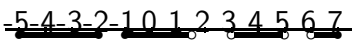
Wiskunde voor vrijescholen
Antwoorden Klas 9

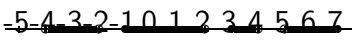
B.Geels

12 juli 2023

Ongelijkheden

1–1 **a.** $[-3,-1\rangle$ **b.** $\langle 0,1]$ **c.** $\langle 2,4\rangle$ **d.** $[5,7]$

1–2 

1–3 

1–4 **c.** $\{-2,-1,0,1,2,3\}$ **d.** $\{-1,0,1,2,3\}$

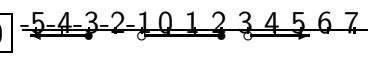
1–5 **b.** $\{0,1,2,3,4\}$; **c.** $\{-1,0,1,2,3,4\}$ **d.** $\{-1\frac{1}{2},\frac{2}{3},3\frac{1}{3}\}$

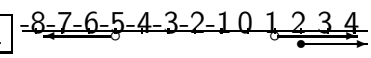
1–6 **a.** $\{-1,0,1\}$ **b.** $\{7\}$ **c.** geen **d.** $\{-1,0\}$ **e.** $\{-5,-4,-3,-2\}$ **f.** $\{6,7,8,9,10\}$

1–7 $[70,120]$

1–8 $[90,110]$

1–9 **a.** $\{0,1,2,3\}$ **b.** $\{-2,-1,0,1,2,3\}$ **c.** $\{1\frac{1}{2},-\frac{1}{3},2\frac{3}{4}\}$

1–10 

1–11 

1–12 **a.** $[1,4]$ **b.** $[-1,2]$ **c.** $\langle 0,4\rangle$ **d.** $\langle 0,3\rangle$ **e.** $[-\frac{1}{3},1\frac{1}{2}]$ **f.** $[1,2]$

1–13 **a.** $[2,3\frac{1}{3}]$ **b.** $[-\frac{1}{2},\frac{1}{2}]$ **c.** $\langle 3,5\rangle$ **d.** $\emptyset$ **e.** $\emptyset$ **f.** $\langle 1,\rightarrow\rangle$

1–14 **a.** ja, A **c.** tussen 11 en 13 zijn A en B beide open.
d. $[12,13]$ **e.** $[9,11\rangle$ en $\langle 15,17]$

1–15 **a.** $[3,8\rangle$ **b.** $[10,13\rangle$ **c.** na dag 21, $[21,\rightarrow\rangle$

1–16 **a.** 48 km/uur **b.** $\langle 48,97]$ **c.** $\langle 72,112]$

1–17 **a.** $\langle -2,4\rangle$ **b.** $\mathbb{R}$ **c.** $\langle\leftarrow,3\rangle$ **d.** $[-1,\rightarrow\rangle$

1–18 **a.** $[1,2\rangle$ **b.** kan niet korter **c.** $\langle 0,1\rangle$ **d.** $\{1\}$ **e.** $\emptyset$ **f.** $\langle\leftarrow,3\rangle$

1–19

a. $[3\frac{1}{7}, 3\frac{1}{6}]$

b. $\emptyset$

c. $\emptyset$

d. $\langle -1\frac{6}{7}, -1\frac{5}{6}\rangle$

1–20

a. $\{3\}$

b. k.n.k of: $[1,5] \setminus \{3\}$

c. $[1,5]$

d. $[4,5\rangle$

e. $\emptyset$

f. $[-1, \rightarrow\rangle$

1–21

a $x \leqslant 2$; $x \in \langle \leftarrow, 2]$

b $x > 0$; $x \in \langle 0 \rightarrow\rangle$

c $x \leqslant 4$; $x \in \langle \leftarrow, 4]$

d $x > 6$; $x \in \langle 6 \rightarrow\rangle$

e $x > 4$; $x \in \langle 4 \rightarrow\rangle$

f $x < 4$; $x \in \langle \leftarrow, 4\rangle$

g $x \leqslant 0$; $x \in \langle \leftarrow, 0]$

h $x \leqslant 5$; $x \in \langle \leftarrow, 5]$

1–22

a $x < 1$; $x \in \langle \leftarrow, 1\rangle$

b $x \leqslant 6$; $x \in \langle \leftarrow, 6]$

c $x < -2$; $x \in \langle \leftarrow, -2\rangle$

d $x < 16$; $x \in \langle \leftarrow, 16\rangle$

e $x \geqslant 4$; $[4, \rightarrow\rangle$

f $x > 7$; $x \in \langle 7 \rightarrow\rangle$

1–23

a $x < 8$; $x \in \langle \leftarrow, 8\rangle$

b $x > 3$; $x \in \langle 3 \rightarrow\rangle$

c $x < 0$; $x \in \langle \leftarrow, 0\rangle$

d $x > -6$; $x \in \langle -6 \rightarrow\rangle$

e $x > -5$; $x \in \langle -5 \rightarrow\rangle$

f $x > -9$; $x \in \langle -9 \rightarrow\rangle$

1–24

a $x \geqslant 2$; $[2, \rightarrow\rangle$

b $x \geqslant 3$; $[3, \rightarrow\rangle$

c $x \leqslant -2$; $x \in \langle \leftarrow, -2]$

d $x < -4\frac{1}{2}$

e $x > 3$; $x \in \langle 3 \rightarrow\rangle$

f $x < 4\frac{1}{2}$

1–25

a $x \geqslant 2$; $[2, \rightarrow\rangle$

b $x \geqslant 0$; $[0, \rightarrow\rangle$

c $x \leqslant 2$; $x \in \langle \leftarrow, 2]$

d $x \leqslant 3$; $x \in \langle \leftarrow, 3]$

e $x \leqslant 0$; $x \in \langle \leftarrow, 0]$

f $x \leqslant 3\frac{1}{4}$; $x \in \langle \leftarrow, 3\frac{1}{4}]$

1–26

a $x > 2$; $x \in \langle 2 \rightarrow\rangle$

b $x < 7$; $x \in \langle \leftarrow, 7\rangle$

c $x > 5$; $x \in \langle 5 \rightarrow\rangle$

d $x > -3$; $x \in \langle -3 \rightarrow\rangle$

e $x < -4$; $x \in \langle \leftarrow, -4\rangle$

f $x > -3$; $x \in \langle -3 \rightarrow\rangle$

1–27 **a** $x > -\frac{5}{2}$; $x \in \langle -\frac{5}{2} \rightarrow \rangle$
b $x < \frac{25}{2}$; $x \in \langle \leftarrow, \frac{25}{2} \rangle$
c $x > 0$; $x \in \langle 0 \rightarrow \rangle$
d $x \leqslant 4$; $x \in \langle \leftarrow, 4]$
e $x \in \mathbb{R}$
f $x \in \mathbb{R}$

1–28
a $x \in \emptyset$
b $x < -2$
c $x \geqslant -\frac{3}{2}$
d $x \leqslant \frac{4}{3}$; $x \in \langle \leftarrow, \frac{4}{3}]$
e $x \leqslant -\frac{5}{3}$
f voor elke x; $x \in \mathbb{R}$

1–29
a. $x < -6$; $x \in \langle \leftarrow, -6 \rangle$
b. $x > 9$; $x \in \langle 9 \rightarrow \rangle$
c. $x \geqslant -\frac{8}{3}$; $[-\frac{8}{3}, \rightarrow \rangle$
d. $x > \frac{11}{2}$; $x \in \langle \frac{11}{2} \rightarrow \rangle$
e. $x \leqslant 0$; $x \in \langle \leftarrow, 0]$
f. $x < -\frac{11}{2}$; $x \in \langle \leftarrow, -\frac{11}{2} \rangle$

1–30 **a.** $x > 12$; $x \in \langle 12 \rightarrow \rangle$
b. $x < \frac{3}{2}$; $x \in \langle \leftarrow, \frac{3}{2} \rangle$
c. $x < -\frac{69}{2}$; $x \in \langle \leftarrow, -\frac{69}{2} \rangle$
d. $x < 0$; $x \in \langle \leftarrow, 0 \rangle$

1–31 **a.** $x < 7$; $x \in \langle \leftarrow, 7 \rangle$
b. $x < \frac{5}{2}$; $x \in \langle \leftarrow, \frac{5}{2} \rangle$
c. $x < 2$; $x \in \langle \leftarrow, 2 \rangle$
d. $x > 1$; $x \in \langle 1 \rightarrow \rangle$

1–32
a $x > 6$; $x \in \langle 6 \rightarrow \rangle$
b $x < -\frac{5}{2}$; $x \in \langle \leftarrow, -\frac{5}{2} \rangle$
c $x > \frac{3}{2}$; $x \in \langle \frac{3}{2} \rightarrow \rangle$
d $x > -\frac{1}{2}$; $x \in \langle -\frac{1}{2} \rightarrow \rangle$
e $x > -5$; $x \in \langle -5 \rightarrow \rangle$
f $x < -\frac{3}{2}$; $x \in \langle \leftarrow, -\frac{3}{2} \rangle$

1–33
a $x \leqslant 5$
b $x \leqslant 5$
c $x \geqslant 4$
d $x < \frac{5}{2}$; $x \in \langle \leftarrow, \frac{5}{2} \rangle$
e $x \geqslant -3$
f $x > -4$; $x \in \langle -4 \rightarrow \rangle$

1–34 **a.** $x < 3$; $x \in \langle \leftarrow, 3 \rangle$
b. $x \leqslant -\frac{11}{2}$; $x \in \langle \leftarrow, -\frac{11}{2}]$
c. $x \leqslant 3$; $x \in \langle \leftarrow, 3]$
d. $x \leqslant -6$; $x \in \langle \leftarrow, -6]$
e. $x \geqslant 2$; $[2, \rightarrow \rangle$
f. $x \geqslant \frac{2}{3}$; $[\frac{2}{3}, \rightarrow \rangle$

1–35 **a.** $x \geqslant 0$
b. $x \leqslant 5$

1–36 **a.** $x \geqslant -2$ **b.** $x \in \mathbb{R}$ **c.** $a \leqslant 4$ **d.** $p \leqslant 4$ **e.** $z \leqslant \frac{5}{3}$ **f.** $k \geqslant -\frac{10}{3}$

1–37 **a.** $x < -2\frac{1}{2}$; $x \in \langle \leftarrow, -2\frac{1}{2} \rangle$ **b.** $x > 9$; $x \in \langle 9, \rightarrow \rangle$ **c.** $x \leqslant -2\frac{2}{5}$; $x \in \langle \leftarrow, -2\frac{2}{5}]$ **d.** $x \geqslant -6\frac{1}{4}$; $x \in [-6\frac{1}{4}, \rightarrow \rangle$ **e.** $x \leqslant -6$; $x \in \langle \leftarrow, -6]$ **f.** alle x

1–38 **a.** $4 < x < 6$ **b.** k.n. **c.** k.n. **d.** $-2 < x < 3$

1–39 **a.** $x \in \langle 3, 7 \rangle$ **b.** $x \in [4, \rightarrow \rangle$ **c.** $x \in \mathbb{R}$ **d.** $x \in \langle 3, \rightarrow \rangle$

1–40 **a.** $x \in \langle \leftarrow, -1 \rangle$ **b.** $x \in \emptyset$ **c.** $x \in \mathbb{R}$ **d.** $x \in \langle \leftarrow, -1 \rangle \cup \langle 2, \rightarrow \rangle$

1–41 **a.** $x \in \langle 0, 3 \rangle$ **b.** $x \in \langle \leftarrow, 7 \rangle$ **c.** $x \in \langle -3, \rightarrow \rangle$ **d.** $x \in \langle -1, 0 \rangle$

1–42 **a.** $x \in \langle 3, 5 \rangle$ **b.** $x \in [-5, -1 \rangle$ **c.** $x \in [0, 1 \rangle$ **d.** $x \in [-1\frac{1}{2}, -\frac{1}{2}]$

1–43 **a.** $x \in \langle \leftarrow, 1 \rangle$ **b.** $x \in \emptyset$ **c.** $x \in \langle 1\frac{1}{2}, 3\frac{1}{2} \rangle$

1–44 **a.** $x \in \langle 3, \rightarrow \rangle$ **b.** $x \in \langle 3, \rightarrow \rangle$ **c.** $x \in \langle -4, -\frac{3}{2} \rangle$

1–45 **a.** $x \in \emptyset$ **b.** $x \in \mathbb{R}$ **c.** $x \in \mathbb{R}$ **d.** $x \in \emptyset$

1–46 **a.** $x < -4 \vee x > 4$ **b.** $x \leqslant -3 \vee x \geqslant 3$ **c.** $-6 < x < 6$ **d.** $\emptyset$ **e.** $-2 \leqslant x \leqslant 2$ **f.** $\mathbb{R}$

1–47 **a.** $-10 < x < 10$ **b.** $x \leqslant -3 \vee x \geqslant 3$ **c.** $x \leqslant -\frac{1}{2} \vee x \geqslant \frac{1}{2}$ **d.** $x < -30 \vee x > 30$ **e.** $\emptyset$ **f.** $\emptyset$

1–48 **a.** $\emptyset$ **b.** $x \neq 0$ **c.** $x = 0$ **d.** $x \in \langle \leftarrow, -1\frac{2}{5} \rangle \cup \langle 4\frac{1}{5}, \rightarrow \rangle$ **e.** $\mathbb{R}$ **f.** $x \in \langle -5, 1 \rangle$

1–49

a $x \in \langle \leftarrow, -\frac{5}{12} \rangle \cup \langle -1\frac{1}{4}, \rightarrow \rangle$

b $x \in \langle -1\frac{1}{2}, 4\frac{1}{2} \rangle$

c $x \in [-12, 20]$

d $x \in \langle \leftarrow, -3] \cup [-\frac{1}{3} \rightarrow \rangle$

e $x \in \langle \leftarrow, 2\frac{1}{2} \rangle \cup \langle 4\frac{1}{2}, \rightarrow \rangle$

f $x \in \langle -\frac{12}{13}, \frac{2}{13} \rangle$

1–50

a. $x \in [-6, 10]$

b. $x \in \mathbb{R}$

c. $x \in \langle \leftarrow, -7] \cup [11, \rightarrow \rangle$

d. $x \in \langle 1\frac{1}{2}, 6\frac{1}{2} \rangle$

1–51

a. $\langle -3, 3 \rangle$

b. $[-10, 10]$

c. $\langle \leftarrow, -5] \cup [5, \rightarrow \rangle$

d. $\langle \leftarrow, -4 \rangle \cup \langle 4, \rightarrow \rangle$

e. $\langle -1, 1 \rangle$

f. $[-3, 3]$

1–52

a. $\mathbb{R}$

b. $\emptyset$

c. $\emptyset$

d. $\mathbb{R}$

e. $\mathbb{R}$

f. $[-2, 2]$

1–53

a. $\emptyset$

b. $x = 0$

c. $\mathbb{R}$

d. $x < 0 \vee x > 6,\ x \in \langle \leftarrow, 0 \rangle \cup \langle 6, \rightarrow \rangle$

e. $x \neq 0$

f. $1 \leqslant x \leqslant 5,\ x \in [1, 5]$

1–54

a. $x \in \emptyset$

b. $x \neq 6,\ x \in \langle \leftarrow, 6 \rangle \cup \langle 6, \rightarrow \rangle,\ x \in \mathbb{R} \setminus \{6\}$

c. $-1 < x < 7,\ x \in \langle -1, 7 \rangle$

d. $x \in \emptyset$

Irrationale getallen

2–1

a. 4

b. 0,7

c. 10

d. 0,8

e. 12

f. $\frac{1}{2}$

g. 13

h. $\frac{2}{3}$

2–2

a. $4 + 3 = 7$

b. $13 - 12 = 1$

c. $5 - 2 = 3$

d. $10 - 11 = -1$

2–3

a. -2

b. 10

c. -9

d. 1

e. 10

f. 4

2–4

a. 6

b. 4

c. -2

d. 0

2–5 **a.** 5 **b.** 5 **c.** 7 **d.** 20 **e.** 6 **f.** 10

2–6 **a.** 2 **b.** 6 **c.** k.n. **d.** -6 **e.** 0 **f.** 1 **g.** k.n. **h.** -1

2–7 **a.** -3 **b.** -2 **c.** k.n. **d.** 10 **e.** 2 **f.** -10

2–8 **a.** $\frac{2}{3}$ **b.** $\frac{9}{2}$ **c.** $\frac{1}{6}$ **d.** $\frac{5}{4}$ **e.** k.n. **f.** $\frac{8}{9}$ **g.** $-\frac{1}{2}$ **h.** $\frac{7}{5}$

2–9 **a.** $\frac{3}{2}$ **b.** $\frac{6}{5}$ **c.** $\frac{5}{2}$ **d.** $\frac{10}{3}$ **e.** $\frac{4}{3}$ **f.** $\frac{9}{2}$ **g.** $\frac{7}{3}$ **h.** $\frac{7}{4}$

2–10 **a.** $\frac{2}{5}$ **b.** $\frac{1}{4}$ **c.** $\frac{3}{2}$ **d.** $\frac{1}{2}$

2–11 **a.** 144 **b.** 0,01 **c.** 1,44 **d.** 0,49 **e.** 441 **f.** 0,04 **g.** 4,41 **h.** 6,25

2–12 **a.** 11 **b.** 0,9 **c.** 1,1 **d.** 0,7 **e.** 1,3 **f.** 0,3 **g.** 0,6 **h.** 0,1

2–13 **a.** 0,1 **b.** 0,2 **c.** 0,2 **d.** $-0,3$

2–14 **a.** 21 **b.** 0 **c.** -20 **d.** -1 **e.** 3 **f.** 8 **g.** 5 **h.** -5

2–15 **a.** 23 **b.** $19\frac{1}{3}$ **c.** 6 **d.** -69

2–16 **a.** 17 **b.** 22 **c.** -6 **d.** 0

2–17 **a.** $9\sqrt{3}$ **b.** $-\sqrt{11}$ **c.** $5\sqrt{5}$ **d.** $\sqrt{2}$ **e.** $-6\sqrt{13}$ **f.** $-16\sqrt{6}$

2–18 **a.** $8\sqrt{3}$ **b.** 0 **c.** $7\sqrt{3}$ **d.** 12 **e.** $2\sqrt{7}$ **f.** k.n.

2–19 **a.** $-4\sqrt{2}$ **b.** 0 **c.** $\frac{1}{2}\sqrt{5}$ **d.** -40 **e.** k.n. **f.** $1\frac{1}{6}\sqrt{5}$

2–20 **a.** $5\sqrt{2}+11\sqrt{3}$ **b.** $-5\sqrt{2}-3\sqrt{5}$ **c.** $-\sqrt{2}-\sqrt{5}$ **d.** $3\sqrt{6}+7\sqrt{10}$ **e.** $2\sqrt{2}+\sqrt{3}$ **f.** $2\sqrt{5}+2\sqrt{3}$

2–21 **a.** 5 **b.** 14 **c.** 4 **d.** $3+3\sqrt{3}$

2–22 **a.** $5+6\sqrt{2}$ **b.** $\frac{3}{4}\sqrt{2}-\frac{4}{5}\sqrt{6}$ **c.** $2\sqrt{5}-2\sqrt{3}+\sqrt[3]{5}$ **d.** $\sqrt{7}+\frac{2}{3}\sqrt{5}$ **e.** $-\frac{1}{4}\sqrt{2}$ **f.** $3\sqrt{7}+\sqrt[3]{10}+2\sqrt{2}$

2–23 **a.** $14\sqrt{3}$ **b.** $10\sqrt{3}+15\sqrt{7}$ **c.** $31\sqrt{7}$ **d.** $6\sqrt{3}-3\sqrt{2}$

2–24 **a.** $6\sqrt{5}+9\sqrt{2}$ **b.** $9\sqrt{3}-3\sqrt{7}$ **c.** $4\sqrt{5}-7\sqrt{2}$ **d.** $-22\sqrt{6}+24\sqrt{3}$

2–25 **a.** $\sqrt{6}$ **b.** $15\sqrt{56}$(of: $30\sqrt{14}$) **c.** $\sqrt{10}$ **d.** 6 **e.** $6\sqrt{12}$ (of: $12\sqrt{3}$) **f.** $10\sqrt{80}$ (of: $40\sqrt{5}$)

2–26 **a.** 90 **b.** $15\sqrt{abc}$ **c.** $2\sqrt{14}$ **d.** $8\sqrt{a^2b}$ (of: $8a\sqrt{b}$) **e.** $6\sqrt{ab}$ **f.** $6\sqrt{\frac{ac}{b}}$

2–27 **a.** 11 **b.** 10 **c.** 4 **d.** k.n. **e.** 4 **f.** $3\sqrt{5}$

2–28 **a.** $\sqrt{6}$ **c.** k.n. **e.** $3\sqrt{42}$
b. $\sqrt{6}$ **d.** 1 **f.** 12

2–29 **a.** $2\sqrt{6}+2\sqrt{3}$ **c.** $2-\sqrt{5}$ **e.** 16
b. $\sqrt{ab}$ **d.** $\sqrt{a^2b}$ (of: $a\sqrt{b}$) **f.** $7\sqrt{a}$

2–30 **a.** 80 **c.** -32 **e.** 18
b. $\sqrt{18}$ (of: $3\sqrt{2}$) **d.** 20 **f.** 10

2–31 **a.** $\sqrt{2}$ **c.** $\sqrt{3}$ **e.** 4
b. 1 **d.** $28\sqrt{15}$ **f.** $40\sqrt{55}$

2–32 **a.** $2\sqrt{5}$ **c.** $\frac{1}{2}\sqrt{3}$ **e.** $\sqrt{7}$
b. 3 **d.** 2 **f.** 10

2–33 **a.** $4\sqrt{3}$ **c.** $1\frac{1}{2}\sqrt{10}$ **e.** $\frac{1}{2}\sqrt{2}$
b. $\frac{1}{8}\sqrt{15}$ **d.** $2\sqrt{7}$ **f.** $\frac{16}{5}$

2–34 **a.** $12+6\sqrt{3}+2\sqrt{5}+\sqrt{15}$ **c.** $7\sqrt{2}-2-7\sqrt{5}+\sqrt{10}$
b. $-3-\sqrt{5}$ **d.** $2\sqrt{6}+3\sqrt{3}$

2–35 **a.** -1 **c.** 1
b. $38-12\sqrt{10}$ **d.** $21+8\sqrt{5}$

2–36
a. $18+6\sqrt{5}+3\sqrt{2}+\sqrt{10}$ **d.** $15-5\sqrt{2}+6\sqrt{3}-2\sqrt{6}$
b. $\sqrt{30}-6\sqrt{10}-2\sqrt{3}+12$ **e.** $2\sqrt{10}+2\sqrt{2}+30+6\sqrt{5}$
c. $57-12\sqrt{15}$ **f.** $18+4\sqrt{18}$ (of: $18+12\sqrt{2}$)

2–37 **a.** 6 **c.** $9\sqrt[3]{3}$
b. a^2 **d.** $4x^4\sqrt{x}$

2–38 **a.** 6 **c.** $3\sqrt{3}+2\sqrt{2}$
b. $-3\sqrt{2}$ **d.** $-\sqrt{6}+3$

2–39 **a.** 7 **c.** $-3\sqrt{10}$
b. $-\sqrt{10}-\frac{1}{9}$ **d.** $\frac{2}{3}\sqrt{5}$

2–40 **a.** $2\sqrt{2}$ **b.** $-2\sqrt{6}$ **c.** $-5\frac{7}{8}$ **d.** $-12\sqrt{2}$

2–41 **a.** 6 **b.** 6 **c.** 6 **d.** 6

2–42 **a.** $2\sqrt{5}$ **b.** $2\sqrt{7}$ **c.** $2\sqrt{6}$ **d.** $3\sqrt{3}$ **e.** $4\sqrt{2}$ **f.** $3\sqrt{2}$

2–43 **a.** $2\sqrt{3}$ **b.** $5\sqrt{6}$ **c.** $10\sqrt{2}$ **d.** $4\sqrt{3}$ **e.** $2\sqrt{15}$ **f.** $2\sqrt{110}$

2–44 **a.** $6\sqrt{2}$ **b.** $3\sqrt{2}$ **c.** $22\frac{1}{2}$ **d.** $\frac{5}{12}$ **e.** $-2\sqrt{3}$ **f.** 0

2–45 **a.** -11 **b.** $13\frac{1}{2}\sqrt{7}$ **c.** 0 **d.** $-12\sqrt{2}$ **e.** $-25\sqrt{10}$ **f.** $\frac{1}{3}\sqrt{5}$

2–46 **a.** -4 **b.** $8\sqrt{11}$ **c.** 30 **d.** $-23\sqrt{6}$ **e.** $2\sqrt{6}$ **f.** $-3\sqrt{10}$

2–47 **a.** $2\sqrt{10}$ **b.** $3\sqrt{5}$ **c.** $\sqrt{3}$ **d.** $6\sqrt{6}$ **e.** $12\sqrt{2}$ **f.** $3\sqrt{6}$ **g.** 6 **h.** $6\sqrt{3}$

2–48 **a.** $10\sqrt{6}$ **b.** $12\sqrt{15}$ **c.** $6\sqrt{70}$ **d.** $30\sqrt{14}$ **e.** $2\sqrt{155}$ **f.** $36\sqrt{14}$

2–49 **a.** $6\sqrt[3]{7}$ **b.** $10\sqrt{1814}$ **c.** $6\sqrt[4]{24}$ **d.** $35\sqrt{2}$ **e.** $3\sqrt[3]{210}$ **f.** $30\sqrt{5}$

2–50	**a.**	$6\sqrt[3]{30}$	**c.**	6	**e.**	$6\sqrt[3]{21}$
	b.	$10\sqrt[4]{54}$	**d.**	$4\sqrt{95}$	**f.**	$6\sqrt{141}$
2–51	**a.**	$a\sqrt[3]{a^2}$	**c.**	$a\sqrt[4]{ab}$	**e.**	$a\sqrt[3]{a^2b^2}$
	b.	$a\sqrt[3]{a^2b}$	**d.**	$a^2\sqrt[3]{b}$	**f.**	$a^2\sqrt{ab}$
2–52	**a.**	$ab\sqrt[3]{a^2b^2}$	**c.**	$ab\sqrt{a}$	**e.**	$ab\sqrt[3]{a^2}$
	b.	$a^2\sqrt{b}$	**d.**	$a^2b\sqrt[4]{b}$	**f.**	$ab\sqrt[3]{a^2}$

2–53	**a**	$\sqrt{a}$	**c**	$ab^2\sqrt{b}$	**e**	$a\sqrt[3]{b^2}$	**g**	$b\sqrt[4]{a^3}$
	b	$\frac{b^3}{a}\sqrt{a}$	**d**	$\frac{b}{a}$	**f**	$\frac{a}{b}\sqrt{a}$	**h**	$\frac{1}{ab}\sqrt{a}$

2–54	**a.**	$\frac{2}{3}$	**c.**	$\frac{1}{3}\sqrt{5}$	**e.**	$\frac{1}{4}\sqrt{7}$
	b.	$\frac{3}{4}\sqrt{3}$	**d.**	$\frac{1}{5}\sqrt{10}$	**f.**	$\frac{1}{7}\sqrt{7}$
2–55	**a.**	$\frac{2}{3}\sqrt{6}$	**c.**	$\frac{1}{10}\sqrt{410}$	**e.**	$\frac{1}{4}\sqrt{5}$
	b.	$\frac{1}{6}\sqrt{30}$	**d.**	$\frac{3}{5}\sqrt{5}$	**f.**	$\frac{7}{3}\sqrt{3}$
2–56	**a.**	$2\frac{1}{2}\sqrt{2}$	**c.**	$\frac{5}{7}\sqrt{7}$	**e.**	$\sqrt{2}$
	b.	$\frac{8}{3}\sqrt{3}$	**d.**	$\frac{1}{2}$	**f.**	$\frac{3}{4}$
2–57	**a.**	$\frac{1}{3}\sqrt{3}$	**c.**	$\frac{1}{7}\sqrt{7}$	**e.**	$\frac{4}{5}$
	b.	$\frac{5}{6}$	**d.**	$\sqrt{3}$	**f.**	$2\sqrt{10}$
2–58	**a.**	$\frac{2}{10}\sqrt{10} = \frac{1}{5}\sqrt{10}$	**c.**	$\sqrt{5}$	**e.**	$\frac{1}{5}\sqrt{5}$
	b.	$\frac{1}{6}\sqrt{3}$	**d.**	$\frac{1}{2}\sqrt{6}$	**f.**	$\frac{1}{2}\sqrt{7}$
2–59	**a.**	$\frac{1}{2}\sqrt{14}$	**c.**	$\frac{1}{4}\sqrt{10}$	**e.**	$\frac{1}{6}\sqrt{6}$
	b.	$\frac{1}{4}\sqrt{14}$	**d.**	$\frac{1}{10}\sqrt{30}$	**f.**	$\frac{2}{15}\sqrt{15}$
2–60	**a.**	$\frac{1}{8}\sqrt{2}$	**c.**	$-6\sqrt{7}$	**e.**	$-3\sqrt{13}$
	b.	$-1\frac{1}{2}\sqrt{2}$	**d.**	$4\frac{1}{3}\sqrt{6}$	**f.**	$1\frac{1}{2}\sqrt{2}$

2–61 **a.** $-\frac{2}{9}$ **b.** $1,7$ **c.** $110\frac{1}{4}$ **d.** $1\frac{1}{4}$ **e.** $1,1$ **f.** $\frac{1}{6}$

2–62 **a.** $\frac{5}{3}(2\sqrt{2}+\sqrt{5})$ **b.** $\frac{5\sqrt{a}+5\sqrt{b}}{a-b}$ **c.** $\frac{2\sqrt{10}-\sqrt{15}}{5}$ **d.** $-6(\sqrt{2}+\sqrt{3})$ **e.** $-\frac{9+2\sqrt{14}}{5}$ **f.** $\frac{50+5\sqrt{3}}{97}$

2–63 **a.** $2+6\sqrt{2}+6\sqrt{3}+\sqrt{6}$ **b.** $7-3\sqrt{5}$ **c.** $21\frac{1}{2}-4\frac{1}{2}\sqrt{15}$ **d.** $2+\sqrt{3}$ **e.** $\frac{3}{7}\sqrt{6}+\frac{12}{7}\sqrt{3}$ **f.** $3\sqrt{2}-2\sqrt{3}$

2–64 **a.** $3\sqrt{3}$ **b.** $2\sqrt[4]{4}$ **c.** $7\sqrt[3]{7}$ **d.** 17 **e.** $\sqrt[3]{25}$ **f.** 125

2–65 **a.** a^2b **b.** $a^2b^2\sqrt[3]{a^2}$ **c.** 81 **d.** $a^3b\sqrt{b}$ **e.** $10\sqrt[5]{100}$ **f.** 50

2–66 **a.** $\sqrt[20]{a}$ **b.** $\frac{2}{5}\sqrt[4]{6}\sqrt{5}$ **c.** $\sqrt{2}\sqrt[4]{5}$ **d.** $3\sqrt[6]{10}\sqrt[3]{a^2}$

2–67 $a=\sqrt{45}=3\sqrt{5}$, $b=\sqrt{90}=3\sqrt{10}$, $c=\sqrt{180}=6\sqrt{5}$ en $d=\sqrt{60}=2\sqrt{15}$

2–68 $a = 3, \qquad b = 20 - \sqrt{105}$

2–69 $a = \sqrt{51};\ b = \sqrt{21}$

2–70 $a = \sqrt{113};\ b = 6$

2–71 $a = 60;\ b = 10\sqrt{5};\ c = 2;\ d = \sqrt{89}$

2–72 $a = 8;\ b = 15;\ c = 3;\ d = 3\sqrt{2}$

2–73 $a = 9;\ b = 2;\ c = 7;\ d = 25$

2–74 $a = 16;\ b = 2\frac{6}{7};\ c = \sqrt{3};\ d = \frac{1}{5}\sqrt{365}$

2–75 $a = 1;\ b = 2\sqrt{11};\ c = 3;\ d = 5$

2–76 $a = \frac{2}{3}\sqrt{7};\ b = 12;\ c = 18;\ d = 2\sqrt{30}$

2–77 $a = 4\sqrt{15};\ b = 6;\ c = 2\sqrt{10};\ d = 2\sqrt{14}$

2–78 $a = \frac{3}{7};\ b = \sqrt{23};\ c = 20;\ d = 11$

2–79 $a = 8;\ b = 6;\ c = 9;\ d = 20$

2–80 $a = 3\sqrt{13};\ b = \sqrt{139}$

2–81 $a = 2\sqrt{5};\ b = \sqrt{3}$

2–82 $a = \dfrac{8}{13}\sqrt{13};\ b = \dfrac{4}{3}\sqrt{3}$

2–83
a. $\frac{5}{6}\sqrt{6}$
b. $2\sqrt{3} - 1$
c. $19 + 12\sqrt{2} + 6\sqrt{3} + 5\sqrt{6}$
d. $10 + 2\sqrt{6} + 2\sqrt{10} + 2\sqrt{15}$

2–84
a. $a^2 + 2a\sqrt{b} + b$
b. $x^2 - 2x\sqrt{y} + y$
c. $b^2 + 2ab\sqrt{b} + a^2b$
d. $b^2 - bc$

2–85
a. $2\sqrt{6}$
b. $x - 2x\sqrt{2}$
c. $1 + 3\sqrt{3}$
d. $11\sqrt{2} + 9\sqrt{3}$

2–86 **a.** $a\sqrt{a} + 6a\sqrt{b} + 12b\sqrt{a} + 8b\sqrt{b}$
b. $24 + 7\sqrt{6}$
c. $2y$

2–87
a. $3\sqrt{7} + 5$
b. 25
c. $3\sqrt{2} + 4\sqrt{3} - \sqrt{5}$
d. $\sqrt{3} - 16$

2–88

a. $1+\sqrt{2}$ **b.** $\frac{1}{3}(\sqrt{5}-\sqrt{2})$ **c.** $\frac{1}{2}+\frac{1}{2}\sqrt{5}$ **d.** $\frac{7+\sqrt{5}}{11}$ **e.** $6\sqrt{5}-12$ **f.** $\frac{1}{5}(9+2\sqrt{14})$

2–89

a $\frac{21}{2}\sqrt{3}-2\frac{1}{2}$ **b** $\frac{103}{71}+\frac{80}{71}\sqrt{3}$ **c** $\frac{2}{5}\sqrt{2}+\frac{1}{5}\sqrt{3}$ **d** $3\sqrt{2}-2\sqrt{3}$ **e** $\frac{1}{97}(-56+15\sqrt{10}-6\sqrt{14}+20\sqrt{35})$ **f** $\frac{17}{2}\sqrt{10}+27$

2–90 **a.** $\frac{1}{17}\left(9+5\sqrt{3}+10\sqrt{5}+6\sqrt{15}\right)$ **b.** $2+\frac{3}{13}\sqrt{10}-\frac{15}{13}\sqrt{3}$ **c.** $4-3\frac{1}{2}\sqrt{2}$ **d.** $\sqrt{3}$

2–91 **a.** $\frac{1}{12}\left(3\sqrt{2}+2\sqrt{3}-\sqrt{30}\right)$ **b.** $\frac{1}{12}\left(\sqrt{2}+\sqrt{3}-\sqrt{5}\right)$ **c.** $\sqrt{2}+\sqrt{5}+\sqrt{6}$ **d.** $1+\sqrt{3}+\sqrt{5}$

2–92 **a.** $-1+\frac{1}{4}\sqrt{2}+\frac{1}{2}\sqrt{3}+\frac{3}{4}\sqrt{6}$ **b.** 14 **c.** $2+\sqrt{2}+\sqrt{3}+\sqrt{6}$ **d.** $\frac{5}{24}$

2–93 **a.** 98; **b.** $\frac{177}{161}+\frac{52}{161}\sqrt{2}$; **c.** $\frac{1}{30}$; **d.** 0; **e.** $2\frac{1}{2}$; **f.** $\frac{1}{3}$

2–94 **a.** $6\sqrt{2}$ **b.** 68 **c.** $10\sqrt{3}$ **d.** $5\sqrt{5}$ **e.** $\frac{1}{2}\sqrt{7}$ **f.** 88

2–95 **a.** -45 **b.** $14\sqrt{6}$ **c.** 634 **d.** $4\sqrt{3}$ **e.** -30 **f.** -20

2–96 **a.** 20 **b.** 1700 **c.** $3\sqrt{35}$ **d.** $50+35\sqrt{2}$ **e.** $3\sqrt{2}$ **f.** $-8\sqrt{6}$

2–97 **a.** $\frac{1}{6}\sqrt{6}+\frac{1}{2}\sqrt{2}$ **b.** $1\frac{1}{3}\sqrt{2}$ **c.** $2\sqrt{7}$

2–98 **a.** $3\sqrt{6}$ **b.** $4\sqrt{5}$ **c.** $10\sqrt{3}$ **d.** $6\sqrt{3}$ **e.** $2\sqrt{14}$ **f.** $6\sqrt{7}$ **g.** $3\sqrt{2}$ **h.** $7\sqrt{2}$

2–99 **a.** $6\sqrt{x}$
b. $\sqrt{x^2+x}$
c. $2\sqrt{x}$
d. $2\sqrt{x}$
e. k.n.
f. $(1+\sqrt{2})\sqrt{x}$
g. $4+x$
h. 0

Tweedegraads vergelijkingen

3–1 **a.** $2 \vee 3$
b. -2
c. $0 \vee 2$
d. $2 \vee 4$
e. $-7 \vee 7$
f. $0 \vee 4$

3–2 **a.** $-2 \vee -4$
b. $3 \vee 40$
c. $-9 \vee 10$
d. $3 \vee 4$
e. $1 \vee 5$
f. -3

3–3 **a.** $2 \vee -5$
b. $3 \vee 7$
c. $-2 \vee 4$
d. $-1 \vee 3$
e. $5 \vee 7$
f. $1 \vee 5$

3–4 **a.** $0 \vee 3$
b. $-3 \vee 9$
c. $0 \vee 12$
d. $0 \vee 13$
e. $-1 \vee 0 \vee 1$
f. $-4 \vee 0$

3–5 **a.** $-6 \vee -4$
b. $-3 \vee -1$
c. $-12 \vee 2$
d. -2
e. $-2 \vee 12$
f. $-2 \vee 5$

3–6 **a.** $\pm 2\sqrt{3}$
b. $\pm 0,4$
c. ± 4
d. $\pm\frac{1}{2}$
e. $\pm 0,9$
f. $\pm\frac{3}{2}$

3–7 **a.** ± 2
b. geen opl.
c. geen opl.
d. geen opl.
e. ± 8
f. geen opl.
g. 0
h. ± 3
i. $\pm\frac{1}{2}$

3–8 **a.** $\pm\sqrt{7}$
b. $\pm\sqrt{7}$
c. $\pm\frac{3}{4}$
d. $\pm\frac{1}{3}$
e. $\pm\sqrt{10}$
f. geen opl.

3–9 **a.** -6
b. $-5, 13$
c. $-9, -3$
d. geen opl.
e. $-8, 2$
f. $5\frac{4}{5} \vee 6\frac{1}{5}$

3–10 **a.** ± 12 **b.** $\pm\frac{1}{3}$ **c.** ± 3 **d.** ± 10 **e.** geen opl. **f.** ± 2

3–11 **a.** -2 **b.** $\frac{3}{2}$ **c.** -3 **d.** $-\text{frac}23$ **e.** 5 **f.** $\frac{2}{5}$

3–12 **a.** $-5 \pm \sqrt{7}$ **b.** $-6 \pm \sqrt{6}$ **c.** $-4 \pm \sqrt{3}$ **d.** $-2 \pm \sqrt{7}$ **e.** $-3 \pm \sqrt{5}$ **f.** $3 \pm 2\sqrt{6}$

3–13 **a.** $-2 \pm \sqrt{19}$ **b.** $5 \pm \sqrt{33}$ **c.** $-1 \vee 3$ **d.** $4 \pm \sqrt{15}$ **e.** $-4 \pm \sqrt{14}$ **f.** $-3 \pm 2\sqrt{3}$

3–14 **a.** $10 \vee -10$ **b.** $1 \vee -1$ **c.** $9 \vee -9$ **d.** $4 \vee -4$ **e.** $13 \vee -13$ **f.** $0,9 \vee -0,9$

3–15 **a.** $0 \vee 1$ **b.** $0 \vee \frac{11}{6}$ **c.** $0 \vee -1\frac{1}{2}$ **d.** $0 \vee 14$ **e.** $0 \vee 3$ **f.** $0 \vee \frac{1}{7}$

3–16 **a.** $-6 \vee -4$ **b.** $-3 \vee -1$ **c.** $-12 \vee 2$ **d.** -2 **e.** $-2 \vee 12$ **f.** $-2 \vee 5$

3–17 **a.** $-12 \vee 12$ **b.** $-\frac{8}{3} \vee \frac{8}{3}$ **c.** $-2\frac{1}{2} \vee 2\frac{1}{2}$ **d.** $-\frac{2}{3} \vee \frac{2}{3}$ **e.** $-0,8 \vee 0,8$ **f.** $-3\frac{1}{2} \vee 3\frac{1}{2}$

3–18 **a.** $-1 \vee 12$ **b.** $-6 \vee 2$ **c.** $-12 \vee 1$ **d.** $-3 \vee 4$ **e.** $-2 \vee 6$ **f.** $-4 \vee 3$

3–19 **a.** -5 **b.** $-7; -3$ **c.** $-1; 7$ **d.** -9 **e.** $-7 \pm \sqrt{3}$ **f.** $-7; -5$

3–20 $a = 1,\ b = 2,\ c = -1$

$$x_{1,2} = \frac{-2 \pm \sqrt{2^2 - 4 \cdot 1 \cdot -1}}{2 \cdot 1} = \frac{-2 \pm \sqrt{4+4}}{2} \quad x_{1,2} = \frac{-2 \pm 2\sqrt{2}}{2} = -1 \pm \sqrt{2}$$

3–21 **a.** $-2 \pm \sqrt{3}$ **b.** $4 \pm \sqrt{10}$ **c.** $3 \pm \sqrt{7}$ **d.** $-3 \pm 2\sqrt{2}$ **e.** $-4 \pm \sqrt{7}$ **f.** $1; 13$

3–22 **a.** $-5 \pm \sqrt{2}$ **b.** $6 \pm \sqrt{6}$ **c.** $3 \pm \sqrt{11}$ **d.** $-12; -4$ **e.** $-7; -3$ **f.** $2; 6$

3–23 **a.** $-1 \pm \sqrt{5}$ **b.** $\frac{5}{2} \pm \frac{1}{2}\sqrt{13}$ **c.** $-1 \vee \frac{1}{2}$ **d.** $-3 \pm \sqrt{5}$ **e.** $-2\frac{1}{2} \vee 1$ **f.** $2 \pm \sqrt{5}$

3–24 **a.** $-1, \frac{1}{2}$ **b.** $2\frac{1}{2} \pm \frac{1}{2}\sqrt{13}$ **c.** $-1 \pm \sqrt{5}$ **d.** $-5 \pm \sqrt{5}$ **e.** $-2\frac{1}{2}, 1$ **f.** $5 \pm \sqrt{3}$

3–25 **a.** $2 \pm \sqrt{6}$ **b.** $-\frac{1}{3} \vee 2$ **c.** $-3 \pm 2\sqrt{2}$ **d.** $-1\frac{1}{2} \vee 2$ **e.** geen oplossing **f.** $-\frac{6}{5} \vee 2$

3–26 **a.** $2 \pm \sqrt{6}$ **b.** $-\frac{1}{3} \vee 2$ **c.** $-3 \pm 2\sqrt{2}$ **d.** $-1\frac{1}{2} \vee 2$ **e.** geen oplossing **f.** $-\frac{6}{5} \vee 2$

3–27 **a.** $\frac{1}{3} \vee 3$ **b.** $1 \vee 2\frac{1}{2}$ **c.** $\frac{5}{4} \pm \frac{1}{4}\sqrt{33}$ **d.** $1 \pm \sqrt{2}$ **e.** $3 \pm \sqrt{3}$ **f.** $\frac{2}{3} \pm \frac{1}{3}\sqrt{19}$

3–28 **a.** $5 \pm 5\sqrt{3}$ **b.** geen opl. **c.** $\frac{13}{6} \pm \frac{1}{6}\sqrt{97}$ **d.** $\frac{1}{2} \vee 6$

3–29 **a.** $\frac{-7}{2} \pm \frac{1}{2}\sqrt{5}$ **b.** $\frac{1}{10} \pm \frac{1}{10}\sqrt{21}$ **c.** $\frac{-3}{2} \pm \frac{1}{2}\sqrt{33}$ **d.** 5

3–30 **a.** $-1 \pm \sqrt{2}$ **b.** $-5 \vee 1$ **c.** $\dfrac{5 \pm 2\sqrt{15}}{5}$ **d.** -1

3–31 **a.** 2 **b.** 0 **c.** 1 **d.** 2 **e.** 0 **f.** 2

3–32 **a.** $a = 2$; $b = 5$; $c = 0$; $D = 25$; twee opl
b. $a = 1$; $b = -6$; $c = 9$; $D = 0$; één opl
c. $a = -2$; $b = 10$; $c = -3$; $D = 76$; twee opl
d. $a = -1$; $b = -2$; $c = -13$; $D = -48$; geen opl
e. $a = 4$; $b = 0$; $c = 9$; $D = -144$; geen opl
f. $a = -30$; $b = 6$; $c = 0$; $D = 36$; twee opl

3–33 **a.** $D = 100$; twee opl
b. $D = 220$; twee opl
c. $D = -131$; geen opl

d. $D = 77$; twee opl
e. $D = -4$; geen opl
f. $D = 0$; één opl

3–34 **a.** 2 **b.** 0 **c.** 0 **d.** 2 **e.** 2 **f.** 0

3–35 **a.** 0 **b.** 2 **c.** 1 **d.** 2

3–36 **a.** geen opl. **b.** $\frac{2}{5}$ **c.** 6 **d.** geen opl.

3–37 **a.** $-6 \vee 0$ **b.** $-3 \pm \sqrt{2}$ **c.** $-7 \vee 1$ **d.** $1\frac{1}{2} \pm \frac{1}{2}\sqrt{29}$ **e.** geen opl. **f.** $-1, 0$

3–38 **a.** $-3 \vee 7$ **b.** $\frac{1}{2} \vee 1$ **c.** $-3 \vee 9$ **d.** $-2\sqrt{2} \vee 0$ **e.** 1 **f.** $0 \vee \frac{7}{3}$

3–39 **a.** $\frac{-3}{2} \pm \frac{1}{2}\sqrt{29}$ **b.** geen opl. **c.** $3 \vee -9$ **d.** $\pm\frac{5}{7}$ **e.** $-\frac{7}{3} \vee \frac{1}{2}$ **f.** geen opl.

3–40 **a.** $0 \vee 6$ **b.** $\frac{3}{2} \pm \frac{1}{2}\sqrt{29}$ **c.** $\frac{3}{2} \pm \frac{1}{2}\sqrt{5}$ **d.** geen opl.

3–41 **a.** $0 \vee \frac{5}{2}$ **b.** $\frac{1}{4} \pm \frac{1}{4}\sqrt{5}$ **c.** $5 \pm 2\sqrt{3}$ **d.** $-2 \vee 8$

3–42 **a.** $-\frac{1}{4} \vee \frac{5}{8}$ **b.** $2 \vee 30$ **c.** $-5 \pm 5\sqrt{2}$ **d.** $\frac{5}{6} \pm \frac{1}{6}\sqrt{19}$

3–43 **a.** $-\frac{1}{3} \vee 15$ **b.** $9 \pm \sqrt{7}$ **c.** $\frac{1}{2} \vee \frac{1}{10}$ **d.** $4\frac{9}{10} \pm \frac{7}{10}\sqrt{69}$ **e.** $2\frac{2}{3} \vee 4$ **f.** $-1\frac{1}{7} \pm 1\frac{5}{7}\sqrt{2}$

3–44 **a.** $3 \pm \sqrt{11}$ **b.** $1 \pm \sqrt{2}$ **c.** $6 \pm \sqrt{6}$ **d.** $4 \vee 6$ **e.** $-1 \pm \sqrt{5}$ **f.** $\frac{2}{3} \vee \frac{3}{2}$

3–45 **a.** geen oplossing **b.** $-3\frac{1}{2} \pm \frac{1}{2}\sqrt{5}$ **c.** $0 \vee 2$ **d.** $-2\sqrt{7} \vee 2\sqrt{7}$ **e.** $0 \vee 9$ **f.** $1 \vee 9$

3–46 **a.** $-3 \pm \sqrt{2}$ **b.** $-7 \vee 2$ **c.** $-5 \vee 6$ **d.** $-6 \vee 6$ **e.** $-4 \vee 5$ **f.** $1 \vee 3$

3–47 **a.** $-\frac{1}{5} \vee -1$ **b.** $-\frac{1}{3} \vee \frac{1}{2}$ **c.** $-\frac{1}{4} \vee -\frac{1}{2}$ **d.** geen opl. **e.** $-\frac{1}{8} \vee -\frac{1}{6}$ **f.** $\frac{1}{5} \vee -\frac{1}{4}$

3–48 **a.** $-\frac{1}{3} \vee 5$ **b.** $\frac{1}{4} \vee -\frac{2}{3}$ **c.** $\frac{1}{5} \vee 7$ **d.** $\frac{1}{3} \vee 3$ **e.** $-\frac{1}{2} \vee -\frac{2}{3}$ **f.** $\frac{2}{3} \vee \frac{3}{2}$

3–49 **a.** $\frac{1}{4} \vee 5$ **b.** $-\frac{5}{8} \vee 6$ **c.** $\frac{1}{3} \vee -\frac{5}{6}$ **d.** $\frac{1}{5} \vee \frac{1}{4}$ **e.** $-\frac{1}{6} \vee \frac{1}{3}$ **f.** $\frac{4}{5} \vee \frac{5}{4}$

3–50 **a.** $p < 12\frac{1}{4}$ **b.** $p > -3\frac{1}{8}$ **c.** $p < 1\frac{1}{3}$ **d.** $p < 9$

3–51 **a.** $p < -10 \ \vee \ p > 10$; **b.** $-4 < p < 4$; **c.** $p^2 + 24 > 0$ is waar voor alle waarden van p

3–52 **a.** $p = -3$ met $x = -3$; **b.** $p = 3$ met $x = 2$

3–53 **a.** $3x + 1 = 0$ heeft één oplossing; **b.** $D = 9 - 4p$ geeft $p < 2\frac{1}{4}$ verder moet gelden: $p \neq 0$ dus antwoord: $p < 0 \vee 0 < p < 2\frac{1}{4}$

3–54 **a.** $p < 0 \ \vee \ 0 < p < 3\frac{1}{8}$; **b.** $-\frac{9}{16} < p < 0 \ \vee \ p > 0$

3–55 **a.** $p > \frac{1}{8}$; **b.** $-\frac{1}{2} < p < 0 \ \vee \ 0 < p < \frac{1}{2}$; **c.** $p < -2\sqrt{2} \ \vee \ p > 2\sqrt{2}$

3–56 **a.** $p = 1$ met $x = -3$; **b.** $p = -2$ met $x = 1$ of $p = 2$ met $x = -1$

Wortel vergelijkingen & gebroken vergelijkingen

4–1 **a.** 4 **b.** 8 **c.** 17 **d.** $\frac{17}{2}$ **e.** 75 **f.** $\frac{15}{2}$

4–2 **a.** $0; 3$ **b.** 45 **c.** $0; \frac{5}{4}$ **d.** 30 **e.** $0; 8$ **f.** ± 9

4–3 **a.** $0; \frac{1}{16}$ **b.** $0; \frac{3}{16}$ **c.** $0; \frac{3}{2}$ **d.** 0 **e.** 0 **f.** 0

4–4 **a.** $-2; 2$ **b.** $-5; 1$ **c.** $-2; 6$ **d.** 5 **e.** $-3; 3$ **f.** $1; 5$

4–5 **a.** $0; 2$ **b.** geen opl. **c.** $-3; 2$ **d.** geen opl. **e.** $-\frac{1}{4}; \frac{13}{4}$ **f.** $5; 9$

4–6 **a.** $1; 2$ **b.** $2; 3$ **c.** $\frac{13+\sqrt{217}}{2}$ **d.** 4 **e.** $1; 4$ **f.** 3

4–7 **a.** 8 **b.** 1 **c.** $1; 7$ **d.** 9 **e.** $3; 4$ **f.** 1

4–8 **a.** 8 **b.** 4 **c.** $1; 4$ **d.** 4 **e.** 10 **f.** 5

4–9 **a.** 3 **b.** 5 **c.** $\frac{1}{2}$ **d.** 3

4–10 **a.** $-\frac{1}{2}, 2$ **b.** 9 **c.** geen opl. **d.** $-1, -\frac{3}{4}$

4–11 **a.** 1 **b.** $-1, -4$ **c.** geen opl. **d.** -7

4–12 **a.** -4 **b.** 4 **c.** -1

4–13 **a.** $\frac{1}{3}$ **b.** 2 **c.** $-\frac{1}{6}$ **d.** 6 **e.** $-\frac{1}{2}$ **f.** $\frac{8}{3}$

4–14 **a.** $-\frac{1}{6}$ **b.** 17 **c.** $-\frac{1}{6}$ **d.** $\frac{13}{4}$ **e.** $-\frac{1}{10}$ **f.** 3

4–15 **a.** $\frac{1}{4}$ **b.** $-\frac{13}{4}$ **c.** -10 **d.** 5 **e.** $-\frac{3}{2}$ **f.** $-\frac{7}{2}$

4–16 **a.** -1 **b.** $\frac{3}{5}$ **c.** -7 **d.** $\frac{7}{6}$ **e.** $\frac{10}{3}$ **f.** $\frac{7}{5}$

4–17 **a.** -17 **b.** $\frac{121}{25}$ **c.** $-\frac{1}{9}$ **d.** $\frac{5}{4}$ **e.** 1 **f.** 2

4–18 **a.** $-\frac{1}{3}$ **b.** k.n. **c.** $-\frac{2}{21}$ **d.** 2 **e.** $\frac{2}{5}$ **f.** $-\frac{6}{13}$

4–19 **a.** $-\frac{3}{4}$ **b.** k.n. **c.** $-\frac{5}{4}$ **d.** 0 **e.** 5 **f.** $x \neq -7$

4–20 **a.** k.n. **b.** -9 **c.** 0 **d.** $2, \frac{9}{2}$ **e.** $-\frac{8}{5}$ **f.** $-1, 2, -2$

4–21 **a.** 2 **b.** geen opl. **c.** $-1, 2$ **d.** $2, -2, 3$

4–22 **a.** $-\sqrt{5}, \sqrt{5}, 2, -2$ **b.** $3, -3$ **c.** 1 **d.** -3

4–23 **a.** k.n. **b.** -4 **c.** 2 **d.** k.n.

4–24 **a.** $0; -\frac{7}{4}$ **b.** $\frac{15 \pm \sqrt{193}}{4}$ **c.** k.n. **d.** 1

4–25 **a.** $-1; \frac{7}{10}$ **b.** 0 **c.** $0; 1$ **d.** k.n.

4–26 **a.** 1
b. $3; \frac{5}{3}$
c. k.n.
d. $-\frac{2}{21}$

4–27 **a.** -4
b. geen opl.
c. $\frac{24}{5}$
d. $-\sqrt{6}, 0, \sqrt{6}$

4–28 **a.** geen opl.
b. -5
c. geen opl.
d. $\frac{26}{19}$

4–29 **a.** $x = 2 \vee x = -1$
b. $x = \pm 2 \vee x = 3$
c. $x = 0$
d. $x = \pm 2\sqrt{3}$
e. $x = \pm 2 \vee x = \pm \frac{3}{2}\sqrt{14}$
f. $x = 4$

4–30 **a.** $x = \pm 3 \vee x = 1$
b. $x = \pm 2 \vee x = \pm \frac{1}{2}\sqrt{2}$
c. $x = 0 \vee x = 3$
d. $x = 0 \vee x = 2 \vee x = \pm\sqrt{3}$
e. $x = 4$
f. $x = 4 \vee x = 16$

4–31 $(100, 49)$

Cirkelmeetkunde

5–35 $61°$

5–36 $45°$, $45°$ en $90°$

5–37 6

5–39 5

5–42

5–43 $80°$, $150°$

5–44 $70°$, $35°$, $35°$

5–45 $10°$, $10°$, $15°$, $15°$, $25°$ en $155°$

5–46 $55°$, $90°$, $35°$, $15°$, $20°$, $30°$ $150°$, $15°$, $55°$ en $105°$

5–47 $30°$

5–48 $30°$, $30°$, $60°$ en $60°$

5–49 $70°$, $110°$, $20°$, $50°$

5–50 $27,5°$, $152,5°$, $12,5°$, $15°$

5–51 44 cm

5–52 440 m

5–53 $223,5$ cm

5–54 12739 km

5–55 **b.** 9π

5–56 $2\pi \approx 6,28$ m

5–57 $R = 100$ m, $O = 30.000$ m^2

5–58 $8\pi \approx 25,1$ m

5–59 $36 - 4\frac{1}{2}\pi$

5–60 308 en 88

5–61 8π en 12π

5–62 80 cm; $1600\pi \approx 5027$ cm^2; $6400 - 1600\pi \approx 1373$ cm^2

5–63 28; 22

5–64 $38\frac{98}{113}$; $28\frac{64}{113}$

5–65 $64 - 16\pi \approx 13,73;\ 8 + 8\pi \approx 33,13$

5–66 $45 - 7\frac{13}{16}\pi$

5–67 $15 + 4\pi$

5–68 72π

5–69 $42 - 6\frac{3}{4}\pi$

5–70 $48 - 4\pi$

5–71 8

5–72 32

5–73 $4\sqrt{2} - 4 \approx 1,7$

Combinatoriek

6–4 $\frac{4!}{2!2!} = 6$

6–5 $\frac{7!}{4!} = 210$

6–6 $\frac{9!}{2!2!2!} = 45360$

6–7 $2! = 2, \qquad \frac{4!}{2!} = 12, \qquad \frac{7!}{3!2!} = 420$

6–8
a. 12
b. 1320
c. 120
d. $\frac{1}{12}$
e. $\frac{1}{210}$
f. 11

6–9 **a.** $(n-1)n$ | **b.** $\frac{1}{n+1}$ | **c.** $n(n+1)$

6–10 **a.** $\frac{9}{8!}$ | **b.** $\frac{5}{4!}$ | **c.** $\frac{6}{7!}$

6–11
a. $\frac{11}{10!}$
b. $4!$
c. $\frac{14}{5!}$
d. $\frac{1}{8!}$

6–12
a. $11!$
b. $\frac{1}{4}$
c. $\frac{1}{11!}$
d. $\frac{91}{10!}$

6–13 Er zijn (veel) meer oplossingen, hier staan er een paar:
$(0!+0!+0!)!$; $(1+1+1)!$; $\left(2+\frac{2}{2}\right)!$; $3+\sqrt{3\times 3}$; $4+4-\sqrt{4}$; $5+\frac{5}{5}$; $6\times\frac{6}{6}$; $7-\frac{7}{7}$; $8-\sqrt{\sqrt{8+8}}$; $\frac{9+9}{\sqrt{9}}$; $\left(\sqrt{10-\frac{10}{10}}\right)!$

6–14 **a.** Als A drie sets gewonnen heeft, dan is A 'best of five' en komt er geen nieuwe set. **b.** 20

6–15 **a.** Dat de teams slechts éénmaal tegen elkaar uitkomen. **b.** 10

6–16 **a.** 66, **b.** 17

6–17 **a.** 21; **b.** 6

6–18 **a.** 24; **b.**4; **c** 6

6–19 $3\cdot 5\cdot 2=30$

6–20 $10^3=1000$

6–21 $6^4=1296$

6–22 $21^3\cdot 9^3=6.751.269$

6–23 $26^2\cdot 10^2=67.600$

6–24 **a** $5+5\times 4=25$; **b** $5+5\times 5=30$

6–25 **a.**9; **b.**19; **c.**22

6–26 **a.**24; **b.**576; **c.**360

6–27 $\binom{10}{2}=45$

6–28 **a.**5040; **b.**604800

6–29 **a.**32768; **b.**6720; **c.**20

6–30 **a.**1680; **b.**4096; **c.**30

6–31 **a.**5; **b.**210; **c.**5313; **d.**1890

6–32 **a.**56; **b.**256; **c.**24

6–33 $P_3^6=120$ en dat is meer dan 100, zes kleuren is dus voldoende.

6–34 $C_1^6+C_2^6+C_3^6+C_4^6+C_5^6+C_6^6=$
$6+15+20+15+6+1=63$

6–36 $10^9 = 1.000.000.000$, want de nummers moeten met een nul beginnen.

6–37 Het gaat om combinaties:
$\binom{10}{6} = \frac{10\times9\times8\times7\times6\times5}{6\times5\times4\times3\times2\times1} = 210$, Sneller is:
$\binom{10}{4} = \frac{10\times9\times8\times7}{4\times3\times2\times1} = 210$

6–38 Aantal kortste wegen van:
a. A $\rightarrow$ B is $\binom{8}{3} = \frac{8\times7\times6}{3\times2\times1} = 56$
b. B $\rightarrow$ C is $\binom{6}{3} = \frac{6\times5\times4}{3\times2\times1} = 20$
c. A $\rightarrow$ C, dan moet je over B dus:
$\binom{8}{3} \times \binom{6}{3} = 56 \times 20 = 1120$
d. A $\rightarrow$ D dan ga je van A $\rightarrow$ B en dan op één manier naar D.
Dus $\binom{8}{3} \times 1 = 56 \times 1 = 56$

6–39 **a.** A $\rightarrow$ B: $\binom{11}{4} = \frac{11\times10\times9\times8}{4\times3\times2\times1} = 330$
b. A $\rightarrow$ C dan: A $\rightarrow$ E $\rightarrow$ C: $1 \times \binom{6}{3} = 1 \times \frac{6\times5\times4}{3\times2\times1} = 20$

6–40 $56 \times 210 = 11760$

6–41
a. 45
b. 3
c. 1
d. 105
e. 66
f. 1

6–42
a. 4950
b. 1
c. 236
d. 35
e. 19900
f. 495

6–43
a. 56
b. 56
c. 126
d. 1330
e. 220
f. 210

6–44 $\binom{3}{0} = 3$, $\binom{6}{4}15$, $\binom{10}{5} = 252$, $\binom{100}{3} = 161700$, $\binom{48}{4} = 194580$

6–45
a. 48
b. 3628800
c. 720
d. 3003
e. 455
f. 3160

6–46
a. 45
b. 40320
c. 90
d. 360

6–47
a. 10
b. 24
c. 42
d. 120

6–48 $C_3^{40} = 9880$

6–49 $C_4^{50} = 230300$

6–50 $P_3^{12} = 1320$

6–51 $3^6 = 729$

6–52 $7 \cdot 5 \cdot 7 = 245$

6–53 $P_8 = 8! = 40320$, 403200 sec $=$ 112 uur

6–54 $P_3^8 = 336$

6–55 $C_4^{25} = 12650$

6–56 $C_6^{13} = 1716$

6–57 $2 \cdot \frac{15!}{6!} = 3.632.428.800$

6–58 $C_3^{12} = 220$, $P_3^{12} = 1320$

6–59 $a^7 + 7a^6b + 21a^5b^2 + 35a^4b^3 + 35a^3b^4 + 21a^2b^5 + 7ab^6 + b^7$

6–60

a. $1 + 9x + 27x^2 + 27x^3$

b. $10^5+10^5+4\cdot10^4+8\cdot10^3+80\cdot10+32 = 248832$

c. $16 - 32y + 24y^2 - 8y^3 + y^4$

d. $4x^2 + 12xy + 9y^2$

6–61

a. 1111

b. 11101010

c. 10110

d. 1000100

6–62

a. 5

b. 54

c. 28

d. 27

6–63

a. 1110

b. 10001

c. 1100

d. 11110101

6–64

a. 101101

b. 111100

c. 100011

d. 11110111100

Meetkunde

7–1 60 cm^3;30 cm^3; 6 cm^2; ja

7–2 NB nummer zes is stiekem een "scheef prisma".

7–3 **a.** 2,76 m^2; **b.** 0,96 m^2; **c.** 2,208 m^3

7–4 32; 40; 36

7–5 36 cm^3;54 cm^3

7–6 2,2 m^3

7–7 1,6 m; 4,4 m; 97,4 m^3

7–8 42 liter;35 dm^3; 1,1 m^2

7–9 1.000.000 liter; €1666

7–10 4,6 liter

7–11 809 ml; 8 ml

7–12 282,7 liter;188,5 cm

7–13 1325 cm^3; 79%

7–14 45

7–15 **a.** 4,48 dm^3; **b.** 50,6 kg

7–16 2035 liter per minuut

7–17 6; ja; $\frac{1}{6}$; $\frac{1}{3}$

7–18 20; $6\frac{2}{3}$; 14

7–19 $21\frac{1}{3}$; $10\frac{2}{3}$; $10\frac{2}{3}$

7–20 **a.** 42 cm^3; $42\frac{2}{3}$; $41\frac{2}{3}$ **b.** 22:43

7–21 28; 10950; 11200

7–22 balk(toren): 4176; balk(schip): 4320; piramide(toren): 288; prisma(schip)540; bij elkaar: 9324 m^3

7–23 740

7–24 **a.** 216; **b.** $\sqrt{4,5^2+8^2} \approx 9,1788$ **c.** 166

7–25 94,2 cm^3

7–26 0,177 km^3

7–27 **a.** 18,84 cm^3; **b.** 17,6 g

7–28 3976 l

7–29 196 g

7–30 0,75 m; 156 m; 1:24

7–32 2; 2,7

7–33 1,8; 94 mm

7–34 1,7; 9,2 cm

7–35 1,5; 27 mm; 0,73; 26 mm

7–36 8,8; 132 cm

7–37 0,49; 45 mm

7–38 **a.** 42 m; **b.**12 m

7–39 25 stuks; 25 $\times$

7–40 3,25 cm^2

7–41 26 cm^2

7–42 8 l

7–43 175

7–44 225 g

7–45 4492 m^2

7–46 9; k=3

7–47 **a.** k $= \sqrt{8}$ dus $28,3 \times 42,4$ cm; **b.** k $= \sqrt{12}$ dus $52,0 \times 34,6$ cm; **c.** k $= \frac{25}{15} = \frac{5}{3}$, 417 cm^2

7–48 5,4

7–49 45x30; 15x10

7–50 **a.** 4,8 m^2; **b.** 1,31; **c.** 3,67 m bij 1,53 m

7–51 9; 3; 27

7–52 262 l; 32 dm^2; 8,1 dm

7–53 29 ml

7–54 9375 ml, minder; 100

7–55 1,7; 3,7 l; 486 cm^2

7–56 $\frac{3}{4}$; 19 ml; 88 ml; 94 cm^2

7–57 37,5 m, 12,8 m; 1181,3 m^3; 405 m^2; 4,5 m, 55 treden; 75%; 87°

7–58 2

7–59 2; 3; 1; 10; 2,57; 4,38; 9,56; 0,95

7–60 0.87; 107,8 cm^2

7–61 1,19; 17,3 cm

7–62 1,19; 2,15 m^2; 101,2 cm

7–63 96 cm^3; 40 cm^3; 16 cm^3

7–64 25π cm^3

7–65 91.000 cm^3=91 l; 1838 cm^2

7–66 948 cm^3=0,948 dm^3; 0,65 kg; 81 g

7–67 1,4; 17,6 cm^2; 192 ml; 2; 560 ml

7–68 98; 6,4 en 4

7–69 37%

7–70 **a.** $A'C' = 6\frac{2}{3}$; $B'C' = 5$; $k = \pm\frac{5}{6}$
b. $A'C' = 22\frac{1}{2}$; $B'C' = 35$; $k = \pm 2\frac{1}{2}$
c. $A'C' = 9$; $B'C' = 6$; $k = \pm\frac{3}{5}$

7–71 PQ $= 4\frac{1}{5}$, PR $= 4\frac{4}{5}$

7–72 PQ $= 4\frac{1}{2}$, QR $= 5\frac{1}{4}$

7–73 RQ $= 5$

7–74 PQ $= 72$ en QR $= 63$

7–75 12 en 18

7–76 $22\frac{1}{2}$ en 15

7–78 BE$7\frac{1}{5}$; CE $= 5\frac{2}{5}$ en AE $= 9\frac{3}{5}$

7–79 BD $= 30$; DS $= x = 10$; $AS = 4\sqrt{13}$ en CS $= 2\sqrt{13}$

7–80 CD $= 4$; CE $= 2\frac{2}{7}$; AE $= 3\frac{3}{7}\sqrt{5}$; BD $= 6\sqrt{5}$.
DS $= x = 10$; $AS = 4\sqrt{13}$ en CS $= 2\sqrt{13}$

7–81 $h_a : h_b = 3 : 2$; $h_a : h_c = 9 : 4$; $h_b : h_c = 3 : 2$ ofwel $h_a : h_b : h_c = 9 : 6 : 4$

7–82 $BF = 4\frac{4}{5}$

7–83 4, $5\frac{1}{3}$ en 1

7–84 12, $3\frac{1}{3}$ en $8\frac{2}{3}$

7–85 $1\frac{5}{7}$

7–86 $1\frac{2}{3}$ en $4\frac{1}{3}$.

7–88 $BE = 4$

7–89 $SQ = 4$; $RS = 5\frac{1}{3}$ en $QR = 6\frac{2}{3}$

7–90 $BC\sqrt{193} \approx 13,89$ en $AD \approx 6,87$ en $BD \approx 5,89$

7–91 $BC\sqrt{21}$, $AB = \sqrt{70}$ en $BD = \sqrt{30}$

7–92 $MN = 4\frac{1}{2}$; $KL = \sqrt{13}$; $KN = \frac{3}{2}\sqrt{13}$

7–93 $TU = 9$, $TV = 16$ en $SV = 20$

7–94 **a.** 36, **b.** 28, 21 en 14

7–95 $11\frac{1}{4}$ en $1\frac{3}{4}$

7–97 $AB = 8\frac{1}{3}$, $AC = 5$, $BC = 6\frac{2}{3}$ en $BD = 5\frac{1}{3}$

7–98 $h_C = 12$, $h_A = h_B = 9\frac{3}{13}$

7–99 $AQ \parallel DC$, dus: $\triangle APQ \backsim \triangle DPC$, $AQ = 4$.

7–100 $CQ \parallel DA$,dus: $\triangle CPQ \backsim \triangle DPA$, $CQ = \frac{8}{3}$.

7–101 $2\frac{2}{3}$, $3\frac{3}{4}$

7–102 4, 5 en $3\frac{3}{4}$.

7–107 $5\frac{1}{2}$

7–108 4

7–109 20

7–110 $15 = 6\frac{1}{4} + 8\frac{3}{4}$ en $18 = 7\frac{1}{2} + 11\frac{1}{2}$

7–111 $4\frac{1}{2}$

7–112 18 en 27.

7–115 $AP = \dfrac{b^2}{a}$

7–116 $PQ = \sqrt{ab}$

7–117 $AP = 3$ en $CL = 1\frac{1}{2}$.

7–118 2, 1, 2 en 3.

7–119 $BK = 3\frac{3}{5}$; $KL = 1\frac{1}{5}\sqrt{34}$

7–120 $EQ = 3\frac{3}{7}$

7–121 10 en 16

7–123 **a.** middenparallel; **b.** $-\frac{1}{2}$; **c.** $EZ = \frac{1}{2}BZ$, $DZ = \frac{1}{3}CD$; **d.** $2:1$

7–124 18 en 10

7–125 **a.** $\sqrt{41}$ en $\frac{2}{3}\sqrt{41}$ **b.** 2

7–126 **a.** 36 **b.** $7\frac{1}{2}$

7–127 28

7–128 $3\frac{9}{17}$

7–129 $\frac{4}{5}\sqrt{5}$

7–130 $CD = 12$; $AE = 9\frac{3}{13}$

7–131 $CF = 1\frac{3}{5}\sqrt{5}$

7–132 $\frac{32}{\sqrt{137}}$

7–134 **a.** $5^2 = 3^2 + 4^2$; **b.** bissectrices; **c.** $\text{Opp}\triangle ABM = 2r$; **d.** $\text{Opp}\triangle ABC = 6r$; **e.** $\text{Opp}\triangle ABC = 6$; **f.** $r = 1$

7–135 **a.** $1+2+3 = 1\times 2\times 3 = 6$; **b.** symmetrie; **c.** $30-60-90^\circ \Leftrightarrow 1:2:\sqrt{3}$; **d.** $O = \frac{1}{2}\times 2\sqrt{3}\times 3 = 3\sqrt{3}$; **e.** $\sqrt{3}+\sqrt{3}+\sqrt{3} = 3\sqrt{3} = \sqrt{3}\times\sqrt{3}\times\sqrt{3}$; **f.** $MC = \sqrt{5}$; de hoogte is: $1+\sqrt{5}$; Pythagoras geeft: $(1+\sqrt{5})^2 + \phi^2 = (2+\phi)^2$ en dat geeft $\phi = \dfrac{1+\sqrt{5}}{2}$; **g.** $O = \frac{1}{2}\times 2\phi\times(1+\sqrt{5}) = 2\phi^2 = 3+\sqrt{5}$; **h.** $a\cdot b\cdot c = \phi\cdot 2\cdot\phi = 2\phi^2 = 3+\sqrt{5}$ en $a+b+c = \phi+\phi+2 = 3+\sqrt{5}$.

7–136 6

7–137 10

7–138 10

7–140 **a.** 24, 192 **b.** 8

7–141 $O' = k^2 O \Rightarrow 100 = k^2 \cdot 4 \times 16 \rightarrow k^2 = \frac{100}{64} \rightarrow k = \frac{5}{4}$

7–142 ja; 125; 343

7–144 **a.** 80 **b.** 10.000 **c.** 30

7–145 **a.** 62, 30 **b.** 558, 810 **c.** 15360 **d.** 992

7–147 **a.** 108 **b.** $\frac{4}{3}$ **c.** 10

7–148 €40,50

7–149 deze is $8\times$ zo groot

7–150 $\frac{1}{4}$ m^2

7–151 **a.** $27\times$

7–152 5 $\quad 5^2 \cdot 4 = 100$

7–153 **a.** 40 **b.** 160 **c.** $17\frac{7}{9}$

7–154 $k^2 = \frac{2}{8} = \frac{1}{4}$ dus $k = \frac{1}{2}$

7–155 $r_B = 10\frac{2}{3}$

7–156 170 m

7–157 180 m; 45 m

7–158 60 m

7–159 108

7–160 283,52

7–161 64; $BT = \sqrt{8^2 + 6^2}$; $DT = \sqrt{6^2 + 4^2}$; $88 + 8\sqrt{13}$

7–162 2,3; 18 cm^2

7–163 1,26; 4,4 cm; 4,29; 0,65 cm^2

7–164 874,32 m^3

7–165 6

7–166 81°

7–167 6; 20; 14

7–168 60°; 75°; $82,5^\circ$

7–169 12 cm

7–170 66°

7–171 25

7–172 $11,5^\circ$

7–173 3:8

7–174 $13,5^\circ$

7–175 18

7–176 71,25

7–177 20

7–178 42°

7–179 45

7–180 $115,5^\circ$

7–181 28

7–182 51°

7–183 28

7–184 51°

7–185 9

7–186 $61,5^\circ$

7–187 15

7–188 130°

7–189 8

7–190 75°

7–191 4

7–192 60°

7–193 240

7–194 $45°$; $67,5°$; $78,75°$

7–195 6

Goniometrie

8–2 **a.** $14°$ **b.** $22°$ **c.** $45°$

8–3 **a.** 200 m **b.** 800 m **c.** 150 m

8–4 **b.** 1,8 **c.** 0,36

8–5 **a.** $\angle CAB = \angle C'AB'$ en $\angle B = \angle B'$
b. $\frac{AC}{AC'} = \frac{BC}{B'C'} = \frac{AB}{AB'}$
c. $\frac{BC}{B'C'} = \frac{AB}{AB'} \Leftrightarrow BC \cdot AB' = AB \cdot B'C' \Leftrightarrow \frac{BC}{AB} = \frac{B'C'}{AB'}$

8–6 $\frac{3}{4}$

8–7 $\frac{2}{3}$

8–8 $\frac{4}{2\sqrt{2}} = \frac{2}{\sqrt{2}} = \sqrt{2}$

8–10 $\frac{4}{3}$ $\frac{1}{5}$

8–11 $BC \approx 1,6$ $\tan 18° \approx 0,3$

8–12
a. $0,781$
b. $0,839$
c. $57,290$
d. $0,424$
e. $1,235$
f. $0,017$
g. $0,070$
h. $2,747$
i. $0,466$

8–13
a. $0,208$
b. $0,999$
c. $0,500$
d. $0,017$
e. $0,743$
f. $1,000$

8–14
a. $39°$
b. $79°$
c. $61°$
d. $27°$
e. $84°$
f. $3°$

8–15
a. $18°$
b. $71°$
c. $35°$
d. $30°$
e. $49°$
f. $19°$

8–16 **a.** 37° **b.** 89° **c.** 19° **d.** 35° **e.** 60° **f.** 30°

8–17 $\tan\beta = \frac{AC}{AB}$ en $\tan\gamma = \frac{AB}{AC}$

8–18 **a.** $\sin\alpha = \dfrac{BC}{AC}$, $\cos\alpha = \dfrac{AB}{AC}$, $\tan\alpha = \dfrac{BC}{AB}$

b. $\sin\gamma = \dfrac{AB}{AC}$, $\cos\gamma = \dfrac{BC}{AC}$, $\tan\gamma = \dfrac{AB}{BC}$

8–19 **a.** $6,846$ **b.** $38,332$ **c.** $6,761$ **d.** $7,247$ **e.** $3,111$ **f.** $30,794$

8–20 **b.** $\tan\angle D = \dfrac{EF}{DE}$, $\tan\angle F = \dfrac{DE}{EF}$

8–21 **a.** AC **b.** $\dfrac{AD}{AC}$, $\dfrac{CD}{AC}$, $\dfrac{AD}{CD}$

8–22 **a.** $\dfrac{CD}{AC}$ **b.** $\dfrac{AD}{AC}$ **c.** $\dfrac{CD}{AD}$ **d.** $\dfrac{CD}{BC}$ **e.** $\dfrac{BD}{BC}$ **f.** $\dfrac{CD}{BD}$ **g.** $\dfrac{BD}{BC}$ **h.** $\dfrac{CD}{BC}$ **i.** $\dfrac{BD}{CD}$

8–23 **a.** $\triangle ADC$, CD, AD

b. $\tan\angle A = \dfrac{CD}{AD}$

c. $\tan\angle B = \dfrac{CD}{BD}$, $\tan\angle C_1 = \dfrac{AD}{CD}$, $\tan\angle C_2 = \dfrac{BD}{CD}$.

d. Er wordt vanuit gegaan dat $\angle C = 90^\circ$

8–24 28°, 62°

8–25 67°

8–26 $\tan\alpha = \dfrac{BC}{AC}$; 2,66

8–27 $\tan\beta = \dfrac{AC}{AB}$; 2,91

8–28 4,44

8–29 39,25

8–30 **a.** $AC = 12$

b. $\frac{12}{13}, \frac{5}{13}, \frac{12}{5}$
c. $\frac{5}{13}, \frac{12}{13}, \frac{5}{12}$

8–31 **a.** $\sin\alpha = \frac{BC}{AC}$, $\sin 20^\circ = \frac{BC}{12,6}$. **b.** 4,309
c. 1. 11,840
2. $\cos\alpha = \frac{AB}{AC}$, $\cos 20^\circ = \frac{AB}{12,6}$.
$AB = 12,6\cos 20^\circ \approx 11,840$

8–32 37°

8–33 13°

8–34 63°

8–35 **a.** $\sin\beta$ **b.** 4,915

8–36 $AC \approx 1,798$ en $BC \approx 0,877$

8–37 $AB \approx 4,448$ en $BC \approx 5,365$

8–38 $\alpha = 32^\circ$ en $\beta = 58^\circ$

8–39 **b.** $CD = \sqrt{21}$
c. $\angle ACD \approx 23,578^\circ \approx 24^\circ$
d. $\angle A \approx 66^\circ$, $\angle B \approx 66^\circ$ en $\angle C \approx 47^\circ$.

8–40 $CD \approx 5,638$ en $AB \approx 4,104$

8–41 39°

8–42 104 m

8–43 22°

8–44 27,6 m

8–45 11,9

8–46 13,05

8–47 **b.** 68° **c.** 51° **d.** $1,028$

8–48 3,73

8–49 $\beta = 63^\circ$ en $\gamma = 117^\circ$

8–50 **b.** 44° **c.** $5,6$

8–51 **a.** $\triangle APM \cong \triangle ARM$ **b.** $4,289$ **c.** $21,22$ **d.** $21,2$

8–52 **c.** 283 m

8–53 **a.** $\angle C_1 = 14^\circ$ en $\angle C_2 = 5^\circ$ **b.** $x = 0,249 \cdot d$ **c.** $y = 0,087 \cdot d$
d. $x + y = 0,337 \cdot d$ **e.** $d = 89$ m

8–54 $4\sqrt{2}$, $4\sqrt{2}$

8–55 $21\sqrt{3}$, 42

8–56 88, $44\sqrt{3}$

8–57 5, 10

8–58 $2\sqrt{3}$, $4\sqrt{3}$, 6, $6\sqrt{2}$

8–59 $3\sqrt{2}$, $3\sqrt{2}$, $6\sqrt{2}$, $3\sqrt{6}$

8–60 $6\sqrt{3}$, 6

8–61

a.	0	**d.**	0	**g.**	-1
b.	1	**e.**	-1	**h.**	0
c.	0	**f.**	0	**i.**	b.n.

8–62

a.	$0,940$	**d.**	$0,438$	**g.**	$-0,087$
b.	$-0,643$	**e.**	$-0,988$	**h.**	$-0,921$
c.	$-0,781$	**f.**	$0,017$	**i.**	$-0,649$

8–63 **a.** $\frac{1}{2}\sqrt{2}$ **b.** $-\frac{1}{2}\sqrt{2}$ **c.** $\frac{1}{2}$ **d.** $-\frac{1}{2}\sqrt{3}$ **e.** $-\frac{1}{2}\sqrt{3}$ **f.** $\frac{1}{2}$

8–64 **a.** $\alpha \approx 17^\circ \vee \alpha \approx 163^\circ$ **b.** $\alpha \approx 96^\circ$ **c.** $\alpha \approx 64^\circ \vee \alpha \approx 116^\circ$ **d.** $\alpha \approx 85^\circ$ **e.** $\alpha \approx 14^\circ \vee \alpha \approx 166^\circ$ **f.** $\alpha \approx 117^\circ$

8–65 **a.** $\alpha = 0^\circ \vee \alpha = 180^\circ$ **b.** $\alpha = 90^\circ$ **c.** $\alpha = 60^\circ \vee \alpha = 120^\circ$ **d.** $\alpha = 135^\circ$ **e.** $\alpha = 90^\circ$ **f.** $\alpha = 120^\circ$

8–66
a. tussen 0° en 180° is $\sin\alpha$ positief
b. omdat $-1 \leq \sin\alpha \leq 1$

8–67 **a.** $\alpha \approx 19^\circ \vee \alpha \approx 161^\circ$ **b.** $\alpha \approx 48^\circ$ **c.** geen enkele α **d.** $\alpha \approx 110^\circ$ **e.** $\alpha \approx 48^\circ \vee \alpha \approx 132^\circ$ **f.** geen enkele α

8–68 **a.** $\frac{16}{25}$
b. $\frac{9}{25}$
c. $\cos\alpha = -\frac{3}{5}$ of $\cos\alpha = \frac{3}{5}$
d. $\tan\alpha = -\frac{4}{3}$ of $\tan\alpha = \frac{4}{3}$

8–69 $\sin\alpha = -\frac{3}{5}$ of $\sin\alpha = \frac{3}{5}$
$\tan\alpha = \frac{3}{4}$ of $\tan\alpha = -\frac{3}{4}$.

8–70 $\cos\alpha = -\frac{5}{13}$
$\tan\alpha = -\frac{12}{5}$.

8–71 $\sin\alpha = \frac{1}{3}$.

8–72 $\cos\alpha = -\frac{1}{4}\sqrt{15}$ of $\cos\alpha = \frac{1}{4}\sqrt{15}$.

8–73 $\text{Opp}(\triangle ABC) = \frac{1}{2} \cdot AB \cdot BC \sin\angle B$
$\text{Opp}(\triangle ABC) = \frac{1}{2} \cdot BC \cdot AC \sin\angle C$

8–74 12,045

8–75 12,632

8–76 41,366

8–77 $\frac{27}{4}\sqrt{3}$, 32, $54\sqrt{3}$

8–78 **a.** 104,1; 40,4; 35,2; 77,6; 74,9; 11,0 m
b. 7233,4 m^2

8–79 **a.** 72°; **b.** 7,053; **c.** 85,595; **d.** 27,502

8–80 **a.** $3,139$; **b.** $99,93\%$; **c.** $\pi \approx 3,139$; **d.** 0,07%; **e.** nee, nee

8–81 **a.** 36°, 72° en 108°; **b.** $9,511$

8–82 $b \approx 4,9$ en $c \approx 6,6$.

8–83 $b \approx 5,6$ en $c \approx 4,6$.

8–84 $DF = 6\sqrt{2}$

8–85 $AB = 1112$ meter.

8–86 $b = 3$

8–88 **b.** $\sin\gamma \approx 0,511$ **c.** $\gamma \approx 31^\circ$

8–89 **b.** $\sin\beta \approx 0,704$ **c.** 135° en 45°

8–90 **a.** $\odot(C, 2)$ snijdt het andere been van hoek A niet.
b. $\sin\beta \approx 1,299$. Dit is niet mogelijk.

8–91 76° of 104°.

8–93 27°, 78°

8–94 **a.** $\beta = 45^\circ$; $\gamma = 103^\circ$ of $\beta = 135^\circ$; $\gamma = 13^\circ$
b. $\beta = 25^\circ$; $\gamma = 123^\circ$
c. 2,120

8–95 86°

8–96 108°

8–97 $\cos\angle K = \frac{1}{2}$, $\angle K = 60^\circ$

8–98 45°

8–100 12,5

8–101 $\sqrt{61}$

8–102 1,313; 129°

8–103 61°

8–104 6,890 km

8–105 55,1; 91°

8–107 2691 m

8–108 11,696 m

8–109 $MT = 33$ m; $LN = 31$ m

8–110 $x = 30^\circ$

Analytische meetkunde

9–1 $A(-5,3)$, $B(6,1)$, $C(3,5;-3,5)$, $D(0,-4)$, $E(-3,0)$, $F(6,0)$

9–4 **a.** afst=$2\sqrt{5}$; midden: $(-1,3)$ **b.** afst=3; midden: $(1,3\frac{1}{2})$

9–5 **a.** afst=$\sqrt{41}$; midden: $(-1\frac{1}{2},4)$ **b.** afst=$\sqrt{17}$; midden: $(-1,4\frac{1}{2})$

9–6 **a.** afst=$\sqrt{5}$; midden: $(-3\frac{1}{2},5)$ **b.** afst=$\sqrt{26}$; midden: $(-1\frac{1}{2},5\frac{1}{2})$

9–7 P : l; Q: l; R: k, l en m

9–8 P: b; Q: c; R: a en b

9–9

x	-3	-2	-1	0	1	2	3	4	5
y	-9	-7	-5	-3	-1	1	3	5	7

9–10

x	-2	-1	0	1	2	3	4
$y_1 = \frac{1}{2}x + 1$	0	$\frac{1}{2}$	1	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3
$y_2 = -2x + 5$	9	7	5	3	1	-1	-3
$y_3 = 1\frac{1}{2}x$	-3	$-1\frac{1}{2}$	0	$1\frac{1}{2}$	3	$4\frac{1}{2}$	6
$y_4 = 3x - 4$	-10	-7	-4	-1	2	5	8

9–11 ja, ja

9–12 nee, ja

9–13 $A(2,4)$ en $B(0,0)$
$C(1,-3)$ en $D(5,5)$
$E(0,8)$ en $F(-2,0)$
$G(0,-4)$ en $H(-2,0)$

9–14 (4,0) en (0,-6)

9–15 **a.** $(0,-4)$ en $(3,0)$
b. Alleen B
c. $p = 4\frac{1}{2}$

9–16 a: rico=3 b: rico=2 c: rico=3/2 d: rico=-1
e: rico=-1/3 f: rico=5/2 g: rico=-3/2

9–18 $y = \frac{1}{2}x$

9–23 **a.** $(0,5)$ en $(2,0)$; **b.** B en C; **c.** $p = 1\frac{1}{5}$

9–24 **a.** $(0,-5)$ en $(2,0)$; **b.** A en C; **c.** $p = 2\frac{4}{5}$

9–25

lijn	r.c.	doorsnijpunt y-as
l	3	-4
m	-2	5
n	$\frac{1}{3}$	5
o	$\frac{5}{3}$	10

9–26

lijn	r.c.	doorsnijpunt y-as
l	$-1\frac{1}{2}$	3
m	2	-2
n	$\frac{1}{2}$	$-\frac{3}{4}$
o	$\frac{1}{2}$	2

9–31 $y = 3$ $y = -2$ $x = 1$ $x = -2$

9–32 $\text{rico}_a = -1$; rico_b = b.n.; $\text{rico}_c = -\frac{1}{3}$; $\text{rico}_d = -\frac{1}{3}$
$c \parallel d$

9–34 $\text{rico}_a = -2$ $\text{rico}_e = 2$ i heeft geen rico
$\text{rico}_b = -3$ $\text{rico}_f = -\frac{1}{3}$ $\text{rico}_j = -3$
$\text{rico}_c = -1$ $\text{rico}_g = \frac{1}{2}$ $\text{rico}_k = 1$
$\text{rico}_d = -2$ $\text{rico}_h = \frac{1}{2}$ $\text{rico}_l = -3$
evenwijdig: a en d, g en h
en: b, j en l
loodrecht: $a \perp g$ $d \perp g$ $a \perp h$ $c \perp k$

9–35 $y = 2x - 1$

9–36 $l:\ y = -2x + 1$

9–37 $y = -2x - 1$

9–38 $\text{rico}_l = -2$; $\text{rico}_{AB} = -2$; $\text{rico}_m = \frac{1}{2}$;

9–39 $p:\ 4x - 2y = 20$

9–40
$l \quad y = 3x$
$m \quad 2x - 4y = -8$
$n \quad y = 3x + 1$
$o \quad x + 3y = 14$
$p \quad y = 2x$

9–41 **a.** $\text{rico}_l = -\frac{1}{2}$; **b.** $AB:\ y = -x + 3$; **c.** $y = \frac{1}{2}x + 5\frac{1}{2}$

9–42 l: $y = x + 1$
m: $y = 3x + 3$
n: $y = 3$

9–43 $y = 4x - 23$

9–44 $y = 3x - 3$

9–45 $y = 3x - 3$

9–46

P	l	$m \parallel l$	$n \perp l$
(3,2)	$y = 3x - 1$	$y = 3x - 7$	$y = -\frac{1}{3}x + 3$
(6,1)	$y = \frac{1}{2}x$	$y = \frac{1}{2}x - 2$	$y = -2x + 13$
(8,0)	$y = -x + 3$	$y = -x + 8$	$y = x - 8$
(0,0)	$y = 2x + 6$	$y = 2x$	$y = -\frac{1}{2}x$
(7,1)	$y = -5x - 3$	$y = -5x + 36$	$y = \frac{1}{5}x - \frac{2}{5}$
(3,0)	$y = 1$	$y = 0$	$x = 3$
(5,8)	$y = x$	$y = x + 3$	$y = -x + 13$
(2,2)	$x = 3$	$x = 2$	$y = 2$

9–47

P	l	$m \parallel l$	$n \perp l$
(5,6)	$y = -3x - 1$	$y = -3x + 21$	$y = \frac{1}{3}x + 4\frac{1}{3}$
(3,2)	$y = \frac{1}{2}x$	$y = \frac{1}{2}x + \frac{1}{2}$	$y = -2x + 8$
(3,4)	$y = 4x + 3$	$y = 4x - 8$	$y = -\frac{1}{4}x + 4\frac{3}{4}$
(0,4)	$y = -3x + 6$	$y = -3x + 4$	$y = \frac{1}{3}x + 4$
(4,0)	$y = \frac{1}{3}x - 3$	$y = \frac{1}{3}x - 1\frac{1}{3}$	$y = -3x + 12$
(3,2)	$y = -5$	$y = 2$	$x = 3$
(5,2)	$y = -\frac{2}{3}x$	$y = -\frac{2}{3}x + 5\frac{1}{3}$	$y = \frac{3}{2}x - 5\frac{1}{2}$
(-2,2)	$x = -3$	$x = -2$	$y = 2$

9–48 (1,4)

9–49 $l: y = 3x + 3$; $m: y = -x - 1$; $(-1, 1)$

9–50
$l \cap m = (-5\frac{1}{3}, -8\frac{1}{3})$
$l \cap n = (0, -3)$
$m \cap n = (-1\frac{1}{15}, \frac{1}{5})$

9–51 $S(3, 1)$

9–52
a. $(1, -1)$ **c.** $(14\frac{1}{2}, 3)$ **e.** $(-6, 9)$
b. $(4, 2\frac{1}{4})$ **d.** $(3, -2)$ **f.** $(2, -1)$

9–53
a. $(1, -2)$ **c.** $(2, -1)$ **e.** $(1, -3)$
b. $(1, 1)$ **d.** $(2, 4)$ **f.** $(0, -4)$

9–54 $l \cap m = (2, 2)$; $l \cap n = (0, -2)$; $m \cap n = (-3, 1)$

9–55 $=$ betekent: vallen samen; $\|$ betekent de lijnen lopen evenwijdig.

	a	b	c	d	e	f	g	h
a	$=$	$(1,6)$	$(0,5)$	$(0,5)$	$\|$	$=$	$(0,5)$	$(-3,2)$
b		$=$	$(2,4)$	$\|$	$(2,4)$	$(1,6)$	$(2,4)$	$(3,2)$
c			$=$	$(0,5)$	$(2,4)$	$(0,5)$	$=$	$(6,2)$
d				$=$	$(1,3)$	$(0,5)$	$(0,5)$	$(1\frac{1}{2},2)$
e					$=$	$\|$	$(2,4)$	$(0,2)$
f						$=$	$(0,5)$	$(-3,2)$
g							$=$	$(6,2)$
h								$=$

9–58 $AB: y = x + 8$, C ligt op AB

9–59 AB: $y = -2 \longrightarrow h_C : x = 2$
AC: $y = x + 2 \longrightarrow h_B : y = -x + 1$
$H = h_C \cap h_B = (2, -1)$

9–60 $\left.\begin{array}{lll} \text{AB:} & y = \frac{1}{2}x + 1\frac{1}{2} & \longrightarrow \quad \text{DE: } y = \frac{1}{2}x + 3 \\ \text{AD:} & y = 2x & \longrightarrow \quad \text{BE: } y = 2x - 3 \end{array}\right\} \Rightarrow E(4,5)$

$\left.\begin{array}{l} \text{BD:} y = -x + 6 \\ \text{AE:} y = x + 1 \end{array}\right\} \Rightarrow AE \perp BD$

9–64 **a.** $y = 2x + \ldots$ **b.** $y = -\frac{1}{2}x + \ldots$

9–65 ja, nee

9–66 $(2,3)$

9–67 $(3,5)$

9–68 **a.** $(2,-1)$

9–69 $l: y = -x + 5$; $m: y = \frac{1}{2}x + 3\frac{1}{2}$; $n: y = -2x - 4$

9–70 $l: y = 0,3x + 7$; $m: y = -\frac{1}{10}x$; $n: y = \frac{1}{5}x + 2$

9–71 $m: y = 3x + 3$; $n: y = -x + 4$

9–72 $\text{rico}_k = 2$; $\text{rico}_l = -1$; $\text{rico}_m = 3$;

9–76 A: nee; B: ja

9–77 P: nee; B: ja

9–78 **a.** $k: y = 6x + 19$; **b.** $(-3\frac{1}{6}, 0)$; **c.** $(0,19)$

9–79 **a.** $m: y = -3x + 2$; **b.** $(\frac{2}{3}, 0)$; **c.** $(0,2)$

9–80 $k \cap m = (-2,2)$ ligt niet op l

9–81 $k \cap l = (2,3)$ ligt op m

9–82 **a.** $y = -1\frac{1}{3}x + 5\frac{1}{3}$; **b.** $y = -1\frac{1}{3}x - 4$

9–83 $AB: y = x$; $BC: y = 20$; $AC: y = -\frac{1}{3}x + 20$; $h_B: y = \frac{1}{3}x + 12\frac{1}{3}$; $h_A: x = 5$; $h_C: y = -x + 20$; $D(5,20)$; $E(2,14)$; $F(10,10)$; $H(5,15)$; $AH = 10$; $BH = 5\sqrt{10}$; $CH = 5\sqrt{2}$; $AE = 3\sqrt{10}$; $AF = 5\sqrt{2}$; $BF = 10\sqrt{2}$; $BD = 15$; $CD = 5$; $CE = 2\sqrt{10}$; $DH = 5$; $EH = \sqrt{10}$; $FH = 5\sqrt{2}$; $EB = 6\sqrt{10}$; $CF = 10\sqrt{2}$; 150

9–84 $AB: y = -\frac{1}{4}x + 12\frac{1}{2}$; $BC: y = 8x - 4$; $AC: y = \frac{7}{5}x - 4$; $D(6,11)$; $E(1,4)$; $F(5,3)$; $z_A: y = \frac{2}{3}x + 3\frac{1}{3}$; $z_B: y = -3x + 18$; $z_C: y = 2\frac{1}{2}x - 4$; $Z(4,6)$; $ED: y = \frac{7}{5}x + 2\frac{3}{5}$; $DF: y = 8x - 37$; $EF: y = -\frac{1}{4}x + 4\frac{1}{4}$; $AB = 2\sqrt{17}$; $AC = 2\sqrt{74}$; $BC = 2\sqrt{65}$; $DE = \sqrt{74}$; $EF = \sqrt{17}$; $DF = \sqrt{65}$; 2 : 1; $ZA = 2\sqrt{13}$; $ZB = 2\sqrt{10}$; $ZC = 2\sqrt{29}$; $ZD = \sqrt{29}$; $ZE = \sqrt{13}$; $ZF = \sqrt{10}$; 2 : 1

9–85 $AB: x = 10$; $BC = \frac{1}{7}x + 10\frac{4}{7}$; $AC: y = -x + 6$; $D(10,4$; $E(3,11)$; $F(3,3)$; $m_a: y = -7x + 32$; $m_b: y = x$; m_c; $y = 4$; $M(4,4)$; $AM = BM = CM = 10$

Kangoeroe opgaven

10–1	E	10–34	B	10–68	E
10–2	C	10–35	C	10–69	B
10–3	C	10–36	E	10–70	C
10–4	E	10–37	A	10–71	D
10–5	C	10–38	C	10–72	E
10–6	A	10–39	B	10–73	D
10–7	E	10–40	C	10–74	B
10–8	B	10–41	C	10–75	D
10–9	B	10–42	C	10–76	D
10–10	E	10–43	B	10–77	E
10–11	B	10–44	A	10–78	A
10–12	E	10–45	C	10–79	C
10–13	B	10–46	B	10–80	B
10–14	D	10–47	D	10–81	E
10–15	E	10–48	E	10–82	B
10–16	A	10–49	D	10–83	E
10–17	C	10–50	D	10–84	D
10–18	C	10–51	B	10–85	D
10–19	B	10–52	C	10–86	A
10–20	B	10–53	C	10–87	D
10–21	C	10–54	D	10–88	E
10–22	A	10–55	D	10–89	B
10–23	E	10–56	D	10–90	A
10–24	B	10–57	D	10–91	A
10–25	C	10–58	A	10–92	A
10–26	C	10–60	E	10–93	E
10–27	D	10–61	A	10–94	D
10–28	D	10–62	D	10–95	D
10–29	E	10–63	C	10–96	E
10–30	C	10–64	C	10–98	E
10–31	D	10–65	E	10–99	C
10–32	B	10–66	E	10–100	C
10–33	C	10–67	C		