

## Aufgaben zu Lineare Gleichungen

(aus Krüger/Pilz, Algebra für Wirtschaftsschulen)

Bestimme die Lösungen der folgenden Gleichungen in der Grundmenge  $\mathbb{Q}$ . Führe jeweils die Lösungskontrolle durch.

1. a)  $4x + 12 = 32$       b)  $16 - 5x = 1$       c)  $105 = x - 7$   
d)  $10 + x = 8$       e)  $3x + 2 = 12$       f)  $26 + 2x = 26$   
g)  $4x - 8 = 0$       h)  $x - \frac{1}{3} = \frac{1}{2}$       i)  $-5x + 2 = -17$
2. a)  $\frac{4x}{5} = 12$       b)  $\frac{7x}{10} = 3,5$       c)  $\frac{2}{3}x = 5,4$   
d)  $\frac{x+9}{10} = 1$       e)  $\frac{x}{4} + 2 = 6$       f)  $-3 = \frac{x}{2} + 5$   
g)  $\frac{x}{5} - \frac{1}{5} = \frac{4}{5}$       h)  $11\frac{1}{2} - \frac{x}{10} = 10$       i)  $5 + \frac{2}{3}x = -1$   
j)  $\frac{x}{3} + x = 4$       k)  $\frac{4x+15}{3} = 11$       l)  $\frac{45-3x}{12} = 3$
3. a)  $3x + 4 + 2x = 34$       b)  $5x + 4 = 3x + 12$   
c)  $19x - 15 = 33x + 7$       d)  $576 - 6x = 72 + 8x$   
e)  $x + 8 + 3x = 10 + 3x$       f)  $5x + 3 = x + 15 - 2x$   
g)  $14 + 3\frac{1}{3}x = 5\frac{3}{4}x - 15$       h)  $5,4x - 24,5 = 2,5x + 4,5$
4. a)  $8x - 29 + 13x - 4 = 7x + 28 - 5$       b)  $9x - 6 + 3x - 9 = -3x + 30$   
c)  $25x - 43 + 2x - 1 = 17x - 4$       d)  $13x + 5 - x + 1 = 14 - 12x + 4$   
e)  $x - \frac{2}{3}x - 14 = \frac{1}{4}x - 2$       f)  $\frac{1}{2}x + 18 - \frac{3}{4}x = \frac{1}{4}x - 12$
5. a)  $ax + bx = c$       b)  $ax + bx = a - b$       c)  $ax + b = bx + a$   
d)  $ax - x = b$       e)  $ax + bx - cx = 1$       f)  $ax - bx = a^2 - b^2$
6. a)  $11x + (10 + x) = 58$       b)  $35 - (x + 6) = 23$   
c)  $4(x - 3) - 1 = x + 11$       d)  $5(7x + 6) - 10 = 440$   
e)  $5(6x - 5) = 11(2x + 5)$       f)  $8(20 - 2x) + 5 = 37$
7. a)  $a(x - 1) - b = x - a$       b)  $2a - (a + b)x = x(a - b)$   
c)  $ax - (bx + c) = 0$       d)  $x(a + b) - x(a - b) = 4b$   
e)  $12ax - 3b(x - a) = 5a(2x + b)$       f)  $(a + b)x - (a - b)x - bx = a + c$
8. a)  $7 - [(2x + 9) + (6x - 3)] = 2x - 9$   
b)  $10 - [14x - (10 - 5x) - 73] = 20x - [90 - (38x - 68) + (9x + 21)]$   
c)  $30x - [10(x + 1) - 6(3x + 1) + 15(x - 2) + 6(x + 2)] = 150$   
d)  $14x = 18 \cdot (5x - 24) - [8 \cdot (42 - x) - 9(512 - 20x)]$   
e)  $2(a^2 + b^2) - [a(3a - x) - b(x - b)] = 0$

9. a)  $(x + 1)(x - 1) = (x - 2)(x + 3)$       b)  $(x - 1)(x - 2) = (x + 4)(x - 4)$   
 c)  $x(x - 4) = (x - 2)(x - 3)$       d)  $(x + 2)(x + 4) - 6 = (x + 1)(x + 4)$   
 e)  $(x + 1)(4x - 3) = 2(x + 1)(2x + 3)$       f)  $(x - 8)(3x + 4) = (3x - 7)(x + 4)$   
 g)  $(x + 3)(x + 5) - (x - 2)(x + 2) = 51$       h)  $(x + 0,5)(x - 3,2) = (x - 4,5)(x - 0,2)$

10. a)  $(x + 4)^2 - (x + 1)^2 = 5(x + 3)$       b)  $(x + 1)^2 = (x + 16)(x - 5)$   
 c)  $(x + 1)^2 + (x - 2)^2 = 2x^2 - 3$       d)  $(3x - 2)^2 + (2 + 4x)^2 = 25x^2 + 16$   
 e)  $(8 - 3x)^2 + (5 - 4x)^2 - 6 = (9 - 5x)^2 + 20x - 4$   
 f)  $(x + 2)^2 + (x + 3)^2 - (x + 5)^2 = (x - 2)^2 - 12$   
 g)  $(x + 12)(x - 7) + (x + 8)(x + 9) = x^2 + (x + 4)^2$

11. a)  $(a + b)(b - x) = (a - b)(b + x)$       b)  $(a - x)(x - b) = a^2 - x^2$   
 c)  $(a - x)(b - x) = x^2$       d)  $(a - b)(x - 1) = 2x(a - b) + 2(b - a)$   
 e)  $(2a + x)(2a - x) = 2a^2 - (2a + x)x$       f)  $(x - a)^2 = (b - x)^2$   
 g)  $(2x - a)(2x - 1) = 2 \cdot (2x^2 + ax - a^2)$       h)  $(a - x)(ab + x) = (a + x)(ab - x)$

12. a)  $\frac{x}{3} + \frac{x}{4} = 28$       b)  $\frac{x}{3} - \frac{x}{4} = 3$       c)  $\frac{x}{4} - \frac{x}{5} = 1$   
 d)  $\frac{x}{4} - \frac{x}{6} = 100$       e)  $\frac{2x}{5} - \frac{3x}{8} = \frac{3}{4}$       f)  $\frac{3x}{8} - \frac{2x}{4} = -5$

13. a)  $\frac{x}{6} - \frac{x}{2} = \frac{x}{9} - 12$       b)  $\frac{x}{3} + \frac{x}{4} + \frac{x}{5} + 13 = x$       c)  $\frac{7x - 6}{4} - 2x = -3$   
 d)  $3 + \frac{301 - 3x}{7} = \frac{2x}{3}$       e)  $\frac{3}{10} + \frac{5}{6}x = \frac{2}{5}x - 1$       f)  $\frac{x + 4}{6} - \frac{x}{10} = 2$

14. a)  $\frac{x - 1}{6} - \frac{x + 1}{10} = 1$       b)  $\frac{15x + 4}{8} = \frac{9x + 10}{5}$   
 c)  $\frac{7x - 1}{6} = \frac{5x - 3}{4}$       d)  $\frac{3 \cdot (13x - 2)}{4} = \frac{9 \cdot (2x + 6)}{5}$   
 e)  $\frac{2x - 7}{3} = 3 + \frac{5x - 1}{8}$       f)  $10 - \frac{3x - 1}{2} = \frac{6x + 3}{11}$

15. a)  $\frac{4x + 5}{5} - \frac{3x - 3}{4} = 2$       b)  $\frac{6x + 6}{7} - \frac{x - 3}{3} = 5$   
 c)  $\frac{3x + 4}{2} + \frac{15 - 5x}{5} = 3x$       d)  $\frac{x - 9}{5} + \frac{x - 12}{8} = \frac{x}{4}$   
 e)  $5x - \frac{17x - 6}{4} = \frac{11x + 24}{15}$       f)  $\frac{2x - 3}{3} + \frac{3x - 5}{5} = x - 1$

16. a)  $\frac{7x + 5}{8} + \frac{4x + 1}{3} = 7x - \frac{1 + 9x}{2}$       b)  $\frac{4x + 6}{5} + \frac{9x - 1}{4} = \frac{17 - 2x}{3} - \frac{7 - 3x}{4}$   
 c)  $\frac{5x + 1}{3} - \frac{3x + 4}{2} = \frac{4x - 1}{5} - \frac{6x + 4}{7}$       d)  $\frac{7x - 1}{5} + 3 = \frac{5x + 1}{8} + \frac{9x + 1}{7} + 1$   
 e)  $\frac{3x - 1}{4} + \frac{2x + 1}{5} - 1 = \frac{3x - 1}{5} + 6 - \frac{x + 2}{3}$       f)  $\frac{x + 5}{3} - \frac{x - 4}{2} = \frac{3x + 5}{7} - \left(\frac{x + 2}{3} - 1\right)$

$$17. \text{ a) } \frac{x}{a} + \frac{x}{b} + \frac{x}{c} = 1 \quad \text{b) } \frac{x}{a} + \frac{x}{b} = a + b \quad \text{c) } \frac{ax - bx}{c} = a^2 - b^2$$

$$\text{d) } 3b - \frac{3x}{a} = \frac{4x}{b} - 4a \quad \text{e) } \frac{3(x-a)}{b} - \frac{2(x-b)}{a} = 1 \quad \text{f) } \frac{a-x}{c} + b = \frac{bc+x}{c}$$

$$\text{g) } \frac{a-bx}{b} = \frac{ax-b}{a} \quad \text{h) } \frac{a+x}{a} + \frac{x-b}{b} = \frac{1}{ab}$$

$$18. \text{ a) } \frac{5}{x} = 25 \quad \text{b) } \frac{5}{x} = \frac{2}{3} \quad \text{c) } \frac{16}{x} - \frac{1}{2} = \frac{1}{6}$$

$$\text{d) } \frac{2}{3} + \frac{5}{x} = \frac{3}{4} \quad \text{e) } \frac{6}{x} + \frac{9}{x} + \frac{15}{x} = 5 \quad \text{f) } \frac{6}{x} + 2 = \frac{36}{x} - 8$$

$$19. \text{ a) } \frac{50}{3x+1} = 5 \quad \text{b) } \frac{x+2}{x-1} = 2 \quad \text{c) } \frac{x}{x+1} = \frac{4}{5}$$

$$\text{d) } \frac{x-1}{x+1} = \frac{1}{3} \quad \text{e) } \frac{15}{3x} = \frac{8}{x+3} \quad \text{f) } \frac{3}{x-2} = \frac{6}{x+1}$$

$$\text{g) } \frac{8}{x-3} - \frac{6}{x-4} = 0 \quad \text{h) } \frac{5}{12x+1} = \frac{9}{24x-3} \quad \text{i) } \frac{33}{x+1} = \frac{88}{x+1} - 5$$

$$20. \text{ a) } \frac{a+b}{x} - \frac{a-b}{x} = b \quad \text{b) } \frac{a(x-1)}{x} = -a \quad \text{c) } \frac{x+a}{x-a} = b$$

$$\text{d) } \frac{1+x}{1-x} = \frac{a}{b} \quad \text{e) } \frac{1}{x} = \frac{1}{a} + \frac{1}{b} \quad \text{f) } \frac{1+x}{1-x} = \frac{1}{a}$$

$$\text{g) } \frac{a}{x} + b = a + \frac{b}{x} \quad \text{h) } \frac{a(b+x)}{a-x} = b \quad \text{i) } \frac{a}{a-x} = \frac{b}{b-x}$$

$$21. \text{ a) } \frac{2x+3}{x} - \frac{5x-3}{x^2} + \frac{2x^2-(x+6)}{x^3} = 2 \quad \text{b) } \frac{3}{x} + \frac{5}{x^2} - \frac{3}{x-1} = \frac{2}{(x-1)^2}$$

$$\text{c) } \frac{x}{x-6} = \frac{x-8}{x-11} \quad \text{d) } \frac{x-2}{x-6} = \frac{x}{x-5} \quad \text{e) } \frac{9-x}{10-x} = \frac{x-3}{x-1}$$

$$22. \text{ a) } \frac{x}{x-1} + \frac{1}{x} = 1 \quad \text{b) } \frac{5}{x} + \frac{3x}{x+1} = 3 \quad \text{c) } \frac{5x}{2x-2} - \frac{x}{3x-3} = 2$$

$$\text{d) } \frac{2x+3}{x-2} - \frac{x+7}{x-1} = 1 \quad \text{e) } \frac{3x-9}{x+1} + \frac{2x-4}{x-5} = 5 \quad \text{f) } \frac{5x+5}{5x-7} - 3 = \frac{10-4x}{2x-3}$$

$$23. \text{ a) } \frac{45}{x-2} - \frac{24}{x+1} = \frac{12(x+13)}{(x+1)(x-2)}$$

$$\text{b) } \frac{16}{x-3} - \frac{20}{x+3} = \frac{12x-4}{x^2-9}$$

$$\text{c) } \frac{x-1}{x-4} + \frac{x+3}{x+4} = \frac{2x^2-5}{x^2-16}$$

$$\text{d) } \frac{8}{x-3} - \frac{10}{x+3} = \frac{40}{x^2-9}$$

$$\text{e) } \frac{15}{x-1} - \frac{7}{x+1} = \frac{70}{x^2-1}$$

$$\text{f) } \frac{2x+60}{x^2-25} = \frac{6}{x+5} + \frac{7}{x-5}$$

$$24. \text{ a) } \frac{4}{x} - \frac{5}{x+4} = \frac{3}{x}$$

$$\text{b) } \frac{2}{x-1} + \frac{3}{x-2} = \frac{5}{x-3}$$

$$\text{c) } \frac{4}{x-10} + \frac{5}{x-11} = \frac{9}{x-9}$$

$$\text{d) } \frac{2}{2x-3} + \frac{5}{3x+6} = \frac{5}{x+2}$$

$$\text{e) } \frac{11}{x+3} = \frac{18}{x+1} - \frac{7}{x-1}$$

$$\text{f) } \frac{9}{x-5} - \frac{28}{35-7x} = \frac{5}{x-9}$$

$$25. \text{ a) } \frac{x-4}{x-1} + \frac{3x-5}{5x-5} = 2 - \frac{5x-1}{7x-7}$$

$$\text{ c) } \frac{3x+3}{4x-32} - 2 + \frac{x+1}{x-8} = \frac{3(x-1)}{2x-16}$$

$$\text{ b) } \frac{3x+2}{5x-10} - \frac{2x-1}{3x-6} + \frac{8x+2}{x-2} = 10$$

$$\text{ d) } \frac{3x-6}{x-2} + \frac{5x-1}{x-3} = \frac{8x-34}{x-6}$$

$$26. \text{ a) } \frac{1}{x-8} - \frac{1}{x-7} = \frac{1}{x-5} - \frac{1}{x-4}$$

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

$$\text{ b) } \frac{5}{x-8} - \frac{5}{x-5} = \frac{3}{x+3} - \frac{3}{x+8}$$

$$\text{ d) } \frac{x+1}{x} + \frac{x-3}{x-4} = \frac{x}{x-1} + \frac{x-2}{x-3}$$