot 2}{3x} = \frac{2}{3x};
 \end{aligned}$$

Murdude jagamine.

$$1. \frac{2}{3} : \frac{5}{7} = \frac{2 \cdot 7}{3 \cdot 5} = \frac{14}{15};$$

$$\frac{8}{9} : \frac{3}{4} = \frac{8 \cdot 4}{9 \cdot 3} = \frac{32}{27};$$

$$1\frac{1}{2} : \frac{2}{3} = \frac{3 \cdot 3}{2 \cdot 2} = \frac{9}{4};$$

$$\frac{4}{15} : \frac{8}{11} = \frac{4 \cdot 11}{15 \cdot 8} = \frac{11}{30};$$

$$1\frac{5}{27} : 1\frac{1}{15} = \frac{32 \cdot 15}{27 \cdot 16} = \frac{10}{9};$$

$$3. \frac{x}{5} : 2\frac{1}{3} = \frac{x \cdot 3}{5 \cdot 7} = \frac{3x}{35};$$

$$\frac{2a}{9} : 3\frac{1}{9} = \frac{2a \cdot 9}{9 \cdot 28} = \frac{a}{14};$$

$$2\frac{1}{10}a^2 : 1\frac{2}{5} = \frac{21a^2 \cdot 5}{10 \cdot 7} = \frac{3a^2}{2};$$

$$3\frac{1}{3}u : 6\frac{2}{3} = \frac{10u \cdot 3}{3 \cdot 20} = \frac{u}{2};$$

$$6\frac{2}{5}v^3 : 4\frac{2}{3} = \frac{20v^3 \cdot 3}{5 \cdot 14} = 4v^3;$$

$$5. \frac{a}{b} : \frac{c}{d} = \frac{ad}{bc};$$

$$\frac{a}{b} : \frac{a}{b} = \frac{ab}{ba} = 1;$$

$$\frac{2a}{3b} : \frac{8a}{21b} = \frac{2a \cdot 21b}{3b \cdot 8a} = \frac{7}{4};$$

$$\frac{m^3}{n^2} : \frac{m}{n} = \frac{m^3 \cdot n}{n^2 \cdot m} = \frac{m}{n};$$

$$\frac{3x^2}{2y^2} : \frac{2x}{3y} = \frac{3x^2 \cdot 3y}{2y^2 \cdot 2x} = \frac{9x}{4y};$$

$$2. \frac{a}{2} : \frac{2}{3} = \frac{a \cdot 3}{2 \cdot 2} = \frac{3a}{4};$$

$$\frac{6x}{7} : \frac{5}{12} = \frac{6x \cdot 12}{7 \cdot 5} = \frac{72x}{35};$$

$$\frac{p}{4} : \frac{3}{5} = \frac{p \cdot 5}{4 \cdot 3} = \frac{5p}{12};$$

$$\frac{3s}{8} : \frac{9t}{16} = \frac{3s \cdot 16}{8 \cdot 9t} = \frac{2s}{3t};$$

$$\frac{3m}{4} : \frac{n}{4} = \frac{3m \cdot 4}{4 \cdot n} = \frac{3m}{n};$$

$$4. \frac{a^2}{3} : \frac{a}{6} = \frac{a^2 \cdot 6}{3 \cdot a} = 2a;$$

$$\frac{x}{8} : \frac{x^2}{4} = \frac{x \cdot 4}{8 \cdot x^2} = \frac{1}{2x};$$

$$\frac{3q^2}{4} : \frac{16q}{15} = \frac{3q^2 \cdot 15}{4 \cdot 16q} = \frac{45q}{64};$$

$$\frac{18p}{5} : \frac{27p^3}{35} = \frac{18p \cdot 35}{5 \cdot 27p^3} = \frac{2 \cdot 7}{3p^2} = \frac{14}{3p^2};$$

$$\frac{m^2}{2} : \frac{m^2}{10} = \frac{m^2 \cdot 10}{2 \cdot m^2} = 5;$$

$$6. \frac{a^2}{b^2} : \frac{a}{b} = \frac{a^2 \cdot b}{b^2 \cdot a} = \frac{a}{b};$$

$$\frac{a^2}{b^2} : \frac{a}{b} = \frac{a^2 \cdot b}{b^2 \cdot a} = \frac{a}{b};$$

$$\frac{a}{b} : \frac{1}{b} = \frac{a \cdot b}{b \cdot 1} = a;$$

$$\frac{2x}{3y} : \frac{2y}{3x} = \frac{2x \cdot 3x}{3y \cdot 2y} = \frac{x^2}{y^2};$$

$$\frac{x}{y} : \frac{x^2}{y^2} = \frac{x \cdot y^2}{y^2 \cdot x} = \frac{y}{x};$$

Murdude jagamine.

$$1. \frac{a+b}{2} : 2 = \frac{a+b}{2 \cdot 2} = \frac{a+b}{4};$$

$$\frac{4(x-2)}{5} : 4 = \frac{4(x-2)}{5 \cdot 4} = \frac{x-2}{5};$$

$$\frac{4(3m+4)}{9} : 24 = \frac{4(3m+4)}{9 \cdot 24} = \frac{3m+4}{54};$$

$$\frac{a(m+n)}{b} : a^2 = \frac{a(m+n)}{b \cdot a^2} = \frac{m+n}{ab};$$

$$\frac{7x(x+2y)}{y} : 35x = \frac{7x(x+2y)}{y \cdot 35x} = \frac{x+2y}{5y};$$

$$2. \frac{6p-9q}{10} : 3 = \frac{6p-9q}{10 \cdot 3} = \frac{2p-3q}{10};$$

$$\frac{8x^2+12y^2}{xy} : 16 = \frac{8x^2+12y^2}{xy \cdot 16} = \frac{4(2x^2+3y^2)}{16 \cdot xy} = \frac{2x^2+3y^2}{4xy};$$

$$\frac{mp+mq}{n} : 3m = \frac{mp+mq}{n \cdot 3m} = \frac{m(p+q)}{3mn} = \frac{p+q}{3n};$$

$$\frac{2a^2x+10a^2y}{7} : 4a = \frac{2a^2x+10a^2y}{7 \cdot 4a} = \frac{2a(ax+5ay)}{7 \cdot 4a} = \frac{ax+5ay}{14};$$

$$\frac{15xy+20xz}{3yz} : 10x^2 = \frac{15xy+20xz}{3yz \cdot 10x^2} = \frac{5x(3y+4z)}{10x^2 \cdot 3yz} = \frac{3y+4z}{2x \cdot 3yz} = \frac{3y+4z}{6xyz};$$

$$3. \frac{a+3}{4} : (b-2) = \frac{a+3}{4(b-2)} = \frac{a+3}{4b-8};$$

$$\frac{2(a+1)}{3} : 2(b+1) = \frac{2(a+1)}{3 \cdot 2(b+1)} = \frac{a+1}{3(b+1)};$$

$$\frac{3x-6}{5} : (3x+9) = \frac{3x-6}{5(3x+9)} = \frac{3(x-2)}{3(5x+15)} = \frac{x-2}{5x+15};$$

$$\frac{x^2+xy}{y} : (x^2-xy) = \frac{x^2+xy}{y(x^2-xy)} = \frac{(x^2+xy)(x^2-xy)}{y(x^2-xy)^2} = \frac{x^4-x^2y^2}{y(x^2-xy)^2};$$

$$\frac{m^3+mn^2}{n} : (m^2-mn) = \frac{m^3+mn^2}{n(m^2-mn)} = \frac{m(m^2+mn)}{n \cdot m(m-n)} = \frac{m^2+mn}{n(m-n)};$$

Murdude jagamine.

$$1. \frac{a+2}{3} : \frac{b+4}{6} = \frac{(a+2)6}{3 \cdot (b+4)} = \frac{2a+4}{b+4};$$

$$\frac{5(x-2)}{9} : \frac{5(x-3)}{2} = \frac{5(x-2) \cdot 2}{9 \cdot 5(x-3)} = \frac{2(x-2)}{9(x-3)} = \frac{2x-4}{9x-27};$$

$$\frac{4(a+2b)}{a} : \frac{12(a-3b)}{b} = \frac{4(a+2b) \cdot b}{12a(a-3b)} = \frac{b(a+2b)}{3a(a-3b)} = \frac{ab+2b^2}{3a^2-9ab};$$

$$\frac{3p-12}{8p} : \frac{24p-9}{5p} = \frac{(3p-12)5p}{8p(24p-9)} = \frac{5 \cdot 3(p-4)}{8 \cdot 3(8p-3)} = \frac{5p-20}{64p-24};$$

$$\frac{7x-14y}{9x} : \frac{5x+10y}{bx} = \frac{(7x-14y)bx}{9x(5x+10y)} = \frac{(7x-14y)2}{3(5x+10y)} = \frac{14x-28y}{15x+30y};$$

$$2. \frac{p-2}{3} : \frac{3(p-2)}{2} = \frac{(p-2)2}{9(p-2)} = \frac{2}{9};$$

$$\frac{a+b}{5} : \frac{2(a+b)}{3} = \frac{(a+b)3}{10(a+b)} = \frac{3}{10};$$

$$\frac{2a-4}{7} : \frac{3a-6}{8} = \frac{(2a-4)8}{(3a-6)7} = \frac{16a-32}{21a-42};$$

$$\frac{6a-9b}{a} : \frac{4a-6b}{b} = \frac{(6a-9b)b}{(4a-6b)a} = \frac{6ab-9b^2}{4a^2-6ab};$$

$$\frac{8n^2-12}{n} : \frac{10n^2-15}{2n} = \frac{(8n^2-12)2n}{(10n^2-15)n} = \frac{16n^2-24}{10n^2-15};$$

$$3. \frac{x^2+xy}{y} : \frac{xy+y^2}{x} = \frac{(x^2+xy)x}{(xy+y^2)y} = \frac{x^3+x^2y}{xy^2+y^3};$$

$$\frac{(a+b)(a-b)}{ab} : \frac{a-b}{b} = \frac{(a+b)(a-b) \cdot b}{ab(a-b)} = \frac{b(a+b)}{ab} = \frac{a+b}{a};$$

$$\frac{a^2-b^2}{4ab} : \frac{a+b}{2a} = \frac{(a^2-b^2)2a}{4ab(a+b)} = \frac{(a+b)(a-b)2a}{(a+b)4ab} = \frac{a-b}{2b};$$

$$\frac{(x+y)^2}{x} : \frac{x+y}{x} = \frac{(x+y)(x+y) \cdot x}{(x+y) \cdot x} = x+y;$$

$$\frac{x^2-2xy+y^2}{xy} : \frac{x-y}{y} = \frac{(x-y)(x-y) \cdot y}{xy \cdot (x-y)} = \frac{x-y}{x};$$

Murdude jagamine.

$$1. \frac{8u^2}{v^2} : \frac{4v}{3u} = \frac{8u^2 \cdot 3u}{v^2 \cdot 4v} = \frac{6u^3}{v^3};$$

$$\frac{4x^2y}{9uv^2} : \left(-\frac{2xy^2}{3uv^2} \right) = \frac{-4x^2y \cdot 3uv^2}{9uv^2 \cdot 2xy^2} = -\frac{2xv^2}{3vy^2};$$

$$-\frac{8x^3}{15an^2} : \left(-\frac{2x}{3an^2} \right) = \frac{8x^3 \cdot 3an^2}{15an^2 \cdot 2x} = \frac{4x^2n}{5};$$

$$-\frac{3ax^2}{7y^2} : \frac{4a^2x}{7y^2} = -\frac{3ax^2 \cdot 7y^2}{7y^2 \cdot 4a^2x} = -\frac{3x}{4a^2};$$

$$\frac{3a^2}{14x^2} : \left(-\frac{9a}{7x} \right) = -\frac{3a^2 \cdot 7x}{14x^2 \cdot 9a} = -\frac{a}{6x^2};$$

$$2. \frac{24a^2b^2}{3 \cdot 3x^2y^2} : \frac{36ab}{49xy} = -\frac{24a^2b^2 \cdot 49xy^2}{352x^2y^2 \cdot 36ab} = -\frac{14ab^2}{15xy};$$

$$\frac{40x^2}{5a^2y} : \frac{3a^2x}{4by^2} = \frac{40x^2 \cdot 4by^2}{5a^2y \cdot 3a^2x} = \frac{16b^2xy}{15a^4};$$

$$\frac{63ax^4}{416} : \frac{42a^3x^2}{416} = \frac{63ax^4}{416 \cdot 42a^3x^2} = \frac{3x^2}{82a^2};$$

$$-13 \frac{4}{5} a^4y^2 : \frac{23x^2y^2}{5} = -\frac{69 \cdot 4y^2 \cdot 5}{5 \cdot 23x^2y^2} = -\frac{3x^2}{5};$$

$$-6 \frac{1}{2} a^2 : 2 \frac{1}{2} ab = -\frac{25 \cdot a^2 \cdot 2}{4 \cdot 5 \cdot ab} = -\frac{5a}{2b};$$

$$K. \frac{7b}{8c} : \frac{2a}{3b} : \frac{6c}{49a} : 7a = \frac{7b \cdot 2a \cdot 6c \cdot 7a}{8c \cdot 3b \cdot 49a} = \frac{7 \cdot 2 \cdot 6 \cdot 7 \cdot a \cdot b \cdot c}{49 \cdot 3 \cdot 8 \cdot a \cdot b \cdot c} = \frac{1}{2};$$

$$-\frac{15b^2y}{4a^3x^2} : \frac{6a^2x}{25by^2} = -\frac{15b^2y \cdot 6a^2x}{4a^3x^2 \cdot 25by^2} = -\frac{18ba}{20xy^2} = -\frac{9ab}{10xy^2};$$

$$\frac{5x}{6ay} : \frac{8y}{5bx} = \frac{5x \cdot 5bx}{6ay \cdot 8y} = \frac{25bx^2+9ay^2}{24abxy};$$

$$\frac{3a+4b}{12b} : \frac{2b}{18a} = \frac{(3a+4b) \cdot 18a}{12b \cdot 18a} = \frac{9a^2+12ab-4ab+16b^2}{36ab} = \frac{9a^2+8ab+16b^2}{36ab};$$

$$\frac{60}{x} : \frac{2a}{x} : \frac{2a}{8} : \frac{15}{4} : \frac{13y}{5} = \frac{60x \cdot 30x \cdot 20x \cdot 15x \cdot 12x}{60} = \frac{73x}{60};$$

Murdude jagamine.

$$\begin{aligned}
 1. \quad \frac{3}{4} &= \frac{3 \cdot 9}{4 \cdot 9} = \frac{1}{12}; & 2. \quad \frac{a}{b} &= \frac{a}{2c}; & 3. \quad \frac{3}{4} &= \frac{3 \cdot 9}{4 \cdot 9} = \frac{27}{4}; \\
 \frac{10}{27} &= \frac{10}{27 \cdot 5} = \frac{2}{27}; & \frac{m}{n} &= \frac{m}{n \cdot m} = \frac{1}{n}; & \frac{-10}{5} &= \frac{-10 \cdot 5}{5 \cdot 5} = \frac{-50}{5}; \\
 \frac{-35}{25} &= \frac{-35}{25 \cdot 25} = \frac{-7}{125}; & \frac{m}{n} &= \frac{m}{n \cdot n} = \frac{m}{n^2}; & \frac{-14}{9} &= \frac{-14 \cdot 9}{9 \cdot 9} = \frac{-126}{9}; \\
 \frac{8}{27} &= \frac{8}{27 \cdot 16} = \frac{1}{54}; & \frac{48}{28} &= \frac{48}{3 \cdot 28} = \frac{2}{3}; & \frac{16}{8} &= \frac{16 \cdot 3}{8 \cdot 3} = \frac{24}{3}; \\
 \frac{-15}{8} &= \frac{-15}{8 \cdot 3} = \frac{-5}{8}; & \frac{54}{201} &= \frac{54}{6 \cdot 201} = \frac{-1}{24}; & \frac{8}{5} &= \frac{8 \cdot 5}{5 \cdot 5} = \frac{40}{5}; \\
 4. \quad \frac{a}{b} &= \frac{a \cdot c}{2}; & \frac{6}{5} &= \frac{6 \cdot 6}{5 \cdot 5} = \frac{36}{5}; & \frac{1}{a} &= \frac{1 \cdot a}{1} = a; \\
 \frac{m}{n} &= \frac{m \cdot n}{n} = m; & \frac{6}{5} &= \frac{6}{5 \cdot 6} = \frac{1}{5}; & \frac{a}{2} &= \frac{a \cdot 2}{2 \cdot 2} = \frac{a}{4}; \\
 \frac{-n}{m} &= \frac{n \cdot n}{m} = \frac{n^2}{m}; & \frac{25}{36} &= \frac{25 \cdot 35}{36} = \frac{875}{36}; & \frac{-b^2}{a} &= \frac{b^2 \cdot b}{a} = \frac{b^3}{a}; \\
 \frac{2}{4} &= \frac{2 \cdot 4}{4} = \frac{8}{4}; & \frac{25}{36} &= \frac{25 \cdot 35}{36 \cdot 35} = \frac{5}{252}; & \frac{b^2}{a} &= \frac{b^2 \cdot b}{a \cdot b} = \frac{b^3}{a}; \\
 \frac{-z^2}{a} &= \frac{z^2 \cdot a}{2} = \frac{z^2 a}{2}; & \frac{-1}{3} &= \frac{-1 \cdot 3}{1} = -3; & \frac{166}{a^2} &= \frac{-166}{a^2 \cdot 405} = \frac{-4}{a^2};
 \end{aligned}$$

Murdude jagamine.

$$\begin{aligned}
 1. \quad \frac{4}{9} &= \frac{4 \cdot 3}{9 \cdot 3} = \frac{2}{3}; & 2. \quad \frac{a}{b} &= \frac{a \cdot d}{b \cdot d}; & 3. \quad \frac{1}{3} &= \frac{5 \cdot 4}{3 \cdot 5} = \frac{4}{3}; \\
 \frac{7}{25} &= \frac{7 \cdot 15}{25 \cdot 15} = \frac{1}{10}; & \frac{a}{b} &= \frac{a \cdot e}{b \cdot a} = \frac{1}{b}; & \frac{1}{1} &= \frac{7 \cdot 4}{1 \cdot 4} = 7; \\
 \frac{16}{15} &= \frac{16 \cdot 45}{15 \cdot 45} = 6; & \frac{a}{b} &= \frac{a \cdot l}{b \cdot c} = \frac{a}{c}; & \frac{5}{6} &= \frac{9 \cdot 6}{6 \cdot 1} = 9; \\
 \frac{33}{64} &= \frac{33 \cdot 8}{64 \cdot 11} = \frac{3}{8}; & \frac{3x}{8y^2} &= \frac{3x \cdot 124}{8y^2 \cdot 52} = \frac{3x}{2y}; & \frac{5}{5} &= \frac{5}{5} = 1; \\
 4. \quad \frac{x - \frac{x}{3}}{2x} &= \frac{x}{2x} - \frac{\frac{x}{3}}{2x} = \frac{1}{2} - \frac{1}{6} = \frac{3}{6} - \frac{1}{6} = \frac{2}{6} = \frac{1}{3}; \\
 \frac{a + \frac{b}{c}}{c} &= \frac{a}{c} + \frac{\frac{b}{c}}{c} = \frac{a}{c} + \frac{b}{c^2} = \frac{ac}{c^2} + \frac{b}{c^2} = \frac{ac+b}{c^2}; \\
 \frac{a + \frac{bx}{c}}{cx} &= \frac{a \cdot cx}{cx} + \frac{bx \cdot cx}{c \cdot 1} = \frac{acx}{1} + \frac{bcx^2}{c} = \frac{ac^2x + bcx^2}{c}; \\
 \frac{2}{3p} - \frac{1}{2q} &= \frac{2 \cdot 6pq}{3p \cdot 5} - \frac{1 \cdot 6pq}{2q \cdot 5} = \frac{4q}{5} - \frac{3p}{5}; \\
 \frac{3}{10} + \frac{b}{30} &= \frac{3a}{30} + \frac{b}{30} = \frac{3a+b}{30} = \frac{(3a+b) \cdot 30}{6(3a+b)} = 5;
 \end{aligned}$$

Kordamine.

1. $\frac{a}{6} + \frac{1}{2}a + \frac{2a}{3} = \frac{a}{6} + \frac{3 \cdot 3a}{6} + \frac{4a}{6} = \frac{14a}{6} = \frac{7a}{3} = 2\frac{1}{3}a$;
 $\frac{6}{2}x^2 - \frac{8}{3}x^2 + \frac{3}{8}x^2 = \frac{54x^2 - 80x^2 + 3x^2}{24} = -\frac{23x^2}{24}$;
 $\frac{c}{ab} + \frac{a}{bc} + \frac{b}{ac} = \frac{c+a+b}{abc}$;
 $\left(\frac{5}{8x} + 7 \cdot \frac{1}{4x^2}\right) \cdot 2x = \left(\frac{5}{8x} + \frac{7}{4x^2}\right) \cdot 2x = \frac{5 \cdot x + 7 \cdot 2}{8x^2} \cdot 2x = \frac{5x + 14}{8x^2} \cdot 2x = \frac{5x^2 + 14x}{8x^2} = \frac{5x + 14}{8x}$;
 $\left(\frac{5a^2}{12b^2} + \frac{9a}{4b} - \frac{7}{8}\right) \cdot 6ab^2 = \frac{10a^2 + 54ab - 21b^2}{24b^2} \cdot 6ab^2 = \frac{10a^2 + 54ab - 21b^2}{4}$;
2. $12xyz \cdot \left(\frac{x}{2y} + \frac{y}{3z} - \frac{y}{4x}\right) = \frac{12xy \cdot x}{2y} + \frac{12xy \cdot y}{3z} - \frac{12xy \cdot y}{4x} = 6x^2 + 4xy^2 - 4xy^2$;
 $\left(\frac{2}{a} + \frac{3}{b}\right) \cdot \frac{ab}{6} = \frac{2ab}{a \cdot 6} + \frac{3ab}{b \cdot 6} = \frac{b}{3} + \frac{a}{2}$;
 $\left(\frac{1}{x} + \frac{1}{y}\right) \cdot \left(\frac{1}{x} - \frac{1}{y}\right) = \left(\frac{1}{x}\right)^2 - \left(\frac{1}{y}\right)^2 = \frac{1}{x^2} - \frac{1}{y^2}$;
 $(a+b)(a-b) : \frac{a+b}{5} = \frac{(a+b)(a-b) \cdot 5}{a+b} = (a-b) \cdot 5$;
 $(p^2 - q^2) : \frac{p+q}{6} = \frac{(p+q)(p-q) \cdot 6}{p+q} = 6(p-q)$;
3. $\left(\frac{1}{p} + \frac{1}{q}\right) : \left(\frac{1}{p} - \frac{1}{q}\right) = \left(\frac{1}{p} + \frac{1}{q}\right) : \left(\frac{1}{p} - \frac{1}{q}\right) = \frac{q+p}{pq} : \frac{q-p}{pq} = \frac{(q+p) \cdot pq}{(q-p) \cdot pq} = \frac{p+q}{q-p}$;
 $\left(x - \frac{1}{6y}\right) : \left(3x - \frac{1}{2y}\right) = \frac{(6xy-1) \cdot 2y}{6y \cdot (6xy-1)} = \frac{2y}{6y} = \frac{1}{3}$;
 $(6y-3) : \frac{2y-4}{3} = \frac{(6y-3) \cdot 3}{2y-4} = \frac{9y-9}{2y-4} = \frac{9(y-1)}{2(y-2)} = \frac{9}{2}$;
 $(a+5) : \frac{3a+15}{7} = \frac{(a+5) \cdot 7}{3(a+5)} = \frac{7}{3}$;
 $(8p-16q) : \frac{4p-8q}{4p-8q} = \frac{(8p-16q) \cdot r}{4p-8q} = \frac{2 \cdot (4p-8q) \cdot r}{4p-8q} = 2r$;
 $(a+b)^2 : \frac{a+b}{2} = \frac{(a+b)(a+b) \cdot 2}{a+b} = 2(a+b)$;

Arvutuste võrrandite juures kasutame tähtsustatud tegureid, mis on
 kogu alla võetud. Siin näitame, kuidas need tegurid
 kogu, mis on kogu, et näitame, et kogu võrrandite juures
 kogu, mis on kogu, et näitame, et kogu võrrandite juures
 kogu, mis on kogu, et näitame, et kogu võrrandite juures

Võrrandite lahendamine.

1. $\frac{4}{3} - \frac{3}{4} = 3$;
 $\frac{47-37}{12} = \frac{36}{12}$;
 $47-37=36$;
 $10=36$;
2. $\frac{3}{2} + \frac{2}{3} = 10$;
 $37+27=60$;
 $57=60$;
 $7=60$;
 $7=12$;
3. $\frac{5}{4} - \frac{3}{5} = \frac{5}{4}$;
 $57-47=5$;
 $7=5$;
4. $\frac{2}{3} + \frac{2}{3} = 3\frac{2}{3}$;
 $57+57=110$;
 $117=110$;
 $7=110$;
 $7=10$;
5. $\frac{3}{8} + \frac{2}{8} = 3,6$;
 $37+27=24,4$;
 $237=110,4$;
 $7=110,4$;
 $7=4,8$;
6. $\frac{3}{8} - \frac{2}{8} = 2$;
 $37-47=36$;
 $-7=36$;
 $7=-36$;
7. $\frac{1}{3} + \frac{3}{4} + \frac{6}{2} = 78$;
 $47+37+67=78 \cdot 12$;
 $137=78 \cdot 12$;
 $7=78 \cdot 12$;
 $7=72$;
8. $\frac{10}{3} + \frac{5}{6} + \frac{2}{5} = 9$;
 $107+57+27=270$;
 $277=270$;
 $7=270$;
 $7=10$;
9. $\frac{4}{3} - \frac{3}{4} = 1\frac{1}{6}$;
 $47-37=18-27$;
 $47-37+27=18$;
 $37=18$;
 $7=\frac{18}{3}=6$;
 $7=6$;
10. $\frac{2}{9} - \frac{3}{6} = 12 - \frac{2}{2}$;
 $27-37=12 \cdot 18-97$;
 $27-37+97=12 \cdot 18$;
 $87=12 \cdot 18$;
 $7=12 \cdot 18$;
 $7=3 \cdot 9=27$;
 $7=27$;
11. $\frac{6}{10} + \frac{15}{4} = \frac{2}{6} + \frac{2}{3} - 2\frac{1}{4}$;
 $67+157=107+27-15 \cdot 9$;
 $67+157-107-27=-15 \cdot 9$;
 $-97=-15 \cdot 9$;
 $97=15 \cdot 9$;
 $7=\frac{15 \cdot 9}{9}=15$;
 $7=15$;

Vörrandite lahendamine.

$$1. \frac{x+2}{3} = 2\frac{1}{3}$$

$$\frac{x+2}{3} = \frac{7}{3};$$

$$x+2=7;$$

$$x=7-2=5;$$

$$x=5;$$

$$4. \frac{3}{x+1} + \frac{2}{x+3} = \frac{6}{12}$$

$$3x+3+2x+2=72;$$

$$3x+2x=72-2-3;$$

$$5x=67;$$

$$x=\frac{67}{5}=13,4;$$

$$x=13,4=13\frac{2}{5};$$

$$7. \frac{3x}{15} + \frac{5}{7} = \frac{5x-5}{9}$$

$$6x+21-(15x-25)=25;$$

$$6x+21-15x+25=25;$$

$$6x-15x=25-25-21;$$

$$-9x=-21;$$

$$x=\frac{-21}{-9}=+\frac{7}{3}=2\frac{1}{3};$$

$$x=2\frac{1}{3};$$

$$10. \frac{6}{4} + \frac{7x+8}{5} = \frac{11x+5}{2} + \frac{7-13x}{6}$$

$$120+42x+48=165x+75+35-65x;$$

$$42x-165x+65x=75+35-120-48-120;$$

$$-58x=-58;$$

$$x=\frac{-58}{-58}=+1; \quad x=1;$$

$$2. \frac{2x-8}{6} = 2,6$$

$$2x-8=13,0;$$

$$2x=13+8;$$

$$2x=21;$$

$$x=\frac{21}{2}=10,5;$$

$$5. \frac{2x-2}{5} + \frac{1}{10} = \frac{5}{3,2}$$

$$2x-4+x+2=35;$$

$$2x+x=35+4-2;$$

$$3x=37;$$

$$x=\frac{37}{3}=12\frac{1}{3};$$

$$x=12\frac{1}{3};$$

$$3. \frac{2}{4x+10} = \frac{9}{14}$$

$$8x+20=9;$$

$$8x=9-20;$$

$$8x=-11;$$

$$x=\frac{-11}{8}=-1\frac{3}{8};$$

$$6. \frac{3x}{4} + \frac{2x}{6} = \frac{2x}{6}$$

$$3x+6-(2x-8)=22;$$

$$3x+6-2x+8=22;$$

$$3x-2x=22-8-6;$$

$$x=8;$$

$$9. \frac{4x+7}{12} = \frac{12x}{x-1}$$

$$4x+7=12x-14;$$

$$4x-12x=-14-7;$$

$$-8x=-21;$$

$$x=\frac{-21}{-8}=2\frac{5}{8};$$

$$x=2\frac{5}{8};$$

Vörrandite lahendamine.

$$1. \frac{16}{x} = 2$$

$$16=2x;$$

$$x=\frac{16}{2}=8;$$

$$x=8;$$

$$4. \frac{24}{5y} = 8$$

$$24=40y;$$

$$40y=24;$$

$$y=\frac{24}{40}=\frac{6}{10}=0,6=\frac{3}{5};$$

$$y=0,6=\frac{3}{5};$$

$$7. \frac{a}{y} = \frac{7}{6}$$

$$a=by;$$

$$y=\frac{a}{8};$$

$$10. \frac{12}{y} + 5 = 8$$

$$12+5y=8y;$$

$$12=8y-5y;$$

$$12=3y;$$

$$y=\frac{12}{3}=4; \quad y=4;$$

$$13. \frac{6x}{28} + \frac{25}{6y} = \frac{6x}{40,5}$$

$$168y+25=280y;$$

$$243y-168y=25;$$

$$75y=25;$$

$$y=\frac{25}{75}=\frac{1}{3};$$

$$y=\frac{1}{3};$$

$$2. \frac{15}{x} = 6$$

$$15=6x;$$

$$6x=15;$$

$$x=\frac{15}{6}=\frac{5}{2}=2,5;$$

$$x=2,5;$$

$$5. \frac{56}{3y} = 28$$

$$56=84y;$$

$$y=\frac{56}{84}=\frac{2}{3};$$

$$y=\frac{2}{3};$$

$$8. \frac{4a}{y} = 8b$$

$$4a=8by;$$

$$y=\frac{4a}{8b}=\frac{a}{2b};$$

$$11. \frac{y}{32} + \frac{27}{y} = \frac{y}{33}$$

$$32y+274=33y;$$

$$274=33y-32y;$$

$$y=274;$$

$$14. \frac{2}{a} + \frac{b}{y} = 3a$$

$$ay+b=3ay;$$

$$ay-3ay=-b;$$

$$3ay-ay=b;$$

$$y(3a-a)=b;$$

$$y=\frac{b}{3a-a}=\frac{b}{2a};$$

$$y=\frac{b}{2a};$$

$$3. \frac{9}{x} = 8$$

$$9=8x;$$

$$8x=9;$$

$$x=\frac{9}{8}=1\frac{1}{8};$$

$$x=1\frac{1}{8};$$

$$6. \frac{14x}{3,5} = \frac{7}{10x}$$

$$35x=7;$$

$$x=\frac{7}{35}=\frac{1}{5};$$

$$x=\frac{1}{5};$$

$$9. \frac{6y}{ay} = \frac{7b}{7b}$$

$$a=42by;$$

$$y=\frac{a}{42b};$$

$$12. \frac{y}{8} - \frac{18}{y} = -1$$

$$8y-18=-y;$$

$$8y+y=18;$$

$$9y=18; \quad y=\frac{18}{9}=2;$$

$$y=2;$$

$$15. \frac{6a}{6a} + \frac{b}{7y} = \frac{3a}{7y}$$

$$42ay+b=14ay;$$

$$42ay-14ay=b;$$

$$28ay=-b;$$

$$y=\frac{-b}{28a};$$

Ülesannete lahendamine võrrandite abil.

1. Kui suured on kolmnurga nurgad, kui üks nurk on $\frac{1}{4}$ teisest ja kolmas on $\frac{1}{12}$ teisest nurgast?

Kolmnurkade sisenurkade summa on 180° , olgu Π nurk x , siis I nurk on $\frac{1}{4}x$ ja III nurk on $\frac{x}{12}$; kõiki kolm nurka arvestades saame 180° : $\frac{1}{4}x + x + \frac{x}{12} = 180$; $3x + 12x + x = 180 \cdot 12$; $16x = 180 \cdot 12$; $x = 135$; Π nurk on 135° ; I nurk on $135^\circ \cdot \frac{1}{4} = 33.75^\circ$; III nurk on $135^\circ \cdot \frac{1}{12} = 11.25^\circ$.

2. Kolmnurga nurkadest on esimene $\frac{1}{2}$ kolmanda nurga ja 60° summast ja teine nurk on $\frac{1}{3}$ kolmanda nurga ja 120° summast. Leia kolmnurga nurgad!

Tähistame III -de nurga x -ga, siis I nurk on $\frac{1}{2}(x+60)$ ja II nurk on $\frac{1}{3}(x+120)$. Kõiki nurgad arvestades saame võrrandi: $\frac{1}{2}(x+60) + \frac{1}{3}(x+120) + x = 180$; $\frac{x}{2} + 30 + \frac{x}{3} + 40 + x = 180$; $3x + 180 + 2x + 240 + 6x = 1080$; $11x = 1080 - 420$; $11x = 660$; $x = 60^\circ$; III nurk on 60° ; II nurk on $60 + 120 = 180^\circ$; I nurk on $60 + 60 = 120^\circ$.

3. Kolmnurga üks nurk on $\frac{1}{2}$ teisest nurgast ja kolmas nurk on $\frac{1}{2}$ esimese ja teise nurga summast. Kui suured on kolmnurga nurgad?

Olgu II nurk x , siis I on $\frac{x}{2}$ ja III on $\frac{x+x}{2}$; teiste summa on 180° ; seega $x + \frac{x}{2} + \frac{x+x}{2} = 180$; $x + \frac{x}{2} + \frac{x}{2} + \frac{x}{2} = 180$; $4x + 2x + x = 4 \cdot 180$; $9x = 4 \cdot 180$; $x = 180 \cdot \frac{4}{9} = 80^\circ$; II nurk on 80° ; I nurk on $\frac{80}{2} = 40^\circ$; III nurk on $(80+40) \cdot 2 = 120^\circ$.

4. Kolmnurga üks külil on $\frac{1}{3}$ teisest küljest ja kolmas külil on $\frac{1}{4}$ esimese ja teise külje summast. Kolmnurga ümbermõõt on 45 m. Leia küljed!

Lei II külje x , siis I on $\frac{x}{3}$ ja III on $\frac{1}{4}(x + \frac{x}{3})$; kõiki külgede pikkused on 45 m; seame võrrandi: $x + \frac{x}{3} + \frac{1}{4}(x + \frac{x}{3}) = 45$; $x + \frac{x}{3} + \frac{1}{4}x + \frac{1}{12}x = 45$; $12x + 4x + 3x + x = 45 \cdot 12$; $20x = 45 \cdot 12$; $x = \frac{45 \cdot 12}{20} = 27$; II külje 27 m; I külje on $\frac{27}{3} = 9$ m; III külje on $45 - 27 - 9 = 9$ m.

Ülesannete lahendamine võrrandite abil.

1. Võrdhaarse kolmnurga tipunurk on $\frac{2}{5}$ alusnurgast. Leia kolmnurga nurgad!



aluse nurk algu x , siis $x + x + \frac{2x}{5} = 180$; $2x + \frac{2x}{5} = 180$; $10x + 2x = 180 \cdot 5$; $12x = 180 \cdot 5$; $x = \frac{180 \cdot 5}{12} = 15 \cdot 5 = 75^\circ$; aluse nurk on 75° ; tipunurk on $\frac{75 \cdot 2}{5} = 15 \cdot 2 = 30^\circ$;

2. Kolme murru summa on $1\frac{5}{19}$. Kolmas murd on 2 korda suurem esimese ja teise murru summast. Esimene murd on $\frac{3}{5}$ teisest. Leia need murrud!

Olgu II murd x , siis I murd on $\frac{3x}{5}$ ja III murd on $(x + \frac{3x}{5}) \cdot 2$; seega: $x + \frac{3x}{5} + (x + \frac{3x}{5}) \cdot 2 = 1\frac{5}{19}$; $x + \frac{3x}{5} + 2x + \frac{6x}{5} = \frac{24}{19}$; $5x + 3x + 10x + 6x = 24 \cdot 5$; $24x = 24 \cdot 5$; $x = \frac{24 \cdot 5}{19 \cdot 24} = \frac{5}{19}$; II murd on $\frac{5}{19}$; I murd on $\frac{3 \cdot 5}{5 \cdot 19} = \frac{3}{19}$; III murd on $(\frac{3}{19} + \frac{5}{19}) \cdot 2 = \frac{8 \cdot 2}{19} = \frac{16}{19}$.

3. Kolme arvu summa on $18\frac{1}{4}$. Teine arv on $\frac{3}{5}$ esimesest ja kolmas arv on $\frac{23}{18}$ teisest. Leia need arvud.

Tähistades I -s arvu x -ga, on teine arv $\frac{3}{5}x$ ja III arv on $\frac{23}{18}x$; $\frac{3 \cdot 25x}{18} = \frac{5 \cdot 23x}{6}$; kolme arvu summa on $18\frac{1}{4}$ ehk $\frac{73}{4}$; seega võime kirjutada: $x + \frac{3x}{5} + \frac{23x}{18} = \frac{73}{4}$; ühise nimetajaga on 60.

$60x + 12 \cdot 3x + 10 \cdot 23x = 73 \cdot 15$; $60x + 36x + 230x = 73 \cdot 15$; $416x = 73 \cdot 15$; $x = \frac{73 \cdot 15}{416} = \frac{15}{2} = 7\frac{1}{2}$;

I arv on $7\frac{1}{2}$; II arv on $\frac{15 \cdot 3}{2 \cdot 5} = 9 = 4\frac{1}{2}$; III arv on $\frac{7 \cdot 23}{2 \cdot 18} = \frac{25}{4} = 6\frac{1}{4}$; III arv on $6\frac{1}{4}$;

1. Kivi kaalub 3 kg ja veel veerand oma kaalust. Kui raske on kivi?

Kaubasaadetise netokaal on 43,75 kg. Taara on $\frac{1}{8}$ brutokaalust. Leia brutokaal!

3. Kauba müügist saadi 2 kr. kasu. Kauba ostuhind oli $\frac{9}{10}$ müügihinnast. Leia kauba ostuhind!

4. Kauba netokaal oli $8\frac{1}{2}$ korda suurem taarast. Brutokaal oli 399 kg. Leia taara!

5. Riide müügist saadi 26 kr. kahju. Kahju oli 5% ostuhinnast. Leia müügihind!

6. Jahu müügist saadi 18 kr. kahju. Kahju oli 5% müügihinnast. Leia ostuhind!

Liivi raskus olgu x kg. Et kivi kaalub $\frac{1}{4}$ rohkem kaalust ja veel 3 kg, siis liivi raskus $x = \frac{1}{4}x + 3$; $4x = x + 12$; $4x - x = 12$; $3x = 12$; $x = 12$; $3 = 4$; Kivi raskus on 4 kg.

Olgu brutokaal x kg, siis taara on $\frac{x}{8}$.
Brutto = taara + neto. $x = \frac{x}{8} + 43,75$;
 $8x = x + 43,75 \cdot 8$; $8x - x = 43,75 \cdot 8$; $7x = 350$;
 $x = \frac{350}{7} = 50$; $50 - 6,25 = 43,75$; 50 kg.

Müügihinna tähistame x ja, siis ostuhind on $\frac{9}{10}x$; ostuhind + kasu = müügihind. Seega
 $\frac{9}{10}x + 2 = x$; $2 = x - \frac{9}{10}x$; $2 = \frac{x}{10}$;
 $x = 2 \cdot \frac{10}{1} = 20$; ostuhind on $20 - 2 = 18$ krooni;
II. laosi: $\frac{9}{10}x + 2 = x$; $9x + 20 = 10x$; $20 = 10x - 9x = x$;
 $x = 20$; brutostuhind = $20 - 2 = 18$ kr.

Taara - x kg, neto - $8\frac{1}{2}x = \frac{17}{2}x$;
Taara + neto = brutokaal;
 $x + \frac{17}{2}x = 399$; $2x + 17x = 399 \cdot 2$;
 $19x = 399 \cdot 2$; $x = 399 \cdot 2 : 19 = 21 \cdot 2 = 42$; taara = 42 kg.

Olgu ostuhind x , siis 5% ostuhinnast on 26 krooni.
 $\frac{x \cdot 5}{100} = 26$; $\frac{x}{20} = 26$; $x = 26 \cdot 20 = 520$; ostuhind on 520 kr.
Müügihind on $520 - 26 = 494$ krooni.

Müügihind - x , siis kahju on 18 kr, mis on 5% x st;
 $\frac{x \cdot 5}{100} = 18$; $\frac{x}{20} = 18$; $x = 18 \cdot 20 = 360$;
ostuhind on müügihind + kahju, s.o.
 $360 + 18 = 378$ kr.

1. Veskitöölaine sai ühel kuul 25 tööpäeva eest töötasuks 42 kr. ja 100 kg rukkijahu. Teisel kuul ta sai 24 tööpäeva eest 45 kr. ja 60 kg rukkijahu. Kui kallilt oli hinnatud kilogramm rukkijahu?

2. Kaubaratvitaja võlgneb kahele äriks kokku 120 kr. Kuna tal ainult 46 kr. raha on, siis tasub ta selle rahaga poole oma võlast ühele äriks ja $\frac{1}{3}$ oma võlast teisele äriks. Kui palju võlgneb kaubaratvitaja kummalegi äriks?

3. Peremaine tahtis tasuda oma arved koloniaalkaupluses ja aiaviljaäris ning võitis selleks kaasa 25 kr. Kuna mõlemad arved olid suuremad, kui ta arvas, siis tasus ta selle rahaga $\frac{5}{6}$ arvest koloniaalkaupluses ja $\frac{2}{3}$ arvest aiaviljaäris. Kui suur oli kumbki arve, kui esimene oli teisest 3 krooni võrra suurem?

Olgu kg. rukkijahu hinnaks x senti, siis 25 tööpäeva eest ta sai $(4200 + 100x)$ senti, ja ühele päevale $\frac{4200 + 100x}{25}$ senti. Teisel kuul ta sai $(4500 + 60x)$ senti, ja päevale $\frac{4500 + 60x}{24}$ senti. Et päevade arv on sama, siis võime kirjutada:
 $\frac{4200 + 100x}{25} = \frac{4500 + 60x}{24}$; $4200 + 100x = 4500 + 60x$; $100x - 60x = 4500 - 4200$;
 $40x = 300$; $x = 7,5$ senti.
1 kg. rukkijahu maksva 7,5 senti.

I. äriks võlgneb x kr, teisele $120 - x$ kr.
I. äriks $\frac{x}{2}$ ja II. äriks $\frac{120 - x}{3}$ kr, ära, mis võlgneb on 46 kr. taara võlgneb:
 $\frac{x}{2} + \frac{120 - x}{3} = 46$; $3x + 240 - 2x = 46 \cdot 3$;
 $x = 276 - 240 = 36$; I. äriks võlgneb 36 kr.
II. äriks $120 - 36 = 84$ kr.

Olgu koloniaalkaupluses arve x kr, siis aiaviljaäris on arve $x - 3$, sest 3 krooni võrra väiksem. Peremaine tasus koloniaali $\frac{5}{6}x$ krooni ja aiaviljaäris $\frac{2}{3}(x - 3)$ krooni. Kokku 25 kr.
 $\frac{5}{6}x + \frac{2}{3}(x - 3) = 25$;
 $5x + 4(x - 3) = 150$; $5x + 4x - 12 = 150$;
 $9x = 150 + 12$; $9x = 162$;
 $x = \frac{162}{9} = 18$; koloniaalkaupluses arve oli 18 kr. ja aiaviljaäris arve oli $18 - 3 = 15$ kr.

1. Auto sõitis ühest linnast teise 6 tunniga. Tagasisõiduks kasutati 70 km võrra lühemat teed, mille kulgemiseks kulus 4 tundi. Kui suur on linnade kaugus teineteisest, kui sinna ja tagasi sõideti ühe ja sama keskmise kiirusega?

Olgu kahe linna vahemaa x km, siis tagasisõidu kiirusest oli $\frac{x}{6}$ km tunni; tagasisõidul tehti $x - 70$ km, ja see läbis 4 tunni. Olgu keskmise kiirusega $x - 70$. Et sinna ja tagasi sõideti ühe ja sama keskmise kiirusega, siis,

$$\frac{x}{6} = \frac{x - 70}{4}; 4x = 6x - 420;$$

$$420 = 6x - 4x; 2x = 420; x = \frac{420}{2} = 210 \text{ km.}$$

on kahe linna kaugus.

2. Auto sõitis ühest linnast teise 9 tunniga. Tagasisõiduks kasutati 10 km võrra pikemat teed, kuna tunnis sõideti 16 km võrra enam. Leia linnade kaugus teineteisest!

Linnade kaugus on x km, keskmise tagasisõidu kiirusest oli $\frac{x}{9}$ km tunni; tagasisõidul $\frac{x}{6}$ oli 16 km võrra. Et sinna ja tagasi tagasisõidul oleksid võrdsed, tuleb 16 lahutada tagasisõidu kiirusest. Saame $\frac{x}{9} = \frac{x}{6} - 16$; $2x = 3x - 288$; $x = 288$. Linnade kaugus on 288 km.

3. Auto kulges kahe linna vahemaal 5 tunniga. Tagasisõiduks kasutati 10 km võrra pikemat teed, mille kulgemiseks kulus ainult 4 tundi, kuna kiirust suurendati 10 km võrra tunnis. Leia linnade kaugus teineteisest!

Linnade kaugus on x km. Sinna sõidu keskmise tagasisõidu kiirusest oli $\frac{x}{5}$ km tunni. Tagasisõidul tehti 10 km võrra pikemat teed, kuna kiirust suurendati 10 km võrra tunnis. Saame $\frac{x}{5} = \frac{x + 10}{4}$, mis on $10 - 10 = 0$ km. võrra suurendati tagasisõidu kiirust. Et sinna ja tagasisõidu kiirused oleksid võrdsed, tuleb 10 lahutada tagasisõidu kiirusest 10. Saame võrrand:

$$\frac{x}{5} = \frac{x + 10}{4} - 10; 4x = 5x + 50 - 200; 4x - 5x = 50 - 200;$$

$$-x = -150; x = \frac{-150}{-1} = 150; \text{ linnade vahemaa on } \underline{150 \text{ km.}}$$

Võrrandite lahendamine
Võrrandite lahendamine

ÕPILASELE.

Paranda eksimused kohe, kui oled nad vastanud: kriipsuta puhtalt läbi valevastus, nõnda et ta ikkagi jääks loetavaks, ja kirjuta õige vastus tema kohale!

Eksimused õigekirjas ja Su enda avastatud matemaatilised vead märgi ühe kriipsuga, teiste poolt leitud matemaatilised vead märgi kahe kriipsuga! Töötulemuste tabelis loe valevastusteks ainult need, mis on märgitud kahe kriipsuga!

TÖÖTULEMUSTE TABEL.

a tähendab õigete vastuste arvu, b — nõutud vastuste arvu.

lk.	a	b	lk.	a	b	lk.	a	b	lk.	a	b
1			17			33			49		
2			18			34			50		
3			19			35			51		
4			20			36			52		
5			21			37			53		
6			22			38			54		
7			23			39			55		
8			24			40			56		
9			25			41			57		
10			26			42			58		
11			27			43			59		
12			28			44			60		
13			29			45			61		
14			30			46			62		
15			31			47			63		
16			32			48			64		
Kokku											

Üldse nõutud vastuseid

Üldse õiged vastused

— = %

Hind 30 senti.

ÕPILASELE.

Tähega „K“ märgitud leheküljed või nende osad on määratud varem õpitu kordamiseks. Kordamisülesannete ees seisavad neljakohalised arvud, mis aitavad leida harjutusvihikutes neid kohti, kus veel leidub samalaadilisi ülesandeid: neis arvudes esimene number vasemalt tähendab klassi, teine number — harjutusvihikut ja kolmas-neljas number — lehekülge. Näiteks kordamisülesanne 2143 kuulub sisult II klassi 1. harjutusvihiku 43. leheküljele.

Kui sa eksid kordamisülesande lahendamisel, siis lahenda harjutamiseks uuesti kõik ülesanded, mis leiduvad tolle leheküljel, mille number seisab kordamisülesande juures!

Hoi a see vihik heas korras alles:

Sa vajad teda veel!

