

Summanden

3 + 4 = 7

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Addition

↑  
Summe

$$\begin{array}{r} 23,4 \\ + 8,2 \\ \hline 31,6 \end{array}$$

$$5 - 3 = 2$$

Subtraktion

Differenz

Faktoren

$$3 \cdot 4 = 12$$

Multiplikation

Produkt

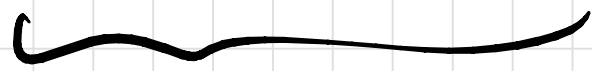
$$\underline{\underline{1,2}} \cdot \underline{\underline{3,4}}$$

$$\begin{array}{r} 360 \\ \text{A} 48 \\ \hline \end{array}$$

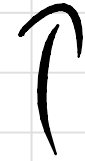
$$\underline{\underline{4,08}}$$

$$12 : 4 = 3$$

Zähler      Nenner



Division



Quotient

$$= \frac{12}{4} \text{ Bruch}$$

$$\underbrace{0 : 3} = \underbrace{0}$$

$$3 : 0 = \downarrow$$

Angenommen, es gäbe  $x$  mit:

$$\frac{3}{0} = x$$

$$\Rightarrow \cancel{0} \cdot \frac{3}{\cancel{0}} = 0 \cdot x$$

$$\Rightarrow 3 = \boxed{0 \cdot x} = 0 \quad \downarrow$$



$$\begin{array}{c} 2 \cdot 3 + 4 \\ \underbrace{\quad\quad\quad}_{6} \\ \underbrace{\quad\quad\quad\quad\quad\quad}_{10} \end{array}$$

$$\begin{array}{c} 2 \cdot (3 + 4) \\ \underbrace{\quad\quad\quad}_{7} \\ \underbrace{\quad\quad\quad\quad\quad}_{14} \end{array}$$

~~midit:~~

$$\begin{array}{c} \del{2 \cdot 3 + 4} \\ \del{\underbrace{\quad\quad\quad}_{6}} \\ \del{\underbrace{\quad\quad\quad\quad\quad\quad}_{7}} \\ \del{14} \end{array}$$

$$\left( (a \cdot 4 + b) \cdot x + 7 \right) \cdot 3$$

ausmultiplizieren

$$\begin{aligned} & \overset{44}{(11 \cdot 4 + 13)} \cdot 7 = 44 \cdot 7 + 13 \cdot 7 \\ & \underline{\underline{(a \cdot 4 + b)}} \cdot \underline{\underline{x}} = \underline{\underline{a \cdot 4 \cdot x}} + \underline{\underline{bx}} \end{aligned}$$

$$= (a \cdot 4 \cdot x + bx + 7) \cdot 3$$

$$= \underbrace{a \cdot 4 \cdot x \cdot 3}_{12ax} + bx \cdot 3 + \underbrace{7 \cdot 3}_{21}$$

$$5 \cdot 4 \cdot 7 \cdot 3 = \underbrace{4 \cdot 3}_{12} \cdot 5 \cdot 7$$

# Binomische Formeln

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

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

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

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

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

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

$$(-3€) \cdot 3 = -9€$$

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$$\underbrace{(-3) \cdot (-3)}_{???,} + \underbrace{(-3) \cdot 3}_{-9} = -3 \cdot \underbrace{(-3+3)}_0 = 0$$

$$\Rightarrow \quad ??.? \quad - 9 = 0$$

$$\Rightarrow \quad ??.? = 9$$

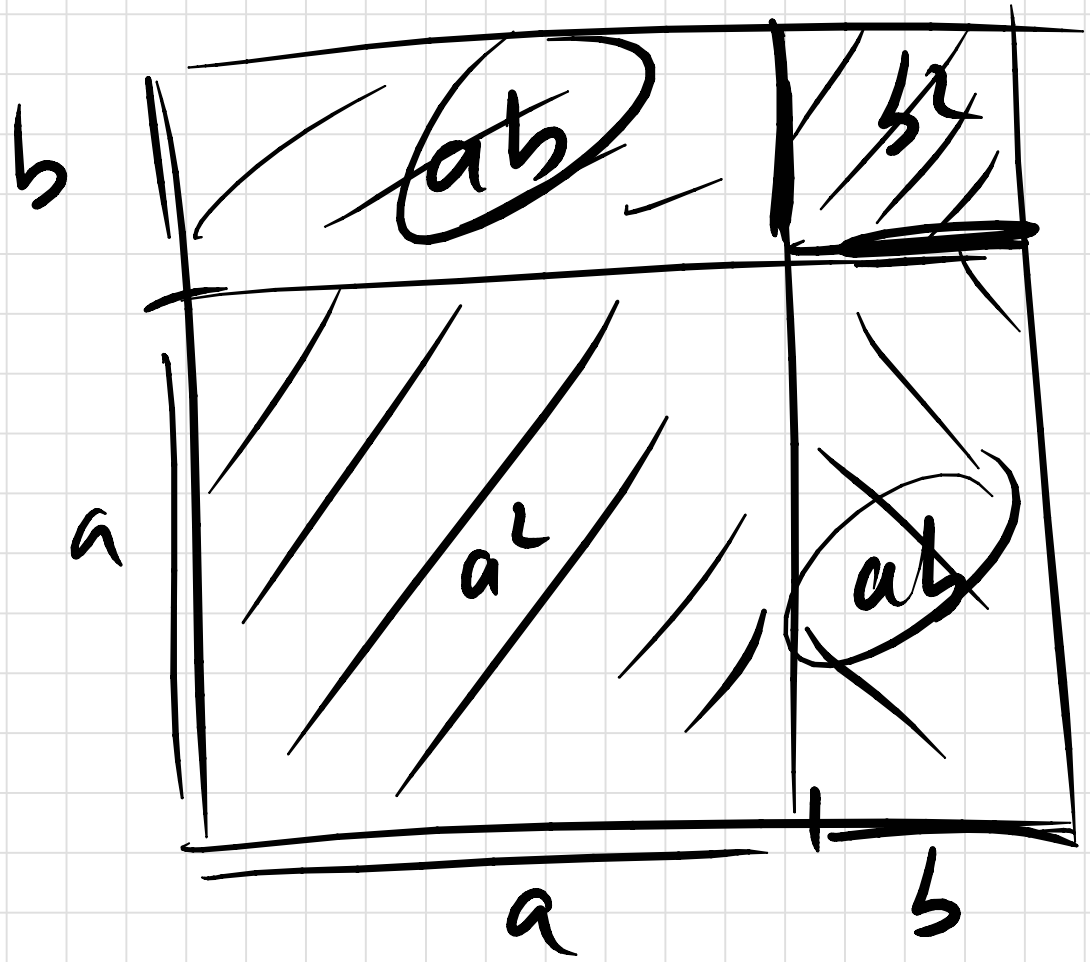
$$(a+b)^3 = (a+b)(a+b)(a+b)$$
$$= a^3 + 3a^2b + 3ab^2 + b^3$$

$$(a+b)^2$$

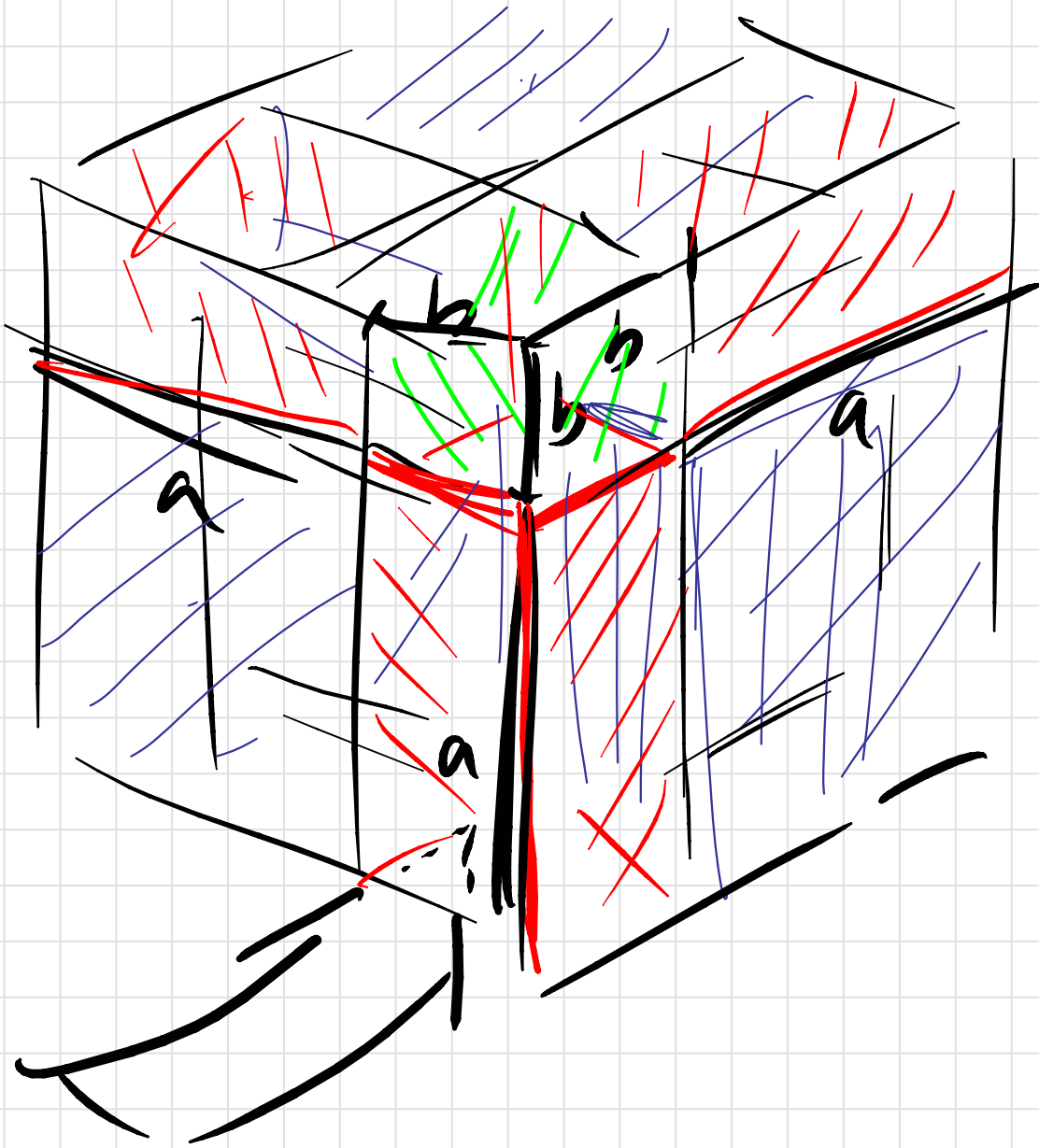
||

Gesamtfläche

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







Volumen.

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

$$a^3$$

$$+ 3a^2b$$

$$+ 3ab^2$$

$$+ b^3$$

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

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

$$= \underbrace{a \cdot a}_{a^2} + \underbrace{ba - ab}_0 - \underbrace{bb}_{b^2}$$

$$= a^2 - b^2$$

Brotche

$$\frac{3}{4} = 3 : 4$$

$$\begin{aligned}\frac{15}{4} &= 15 : 4 = 3 + \frac{3}{4} = 3\frac{3}{4} \\ &= 3,75\end{aligned}$$

$$15 : 4 = \boxed{3} \text{ Rest } \boxed{3}$$
$$\begin{array}{r} 12 \\ \hline 3 \end{array}$$

$$120 : 11 = 10 \text{ Rest } 10$$
$$\begin{array}{r} 11 \\ \hline 10 \end{array}$$

$$119 : 11 = \textcircled{10} \text{ Rest } 9$$
$$\begin{array}{r} 11 \\ \hline 09 \end{array}$$

$$\frac{\Gamma_{09}}{m} = \frac{1}{10} \frac{g^{\downarrow}}{m}$$

$$\frac{7}{11} = \frac{21}{33}$$

Arrows indicate the multiplication of both numerator and denominator by 3.

Erweitern

$$\frac{140}{210} = \frac{14}{21} = \frac{2}{3}$$

Arrows indicate the simplification steps: dividing 140 and 210 by 10 to get 14/21, and then dividing 14 and 21 by 7 to get 2/3.

Kürzen

$$\frac{7a}{21} = \frac{a}{3}$$

$$\frac{21 \pm 7a}{14} = \frac{\cancel{7} (3 \pm a)}{\cancel{14} 2}$$



$$\frac{5}{3} \cdot \textcircled{11} = \frac{5 \cdot \textcircled{11}}{3} = \frac{55}{3}$$

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$$\frac{5}{3} \cdot \frac{7}{8} = \frac{5 \cdot 7}{3 \cdot 8}$$

$$(5:3) \cdot (7:8) = \left(5 \cdot \frac{1}{3}\right) \cdot \left(7 \cdot \frac{1}{8}\right)$$

$$= 5 \cdot 7 \cdot \frac{1}{3} \cdot \frac{1}{8} = 5 \cdot 7 \cdot \frac{1}{3 \cdot 8}$$

$$= \frac{5.7}{3.8}$$

$$3 : \frac{4}{1000} = 3000$$

$$= \frac{3}{\frac{4}{1000}} = \frac{3 \cdot 1000}{4}$$

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$$(4 : 7) : (9 : 13)$$

$$= \frac{\frac{4}{7}}{\frac{9}{13}} = \frac{4}{7} \cdot \frac{13}{9}$$

$$= \frac{4.13}{7.9}$$

$$\frac{3}{4} + \frac{5}{7} = \frac{21}{28} + \frac{20}{28}$$

Haupt-  
nenner

$$= \frac{21+20}{28} = \frac{41}{28}$$

$$\frac{3}{4} + \frac{5}{1+a} = \frac{3+3a}{4+4a} + \frac{20}{4+4a}$$

Diagram illustrating the common denominator process:

- An arrow from the denominator  $4$  of  $\frac{3}{4}$  to the denominator  $4+4a$  of  $\frac{3+3a}{4+4a}$  is labeled  $\cdot(1+a)$ .
- An arrow from the denominator  $1+a$  of  $\frac{5}{1+a}$  to the denominator  $4+4a$  of  $\frac{20}{4+4a}$  is labeled  $\cdot 4$ .

$$= \frac{3+3a + 20}{4+4a}$$

$$= \frac{23+3a}{4+4a}$$

# Dezimalbrüche

$$23,456 = 23 \frac{456}{1000}$$

$$23,4 = 23 \frac{4}{10}$$

$$23,45 = 23 \frac{45}{100}$$

$$\frac{10}{7} = 1,42857142852\dots$$
$$= 1,\overline{428571}$$

$$10 : 7 = 1,428 \dots$$
$$\begin{array}{r} 1237 \\ \hline 1280 \\ \hline 20 \\ 25 \\ \hline 560 \\ 560 \\ \hline 0 \end{array} \dots$$

$$\frac{123}{10} = 12,3$$

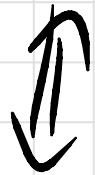


$$3 + x = 7 \quad || -3$$

$$\cancel{3} + x - \cancel{3}$$



$$= 7 - 3$$



$$x = 7 - 3 = 4$$

$$ab^2 + 98x - 5 = ab^2 + 3 \parallel + 5$$

$x = ?$

$$\begin{aligned} ab^2 + 98x - 5 + 5 &= ab^2 + 3 + 5 \\ &= ab^2 + 8 \end{aligned}$$

$$\cancel{ab^2} + 98x - \cancel{ab^2} = \cancel{ab^2} + 8 - \cancel{ab^2} \parallel - ab^2$$

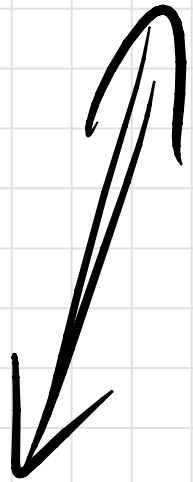
$$\Leftrightarrow 98 \times = 8 \quad // \quad : 98$$

$$\Leftrightarrow \frac{\cancel{98} \times}{\cancel{98}} = \frac{\cancel{8}^4}{\cancel{98}_{49}}$$

$$\Leftrightarrow \times = \frac{4}{49}$$

$$\frac{3}{x-2} = 7$$

$$D = \mathbb{R} \setminus \{2\}$$



x darf alles sein,  
aber nicht 2!

$$\cancel{\frac{3}{x-2}} (\cancel{x-2}) = 7(x-2)$$

$$\Leftrightarrow 3 = 7x - 14 \quad || + 14$$

$$\Leftrightarrow \underbrace{3+14}_{17} = 7x - \cancel{14+14}$$

$$\Leftrightarrow 17 = 7x \quad || : 7$$

$$\Leftrightarrow 17 : 7 = \cancel{7}x : \cancel{7} \quad || = \left\{ \frac{17}{7} \right\}$$

$$\Leftrightarrow x = \frac{17}{7}$$