ANTWOORDEN

OP DE

VRAAGSTUKKEN VAN HET LEERBOEK DER GONIOMETRIE EN TRIGONOMETRIE

DOOR

D^R. B. GONGGRIJP EN P. WIJDENES

Lemb. Keb. Ind.
Kon. Bat. Gen.
V-58
NO.2.

RDHOFF — 1917 — GRONINGEN

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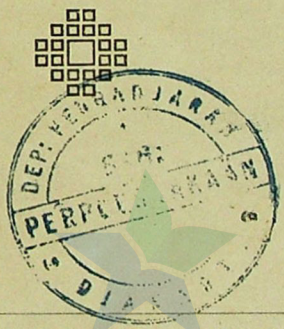

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VOORBERICHT.

De kolom onder „Aanteekeningen" is opengelaten om gebruikers de gelegenheid te geven uitkomsten van tusschenbewerkingen en gewijzigde notaties in de antwoorden op de gon. verg. te noteeren.

We betuigen onzen besten dank aan de Heeren P. S. Dauvillier, te Gouda, en C. van der Waals, te Rotterdam, voor hunne medewerking bij het uitrekenen der vraagstukken.

DR. B. GONGGRIJP.
P. WIJDENES.

PERPUSTAKAAN NASIONAL
anggal : 20-6-2010
omor Induk : 157/PN-Museum
B - ID : 0010-27332560
TEM - ID : 100803081
l : Museum Pusat

ERRATA IN DE VRAAGSTUKKEN:

Bldz. 47 No. 8c; gevraagd: log sin z in plaats van log tg z.
„ 51 No. 5a; lees 3222°.
„ 51 No. 18; laatste factor in den noemer; lees: sec. 320° 39′ 44″.
„ 65 No. 15; lees $2x$ ligt in het 2e kwadrant.
„ 84 No. 5b; lees 0,26 c.M.
„ 101 No. 20; lees 29,15 c.M. in plaats van 39,15 c.M.
„ 105 No. 9; lees $b = 28{,}206$ c.M.
„ 105 No. 11; lees $b = 613{,}72$ c.M.
„ 131 No. 4; lees $\angle$ A P B = 34°.
„ 132 No. 6; lees $c = 3889$.
„ 191 No. 12; lees B — C = 112° 36′ 42″.
„ 202 No. 7; er staat: „Bereken α, als de boog driemaal ...."
lees: „ „ „ „ koorde „

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HOOFDSTUK I.

Scherpe hoeken.

Aanteekeningen.

§ 4. 1. $\sin 30° = {}^1/_2$; $\cos 30° = {}^1/_2\sqrt{3}$;

Bldz. 4. $\operatorname{tg} 30° = {}^1/_3\sqrt{3}$; $\operatorname{cosec} 30° = 2$;

$\sec 30° = {}^2/_3\sqrt{3}$; $\cot 30° = \sqrt{3}$.

2. $\sin 45° = {}^1/_2\sqrt{2}$; $\cos 45° = {}^1/_2\sqrt{2}$;

$\operatorname{tg} 45° = 1$; $\operatorname{cosec} 45° = \sqrt{2}$;

$\sec 45° = \sqrt{2}$; $\cot 45° = 1$.

3. $\sin 60° = {}^1/_2\sqrt{3}$; $\cos 60° = {}^1/_2$;

$\operatorname{tg} 60° = \sqrt{3}$; $\operatorname{cosec} 60° = {}^2/_3\sqrt{3}$;

$\sec 60° = 2$; $\cot 60° = {}^1/_3\sqrt{3}$.

12. $\sin \alpha = p$; $\cos \alpha = \sqrt{1-p^2}$;

Bldz. 5. $\operatorname{tg} \alpha = \dfrac{p}{\sqrt{1-p^2}}$; $\operatorname{cosec} \alpha = \dfrac{1}{p}$;

$\sec \alpha = \dfrac{1}{\sqrt{1-p^2}}$; $\cot \alpha = \dfrac{\sqrt{1-p^2}}{p}$;

13. $\sin \alpha = \sqrt{1-q^2}$; $\cos \alpha = q$;

$\operatorname{tg} \alpha = \dfrac{\sqrt{1-q^2}}{q}$; $\operatorname{cosec} \alpha = \dfrac{1}{\sqrt{1-q^2}}$;

$\sec \alpha = \dfrac{1}{q}$; $\cot \alpha = \dfrac{q}{\sqrt{1-q^2}}$.

14. $\sin \alpha = \dfrac{r}{\sqrt{1+r^2}}$; $\cos \alpha = \dfrac{1}{\sqrt{1+r^2}}$;

$\operatorname{tg} \alpha = r$; $\operatorname{cosec} \alpha = \dfrac{\sqrt{1+r^2}}{r}$;

$\sec \alpha = \sqrt{1+r^2}$; $\cot \alpha = \dfrac{1}{r}$.

Bldz. 6. 16. $\sin \alpha = \dfrac{\sqrt{\sec^2\alpha - 1}}{\sec \alpha}$; $\cos \alpha = \dfrac{1}{\sec \alpha}$;

$\operatorname{tg} \alpha = \sqrt{\sec^2 \alpha - 1}$; $\operatorname{cosec} \alpha = \dfrac{\sec \alpha}{\sqrt{\sec^2\alpha - 1}}$;

; $\cot \alpha = \dfrac{1}{\sqrt{\sec^2\alpha - 1}}$.

17. $\sin \alpha = \dfrac{1}{\operatorname{cosec} \alpha}$; $\cos \alpha = \dfrac{\sqrt{\operatorname{cosec}^2\alpha - 1}}{\operatorname{cosec} \alpha}$;

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$$\operatorname{tg}\alpha = \frac{1}{\sqrt{\operatorname{cosec}^2\alpha - 1}};$$

$$\sec\alpha = \frac{\operatorname{cosec}\alpha}{\sqrt{\operatorname{cosec}^2\alpha - 1}};\quad \cot\alpha = \sqrt{\operatorname{cosec}^2\alpha - 1}.$$

19. $\cos\alpha = \sqrt{1 - \sin^2\alpha} = \frac{1}{\sqrt{1 + \operatorname{tg}^2\alpha}} =$

$$\frac{\cot\alpha}{\sqrt{1 + \cot^2\alpha}} = \frac{1}{\sec\alpha} = \frac{\sqrt{\operatorname{cosec}^2\alpha - 1}}{\operatorname{cosec}\alpha}.$$

20. $\operatorname{tg}\alpha = \frac{\sin\alpha}{\sqrt{1 - \sin^2\alpha}} = \frac{\sqrt{1 - \cos^2\alpha}}{\cos\alpha} =$

$$\frac{1}{\cot\alpha} = \sqrt{\sec^2\alpha - 1} = \frac{1}{\sqrt{\operatorname{cosec}^2\alpha - 1}}.$$

21. $\cot\alpha = \frac{\sqrt{1 - \sin^2\alpha}}{\sin\alpha} = \frac{\cos\alpha}{\sqrt{1 - \cos^2\alpha}} =$

$$\frac{1}{\operatorname{tg}\alpha} = \frac{1}{\sqrt{\sec^2\alpha - 1}} = \sqrt{\operatorname{cosec}^2\alpha - 1}.$$

22. $\sec\alpha = \frac{1}{\sqrt{1 - \sin^2\alpha}} = \frac{1}{\cos\alpha} =$

$$\sqrt{1 + \operatorname{tg}^2\alpha} = \frac{\sqrt{1 + \cot^2\alpha}}{\cot\alpha} = \frac{\operatorname{cosec}\alpha}{\sqrt{\operatorname{cosec}^2\alpha - 1}}.$$

23. $\operatorname{cosec}\alpha = \frac{1}{\sin\alpha} = \frac{1}{\sqrt{1 - \cos^2\alpha}} =$

$$\frac{\sqrt{1 + \operatorname{tg}^2\alpha}}{\operatorname{tg}\alpha} = \sqrt{1 + \cot^2\alpha} = \frac{\sec\alpha}{\sqrt{\sec^2\alpha - 1}}.$$

24. $\sqrt{2}$; $\sqrt{23}$. **25.** 1,5 $\sqrt{3}$; 3; hoeken 30° en 60°. **26.** 0,25 en 0,25 $\sqrt{3}$; 30° en 60°.

§ 5. **1.** $\sqrt{2} - 1$. **4.** 45°. **5.** $\sqrt{1 - (0.57)^2} = 0{,}82165$.

Bldz. 7. **6.** $\sin 75° = \frac{1}{\sqrt{1 + \operatorname{tg}^2 15°}}$;

$$\cos 75° = \frac{\operatorname{tg} 15°}{\sqrt{1 + \operatorname{tg}^2 15°}};\quad \operatorname{tg} 75° = \frac{1}{\operatorname{tg} 15°};$$

$$\operatorname{cosec} 75° = \sqrt{1 + \operatorname{tg}^2 15°};$$

$$\sec 75° = \frac{\sqrt{1 + \operatorname{tg}^2 15°}}{\operatorname{tg} 15°};\quad \cot 75° = \operatorname{tg} 15°.$$

Andere hoeken.

§ 13. Bldz. 15. **1.** $\sin 20°$; $-\cos 50°$; $-\operatorname{tg} 68° 57'$; $-\cot 44° 34' 46''$; $-\sec 69° 8' 59''$; $-\operatorname{cosec} 1° 44' 28''$.

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2. $-\cos 60° 41' 9''$; $-\cot 89° 24' 35''$;
$-\sin 21° 48' 23''$; $\operatorname{cosec} 32° 47' 12''$;
$-\operatorname{tg} 64° 59' 29''$; $-\sec 87° 1' 38''$.

3. $\sec 59° 42' 41''$; $-\cot 11° 54' 1''$;
$\cos 60° 32' 19''$; $\operatorname{cosec} 10° 58' 59''$;
$\operatorname{tg} 20° 6' 39''$; $-\sin 31° 34' 3''$.

4. [1]) $\sin 20°$; $-\sin 40°$; $-\cot 21° 3'$;
$-\cot 44° 34' 46''$; $-\operatorname{cosec} 20° 8' 59''$;
$-\operatorname{cosec} 1° 44' 28''$.

4. [2]) $-\sin 29° 18' 51''$; $-\operatorname{tg} 35' 25''$;
$-\sin 21° 48' 23''$; $\operatorname{cosec} 32° 47' 12''$;
$-\cot 25° 0' 31''$; $-\operatorname{cosec} 2° 58' 22''$.

4. [3]) $\operatorname{cosec} 30° 17' 19''$; $-\cot 11° 54' 1''$;
$\sin 29° 27' 41''$; $\operatorname{cosec} 10° 58' 59''$;
$\operatorname{tg} 20° 6' 39''$; $-\sin 31° 34' 3''$.

5. $\sin = {}^1/_2\sqrt{2}$; $\cos = -{}^1/_2\sqrt{2}$; $\operatorname{tg} = -1$;
$\cot = -1$; $\sec = -\sqrt{2}$; $\operatorname{cosec} = \sqrt{2}$.

6. $\sin = {}^1/_2\sqrt{3}$; $\cos = -{}^1/_2$; $\operatorname{tg} = -\sqrt{3}$;
$\cot = -{}^1/_3\sqrt{3}$; $\sec = -2$; $\operatorname{cosec} = \frac{2}{3}\sqrt{3}$.

7. $\sin = {}^1/_2$; $\cos = -{}^1/_2\sqrt{3}$; $\operatorname{tg} = -{}^1/_3\sqrt{3}$;
$\cot = -\sqrt{3}$; $\sec = -\frac{2}{3}\sqrt{3}$; $\operatorname{cosec} = 2$.

8. $\sin = -{}^1/_2\sqrt{2}$; $\cos = -{}^1/_2\sqrt{2}$; $\operatorname{tg} = 1$;
$\cot = 1$; $\sec = -\sqrt{2}$; $\operatorname{cosec} = -\sqrt{2}$.
$\sin = -{}^1/_2\sqrt{2}$; $\cos = {}^1/_2\sqrt{2}$; $\operatorname{tg} = -1$;
$\cot = -1$; $\sec = \sqrt{2}$; $\operatorname{cosec} = -\sqrt{2}$.

9. $\sin = -{}^1/_2\sqrt{3}$; $\cos = -{}^1/_2$; $\operatorname{tg} = \sqrt{3}$;
$\cot = {}^1/_3\sqrt{3}$; $\sec = -2$; $\operatorname{cosec} = -{}^2/_3\sqrt{3}$.
$\sin = -{}^1/_2\sqrt{3}$; $\cos = {}^1/_2$; $\operatorname{tg} = -\sqrt{3}$;
$\cot = -{}^1/_3\sqrt{3}$; $\sec = 2$; $\operatorname{cosec} = -{}^2/_3\sqrt{3}$.

10. $\sin = {}^1/_5\sqrt{5}$; $\cos = -{}^1/_2\sqrt{5}$; $\operatorname{tg} = -{}^1/_2$;
$\cot = -2$; $\sec = -\frac{2}{5}\sqrt{5}$; $\operatorname{cosec} = \sqrt{5}$.

Bldz. 16. 11. $\sin = -{}^1/_3\sqrt{6}$; $\cos = -{}^1/_3\sqrt{3}$; $\operatorname{tg} = \sqrt{2}$;
$\cot = {}^1/_2\sqrt{2}$; $\sec = -\sqrt{3}$; $\operatorname{cosec} = -{}^1/_2\sqrt{6}$.

12. $\sin = {}^1/_4\sqrt{13}$; $\cos = -{}^1/_4\sqrt{3}$; $\operatorname{tg} = -{}^1/_3\sqrt{39}$;
$\cot = -{}^1/_{13}\sqrt{39}$; $\sec = -\frac{4}{3}\sqrt{3}$; $\operatorname{cosec} = \frac{4}{13}\sqrt{13}$.

13. $\sin\alpha$; $-\sqrt{1-\sin^2\alpha}$; $-\dfrac{\sin\alpha}{\sqrt{1-\sin^2\alpha}}$;
$-\dfrac{\sqrt{1-\sin^2\alpha}}{\sin\alpha}$; $-\dfrac{1}{\sqrt{1-\sin^2\alpha}}$; $\dfrac{1}{\sin\alpha}$.

14. $-\sqrt{1-\cos^2\alpha}$; $\cos\alpha$; $-\dfrac{\sqrt{1-\cos^2\alpha}}{\cos\alpha}$;

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$$\frac{-\cos\alpha}{\sqrt{1-\cos^2\alpha}};\quad \frac{1}{\cos\alpha};\quad -\frac{1}{\sqrt{1-\cos^2\alpha}}.$$

15. $$-\frac{\operatorname{tg} x}{\sqrt{1+\operatorname{tg}^2 x}};\quad -\frac{1}{\sqrt{1+\operatorname{tg}^2 x}};\quad \operatorname{tg} x;$$

$$\frac{1}{\operatorname{tg} x};\quad -\sqrt{1+\operatorname{tg}^2 x};\quad -\frac{\sqrt{1+\operatorname{tg}^2 x}}{\operatorname{tg} x}.$$

16. $$\operatorname{tg}\alpha = -\frac{\sin\alpha}{\sqrt{1-\sin^2\alpha}} = \frac{\sqrt{1-\cos^2\alpha}}{\cos\alpha} =$$

$$\frac{1}{\cot\alpha} = -\sqrt{\sec^2\alpha - 1} = \frac{-1}{\sqrt{\operatorname{cosec}^2\alpha - 1}}.$$

17. $$\sin z = -\sqrt{1-\cos^2 z} = -\frac{\operatorname{tg} z}{\sqrt{1+\operatorname{tg}^2 z}} =$$

$$-\frac{1}{\sqrt{1+\cot^2 z}} = \frac{\sqrt{\sec^2 z - 1}}{\sec z} = \frac{1}{\operatorname{cosec} z}.$$

18. $$\cos y = \sqrt{1-\sin^2 y} = \frac{1}{\sqrt{1+\operatorname{tg}^2 y}} =$$

$$\frac{-\cot y}{\sqrt{1+\cot^2 y}} = \frac{1}{\sec y} = -\frac{\sqrt{\operatorname{cosec}^2 y - 1}}{\operatorname{cosec} y}.$$

Meetkundige Toepassingen.

§ 16. Bij berekening in 3 decimalen krijgt men :

Bldz. 21. 1. $C = 80° 40'$; $b = 54{,}1$ cM ; $c = 55{,}8$ cM.
2. $a = 6{,}276$ cM ; $B = 53° 24'$; $C = 69° 29'$.
3. $P = 53° 8'$; $Q = 59° 29'$; $R = 67° 23'$.
4. AC = 6,85 KM ; BC = 5,42 KM.
5. $\angle M = 101° 32'$.
6. 329 cM, 421 cM en 250 cM.

Hoofdwaarden en bijzondere waarden.

§ 19. Bldz. 27. 1. $\sin 15° = {}^1/_4(\sqrt{6} - \sqrt{2})$;
$\cos 15° = {}^1/_4(\sqrt{6} + \sqrt{2})$; $\operatorname{tg} 15° = 2 - \sqrt{3}$;
$\cot 15° = 2 + \sqrt{3}$; $\sec 15° = \sqrt{6} - \sqrt{2}$;
$\operatorname{cosec} 15° = \sqrt{6} + \sqrt{2}$.

2. Van $22{}^1/_2°$ zijn de resp. verh. : $\frac{1}{2}\sqrt{2-\sqrt{2}}$;

$$\frac{1}{2}\sqrt{2+\sqrt{2}};\quad \sqrt{2}-1;\quad 1+\sqrt{2};$$

$$\sqrt{4-2\sqrt{2}};\quad \sqrt{4+2\sqrt{2}}.$$

Bldz. 28. 3. Van 18° zijn zij :

$${}^1/_4(-1+\sqrt{5}),\ \frac{1}{4}\sqrt{10+2\sqrt{5}},$$

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$\frac{1}{5}\sqrt{25-10\sqrt{5}}$; $\sqrt{5+2\sqrt{5}}$, $\frac{1}{5}\sqrt{50-10\sqrt{5}}$ en $1+\sqrt{5}$. (Het buiten de wortels brengen der breuken *kan* aangewend worden ter bereiking van grootere nauwkeurigheid).

4. $\sin 36° = \frac{1}{4}\sqrt{10-2\sqrt{5}}$; $\cos 36° = \frac{1+\sqrt{5}}{4}$; $\operatorname{tg} 36° = \sqrt{5-2\sqrt{5}}$; $\cot 36° = \frac{1}{5}\sqrt{25+10\sqrt{5}}$; $\sec 36° = -1+\sqrt{5}$; $\operatorname{cosec} 36° = \frac{1}{5}\sqrt{50+10\sqrt{5}}$.

5. resp. $-\frac{1}{4}(-1+\sqrt{5})$, $-\frac{1}{4}\sqrt{10+2\sqrt{5}}$, $\frac{1}{5}\sqrt{25-10\sqrt{5}}$, $\sqrt{5+2\sqrt{5}}$, $-\frac{1}{5}\sqrt{50-10\sqrt{5}}$, $-1-\sqrt{5}$.

6. $-\frac{1}{4}(\sqrt{6}-\sqrt{2})$, $-\frac{1}{4}(\sqrt{6}+\sqrt{2})$, $2-\sqrt{3}$, $2+\sqrt{3}$, $\sqrt{2}-\sqrt{6}$, $-\sqrt{2}-\sqrt{6}$.

7. $\sin 292\frac{1}{2}° = -\frac{1}{2}\sqrt{2+\sqrt{2}}$; $\cos 292\frac{1}{2}° = \frac{1}{2}\sqrt{2-\sqrt{2}}$; $\operatorname{tg} 292\frac{1}{2}° = -1-\sqrt{2}$; $\cot 292\frac{1}{2}° = 1-\sqrt{2}$; $\sec 292\frac{1}{2}° = \sqrt{4+2\sqrt{2}}$; $\operatorname{cosec} 292\frac{1}{2}° = -\sqrt{4-2\sqrt{2}}$.

8. Zie no. 4; de 2e, 3e, 4e en 5e verh. worden negatief.

9. Zie no. 2; de 1e, 3e, 4e en 6e verh. worden negatief.

10. $\sin 108° = \frac{1}{4}\sqrt{10+2\sqrt{5}}$; $\cos 126° = -\frac{1}{4}\sqrt{10-2\sqrt{5}}$; $\operatorname{tg} 157° 30' = 1-\sqrt{2}$; $\cot 202° 30' = 1+\sqrt{2}$; $\sec 216° = 1-\sqrt{5}$; $\operatorname{cosec} 234° = 1-\sqrt{5}$.

11. $\sin 247\frac{1}{2}° = -\frac{1}{2}\sqrt{2+\sqrt{2}}$; $\cos 255° = -\frac{1}{4}(\sqrt{6}-\sqrt{2})$; $\operatorname{tg} 288° = -\sqrt{5+2\sqrt{5}}$; $\cot 306° = -\sqrt{5-2\sqrt{5}}$; $\sec 342° = \frac{1}{5}\sqrt{50-10\sqrt{5}}$; $\operatorname{cosec} 345° = -\sqrt{6}-\sqrt{2}$.

Algemeene Formules.

§ 24. Bldz. 33.

1. 20°, 40°, 140°, 160°, 260° en 280°.

2. 35°, 55°, 95°, 115°, 155° en 175°.

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3. 54° en 42°.
4. 35°, 95°, 155°, 215°, 275° en 335°.
5. — 290°, — 200°, — 110°, — 20°, + 70°, 160°, 250° en 340°.
6. 6° 25′, 173° 35′, 186° 25′ en 353° 35′.
7. 48° 33′ 20″ ; 108° 33′ 20″ ; 168° 33′ 20″ ; 228° 33′ 20″ ; 288° 33′ 20″ ; 348° 33′ 20″.
8. — 130° 20′; — 70° 20′ ; — 10° 20′ ; + 49° 40′; 109° 40′ ; 169° 40′.
9a. $x = 15° \pm k \times 360°$ en $x = 165° \pm k \times 360°$ of $(\pm 4k + 1)\, 90° \pm 75°$.
9b. $x = 82° \pm k \times 360°$ en $x = 98° \pm k \times 360°$ of $(\pm 4k + 1)\, 90° \pm 8°$.
10a. $x = 37° \pm k \times 180°$; **10b.** $x = 69° \pm k \times 180°$.
11a. $x = \pm 49° \pm k \times 360$;
11b. $x = \pm 38° \pm k \times 360°$.
12a. $x = 45°, 225°, 405°, 585°, 765°, 945°$.
12b. $x = 180°, 360°, 540°, 720°$ en $900°$.
12c. $x = 45°, 135°, 225°, 315°, 405°, 495°, 585°, 675°, 765°, 855°$ en $945°$.

§ 26. Bldz. 37.

2. $\text{tg}(90° + \alpha) = - \cot \alpha$;
$\cot(90° + \alpha) = - \text{tg}\, \alpha$;
$\sec(90° + \alpha) = - \text{cosec}\, \alpha$;
$\text{cosec}(90° + \alpha) = \sec \alpha$.

3. $\sin(180° + \alpha) = - \sin \alpha$;
$\cos(180° + \alpha) = - \cos \alpha$;
$\text{tg}(180° + \alpha) = + \text{tg}\, \alpha$;
$\cot(180° + \alpha) = + \cot \alpha$;
$\sec(180° + \alpha) = - \sec \alpha$;
$\text{cosec}(180° + \alpha) = - \text{cosec}\, \alpha$.

4. $\sin(270° - \alpha) = - \cos \alpha$;
$\cos(270° - \alpha) = - \sin \alpha$;
$\text{tg}(270° - \alpha) = \cot \alpha$;
$\cot(270° - \alpha) = \text{tg}\, \alpha$;
$\sec(270° - \alpha) = - \text{cosec}\, \alpha$;
$\text{cosec}(270° - \alpha) = - \sec \alpha$.

5. $\sin(270° + \alpha) = - \cos \alpha$;
$\cos(270° + \alpha) = \sin \alpha$;
$\text{tg}(270° + \alpha) = - \cot \alpha$;
$\cot(270° + \alpha) = - \text{tg}\, \alpha$;
$\sec(270° + \alpha) = \text{cosec}\, \alpha$;
$\text{cosec}(270° + \alpha) = - \sec \alpha$;

6. $\sin(360° - \alpha) = - \sin \alpha$;
$\cos(360° - \alpha) = \cos \alpha$;
$\text{tg}(360° - \alpha) = - \text{tg}\, \alpha$;

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$\cot(360° - \alpha) = -\cot\alpha$;
$\sec(360° - \alpha) = \sec\alpha$;
$\operatorname{cosec}(360° - \alpha) = -\operatorname{cosec}\alpha$;

7. $\cos 210° = -\cos 30° = -\frac{1}{2}\sqrt{3}$;
$\operatorname{tg} 225° = \operatorname{tg} 45° = 1$;
$\operatorname{cosec} 210° = -\operatorname{cosec} 30° = -2$;
$\sin 225° = -\sin 45° = -\frac{1}{2}\sqrt{2}$;
$\cot 240° = \operatorname{tg} 30° = \frac{1}{3}\sqrt{3}$;
$\sec 480° = -\operatorname{cosec} 30° = -2$.

8. $\sin 240° = -\cos 30° = -\frac{1}{2}\sqrt{3}$;
$\operatorname{cosec} 135° = \sec 45° = \sqrt{2}$;
$\operatorname{tg} 480° = -\cot 30° = -\sqrt{3}$;
$\cos 300° = \sin 30° = \frac{1}{2}$;
$\cot 210° = \cot 30° = \sqrt{3}$;
$\sec 225° = -\sec 45° = -\sqrt{2}$.

9. $-\sin 22° 25' 37''$; $\cos 27° 2' 43''$;
$-\operatorname{tg} 7° 41' 38''$; $-\cot 38° 54' 29''$;
$-\sec 18° 0' 59''$; $-\operatorname{cosec} 33° 27' 8''$.

10. $-\sin 33° 15' 12''$; $\cot 29° 52' 57''$;
$-\sin 39° 5' 41''$; $-\operatorname{tg} 32° 13' 8''$;
$\sec. 32° 11' 46''$; $-\sec 30° 1' 11''$.

11. $\operatorname{Sin}^2 22° 13' 5''$.

12. $\operatorname{tg}^2 41° 0' 27''$.

Bldz. 38. **16.** ja.

17. $\cos(315° + \alpha) = -\sin(315° - \alpha)$.

18. 1.

21. a) $\frac{1}{2}$; b) $\frac{1}{2}\sqrt{2-\sqrt{2}}$; c) $2+\sqrt{3}$; d) $-\frac{1}{3}\sqrt{3}$;
e) 2 ; f) 2.

22. a) $-\frac{1}{2}\sqrt{3}$; b) $-\frac{1}{2}$; c) $\frac{\sqrt{25-10\sqrt{5}}}{5}$;
d) $\sqrt{5-2\sqrt{5}}$; e) $\frac{\sqrt{50-10\sqrt{5}}}{5}$; f) $\frac{\sqrt{50+10\sqrt{5}}}{5}$.

23. $3\frac{1}{4}$.

24. 0.

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

26. $-\sin 12°$; $\cot 26°$; $\cot 8°$; $\sin 10°$.

Logarithmen der gon. verhoudingen.

§ 30. Bldz. 46. **1.** 9,73184 — 10 ; 9,97757 — 10 ; 9.98982 — 10 ;
0,70069 ; 0,035995 ; 0,31316.

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$\frac{\sqrt{25-10\sqrt{5}}}{5}$; $\sec 252° = -1-\sqrt{5}$;

$\operatorname{cosec} 252° = -\frac{\sqrt{50-10\sqrt{5}}}{5}$.

3b. $\sin 288° = -\frac{\sqrt{10+2\sqrt{5}}}{4}$; $\cos 288° = \frac{-1+\sqrt{5}}{4}$; $\operatorname{tg} 288° = -\sqrt{5+2\sqrt{5}}$;

$\cot 288° = -\frac{\sqrt{25-10\sqrt{5}}}{5}$; $\sec 288° = 1+\sqrt{5}$; $\operatorname{cosec} 288° = -\frac{\sqrt{50-10\sqrt{5}}}{5}$.

4a. $\frac{\sqrt{10-2\sqrt{5}}}{4}$; $-\frac{1+\sqrt{5}}{4}$; $-\sqrt{5-2\sqrt{5}}$;

$-\frac{\sqrt{25+10\sqrt{5}}}{5}$; $1-\sqrt{5}$; $\frac{\sqrt{50+10\sqrt{5}}}{5}$.

4b. $\frac{1-\sqrt{5}}{4}$; $-\frac{\sqrt{10+2\sqrt{5}}}{4}$; $\frac{\sqrt{25-10\sqrt{5}}}{5}$;

$\sqrt{5+2\sqrt{5}}$; $-\frac{\sqrt{50-10\sqrt{5}}}{5}$; $-1-\sqrt{5}$.

4c. $\frac{-1+\sqrt{5}}{4}$; $-\frac{\sqrt{10+2\sqrt{5}}}{4}$;

$-\frac{\sqrt{25-10\sqrt{5}}}{5}$; $-\sqrt{5+2\sqrt{5}}$;

$-\frac{\sqrt{50-10\sqrt{5}}}{5}$; $1+\sqrt{5}$.

5a. $\sin 3222° = \frac{1}{4}(+1-\sqrt{5})$; $\cos 3222° = \frac{1}{4}\sqrt{10+2\sqrt{5}}$; $\operatorname{tg} 3222° = -\frac{1}{5}\sqrt{25-10\sqrt{5}}$;

$\cot 3222° = -\sqrt{5+2\sqrt{5}}$; $\sec 3222° = \frac{1}{5}\sqrt{50-10\sqrt{5}}$; $\operatorname{cosec} 3222° = -(1+\sqrt{5})$.

5b. $\frac{1+\sqrt{5}}{4}$; $\frac{\sqrt{10-2\sqrt{5}}}{4}$; $\frac{\sqrt{25+10\sqrt{5}}}{5}$;

$\sqrt{5-2\sqrt{5}}$; $\frac{\sqrt{50+10\sqrt{5}}}{5}$; $-1+\sqrt{5}$.

5c. $-\frac{\sqrt{10-2\sqrt{5}}}{4}$; $\frac{1+\sqrt{5}}{4}$; $-\sqrt{5-2\sqrt{5}}$;

$-\frac{\sqrt{25+10\sqrt{5}}}{5}$; $-1+\sqrt{5}$; $-\frac{\sqrt{50+10\sqrt{5}}}{5}$.

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6. $\sin \alpha = -\frac{\sqrt{50 + 10\sqrt{5}}}{10}$;

$\cos \alpha = -\frac{\sqrt{50 - 10\sqrt{5}}}{10}$; $\operatorname{tg} \alpha = \frac{1 + \sqrt{5}}{2}$;

$\cot \alpha = \frac{-1 + \sqrt{5}}{2}$; $\sec \alpha = -\frac{\sqrt{10 + 2\sqrt{5}}}{2}$;

$\operatorname{cosec} \alpha = -\frac{\sqrt{10 - 2\sqrt{5}}}{2}$.

7. $\cos \alpha = -\frac{\cot \alpha}{\sqrt{1 + \cot^2 \alpha}}$.

8. $\sin \alpha = -\frac{\sqrt{\sec^2 \alpha - 1}}{\sec \alpha}$.

9. $\sin \alpha = -\frac{\sqrt{50 - 10\sqrt{5}}}{10}$;

$\cos \alpha = \frac{\sqrt{50 + 10\sqrt{5}}}{10}$; $\operatorname{tg} \alpha = -\frac{\sqrt{5} - 1}{2}$;

$\cot \alpha = -\frac{1 + \sqrt{5}}{2}$, $\operatorname{cosec} \alpha = -\frac{\sqrt{10 + 2\sqrt{5}}}{2}$.

10. $\operatorname{tg} \alpha = -\frac{\sin \alpha}{\sqrt{1 - \sin^2 \alpha}}$.

11. $\cos \alpha = -\frac{\sqrt{\operatorname{cosec}^2 \alpha - 1}}{\operatorname{cosec} \alpha}$.

17. $x = 30°$. **18.** $x = 151° 9' 54'' + k \times 180°$.

19. $x = 124° 21' 11'' \pm k \times 180°$.

20. 1,1756r; 0,76537r; 0,61803r; 0,51764r; 0,41583r.

Bldz. 52. **21.** 0,68404r; 0,34730r; 0,17431r; 0,087238r.

22. 0,86776r; 0,56347r; 0,47863r; 0,36750r.

23. 3,14154 (Zie Tafel D bldz. 224)

24. 1,4531R; 1,1547R; 0,82842R; 0,64984R; 0,53590R; 0,42511R.

25. 0,72795R; 0,35265R; 0.17498R; 0,087322R.

26. 0,96314R; 0.58724R; 0,49296R; 0,37387R.

27. $2 (\operatorname{tg} 18' - \sin 18') = 4 \operatorname{tg} 18' \sin^2 9' =$ 0,00000014355.

28. 3,1014 m.M. (Zie no. 27).

29. 1°. $x = 30° \pm k \times 360°$; 2°. $x = 150° \pm k \times 360°$.

30. 1.

31. 0,45425; 0,97237.

32. *a*. $x = \pm 60° \pm k \times 180°$.
b. $x = \pm 30° \pm k \times 180°$.

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33. $-\frac{3}{8}\sqrt{6}$.

34. 3,60573.

35a. cot a; **35b.** $2\sec^2 a$.

35c. $\sin x + \cos x = \cos(x - 45°)\sqrt{2}$.
Opm.: bij 35a geen dubbelteeken aan den $\sqrt{}$ geven; bij 35c is de uitkomst der rechtstreeksche berekening van sin x + cos x 10 maal zoo nauwkeurig als die van $\cos(x - 45°)\sqrt{2}$.

Bldz. 53. **36a.** 4. **36b.** $\sqrt{2+\sqrt{2}}$ (beide wortels pos. gerek.).

37. $1 - \frac{1}{2}\sqrt{6}$. **38.** $\pm\frac{p^2-q^2}{2pq}$.

39a. $\pm\frac{1}{2}\sqrt{2}$; **39b.** 0; **39c.** $\frac{1}{3}\sqrt{3}$; **39d.** -1;
39e. $-\sqrt{2}$; **39f.** $\pm\infty$.

40. De stukken der overstaande zijden zijn:
$4 + 4\sqrt{5} - 4\sqrt{5+2\sqrt{5}}$ en
$-5 - 3\sqrt{5} + 4\sqrt{5+2\sqrt{5}}$; verder is

$$\sin 9° = \cos 81° = \frac{\sqrt{8-2\sqrt{10+2\sqrt{5}}}}{4};$$

$$\cos 9° = \sin 81° = \frac{\sqrt{8+2\sqrt{10+2\sqrt{5}}}}{4};$$

$$\operatorname{tg} 9° = \cot 81° = 1 + \sqrt{5} - \sqrt{5+2\sqrt{5}};$$

$$\cot 9° = \operatorname{tg} 81° = 1 + \sqrt{5} + \sqrt{5+2\sqrt{5}}$$

$$\sec 9° = \operatorname{cosec} 81° =$$
$$\sqrt{12+4\sqrt{5}-2\sqrt{50+22\sqrt{5}}};$$

$$\operatorname{cosec} 9° = \sec 81° =$$
$$\sqrt{12+4\sqrt{5}+2\sqrt{50+22\sqrt{5}}}.$$

41a. 0. **41b.** $^1/_2$.

Optellings-theorema's.

§ 39. Bldz. 62. **9.** $\sin(90°+\alpha) = \cos\alpha$; $\sin(180°-\alpha) = \sin\alpha$;
$\sin(180°+\alpha) = -\sin\alpha$; $\sin(270°-\alpha) = -\cos\alpha$;
$\sin(270°+\alpha) = -\cos\alpha$; $\sin(360°-\alpha) = -\sin\alpha$.

10. $\cos(90°+\alpha) = -\sin\alpha$; $\cos(180°-\alpha) = -\cos\alpha$;
$\cos(180°+\alpha) = -\cos\alpha$; $\cos(270°-\alpha) = -\sin\alpha$;
$\cos(270°+\alpha) = \sin\alpha$; $\cos(360°-\alpha) = \cos\alpha$.

13. $\sin 15° = \frac{\sqrt{6}-\sqrt{2}}{4}$.

14. $\sin 75° = \frac{\sqrt{6}+\sqrt{2}}{4}$; $\sin 105° = \frac{\sqrt{6}+\sqrt{2}}{4}$.

15. $\cos 75° = \frac{\sqrt{6}-\sqrt{2}}{4}$; $\cot 105° = -2+\sqrt{3}$.

Aanteekeningen.

16. $\operatorname{tg} 15° = 2 - \sqrt{3}$; $\operatorname{tg} 165° = -2 + \sqrt{3}$.

17. $\operatorname{tg} 81° = 1 + \sqrt{5} + \sqrt{5 + 2\sqrt{5}}$;

$\cos 54° = \frac{\sqrt{10 - 2\sqrt{5}}}{4}$.

Bldz. 63. **26a.** $\cot \alpha$; **26b.** 0.

28. $\operatorname{tg}(a + b) = 1$.

31a. 0 ; **31b.** 4.

32. $\sin(\alpha + \beta) = \frac{1225}{1513}$ als α en β beide in het 1e of in het 3e kwadrant gelegen zijn.

$\sin(\alpha + \beta) = -\frac{1225}{1513}$ *1e.* als α in het 1e en β in het 3e kwadrant ligt.

2e. als α in het 3e en β in het 1e kwadrant ligt.

§ 41. **10.** $\sin 22° 30' = \frac{1}{2}\sqrt{2 - \sqrt{2}}$;

Bldz. 65. $\cos 22° 30' = \frac{1}{2}\sqrt{2 + \sqrt{2}}$;

$\operatorname{tg} 22° 30' = -1 + \sqrt{2}$; $\cot 22° 30' = 1 + \sqrt{2}$;

$\sec 22° 30' = \sqrt{4 - 2\sqrt{2}}$;

$\operatorname{cosec} 22° 30' = \sqrt{4 + 2\sqrt{2}}$.

11. $\sin 15° = \frac{\sqrt{6} - \sqrt{2}}{4}$; $\cos 15° = \frac{\sqrt{6} + \sqrt{2}}{4}$;

$\operatorname{tg} 15° = 2 - \sqrt{3}$; $\cot 15° = 2 + \sqrt{3}$;

$\sec 15° = \sqrt{6} - \sqrt{2}$; $\operatorname{cosec} 15° = \sqrt{6} + \sqrt{2}$.

12. $2 - \sqrt{2} - \sqrt{3} + \sqrt{6}$.

13. $-2 + \sqrt{2} - \sqrt{3} + \sqrt{6}$.

15. $\sin 3\alpha = -\frac{9\sqrt{10}}{50}$; $\cos 3\alpha = -\frac{13\sqrt{10}}{50}$;

$\operatorname{tg} 3\alpha = \frac{9}{13}$; $\cot 3\alpha = \frac{13}{9}$; $\sec 3\alpha = -\frac{5\sqrt{10}}{13}$; $\operatorname{cosec} \alpha = -\frac{5\sqrt{10}}{9}$.

16. $\operatorname{tg} 1\frac{1}{2}\alpha = \frac{9}{13}$; $\cos \frac{1}{4}\alpha = \frac{\sqrt{50 + 5\sqrt{10}}}{10}$; $\sin \frac{1}{4}\alpha = \frac{\sqrt{50 - 5\sqrt{10}}}{10}$.

17. $\operatorname{tg} 3\alpha = \frac{3 \operatorname{tg} \alpha - \operatorname{tg} \alpha}{1 - 3 \operatorname{tg}^2 \alpha}$.

23. $\sin(a + b + c) = \sin a \cos b \cos c + \cos a \sin b \cos c + \cos a \cos b \sin c - \sin a \sin b \sin c$.

24. $\cos(a + b + c) = \cos a \cos b \cos c - (\cos a \sin b \sin c + \sin a \cos b \sin c + \sin a \sin b \cos c)$.

Aanteekeningen.

§ 43. Bldz. 67.

1a. $2 \sin 2p \cos p = 4 \sin p \cos^2 p$;

1b. $2 \cos 2p \sin p$;

1c. $2 \cos 2p \cos p$;

1d. $2 \sin 2p \sin p = 4 \sin^2 p \cos p$.

2a. $\frac{\sin 3\alpha}{\cos 2\alpha \cos \alpha}$; **2b.** $\frac{\sin 3\alpha}{\sin 2\alpha \sin \alpha}$;

2c. $\frac{\operatorname{tg} \alpha}{\cos 2\alpha}$; **2d.** $\frac{1}{\sin 2\alpha} = \operatorname{cosec} 2\alpha$.

5a. $\cos(\alpha - 45°) \sqrt{2} = \sin(45° + \alpha) \sqrt{2}$;

5b. $\sin(45° - \alpha) \sqrt{2} = \cos(45° + \alpha) \sqrt{2}$;

5c. $2 \operatorname{tg} \alpha \cos^2 \frac{1}{2} \alpha$; **5d.** $2 \operatorname{tg} \alpha \sin^2 \frac{1}{2} \alpha$.

6a. $\frac{\sin \alpha}{\cos \frac{1}{2}(\alpha + \beta) \cos \frac{1}{2}(\alpha - \beta)}$;

6b. $\frac{\sin \alpha}{\sin \frac{1}{2}(\alpha + \beta) \sin \frac{1}{2}(\alpha - \beta)}$.

Bldz. 68.

11. $\operatorname{tg}(\alpha - 45°)$.

12. $4 \cos 2x \cos^2 \frac{1}{2} x$.

13. 2,8693; de rechtstreeksche berekening geeft nauwkeuriger : 2,86937 (Tafel C of D).

14. $4 \sin(\frac{\alpha}{2} + 15°) \cos(\frac{\alpha}{2} - 15°)$;

$4 \cos(\frac{\alpha}{2} + 15°) \sin(\frac{\alpha}{2} - 15°)$;

$4 \cos(15° + \frac{\alpha}{2}) \sin(15° - \frac{\alpha}{2})$.

15. $4 \cos(30° + \frac{1}{2}\alpha) \cos(30° - \frac{1}{2}\alpha)$;

$4 \sin(30° + \frac{1}{2}\alpha) \sin(30° - \frac{1}{2}\alpha)$;

$4 \sin(\frac{1}{2}\alpha + 30°) \sin(\frac{1}{2}\alpha - 30°)$.

16. $4 \sin 2x \cos(30° + \frac{1}{2}x) \cos(30° - \frac{1}{2}x)$.

17. $4 \cos 2x \cos(30° + \frac{1}{2}x) \cos(30° - \frac{1}{2}x)$.

§ 45. Bldz. 71.

12. 13,532. De rechtstreeksche berekening met behulp van Tafel C of D (Dr. Gonggrijp) geeft 13,53239.

13. 2,5058. (rechtstreeks 2,50582).

24. $\cot \alpha \cot \beta \cot \gamma$.

25. $\operatorname{tg} \alpha \operatorname{tg} \beta + \operatorname{tg} \beta \operatorname{tg} \gamma + \operatorname{tg} \gamma \operatorname{tg} \alpha = 1$.

Aanteekeningen.

Bldz. 72. **29.** $-4\cos\frac{3A}{2}\cos\frac{3B}{2}\cos\frac{3C}{2}$.

30. $4\cos\frac{1}{2}A\cos\frac{1}{2}B\cos\frac{1}{2}C$.

Tweede Herhaling.

§ 46. **1.** $\cos 2\alpha = \frac{7}{25}$; $\sin 3\alpha = \pm\frac{117}{125}$.

Bldz. 72. **2.** $2\cos^2\alpha$.

3. $\cos\alpha = -\frac{60}{61}$; $\text{tg}\,\alpha = -\frac{11}{60}$; $\cot\alpha = -5\frac{5}{11}$;

$\sec\alpha = -1\frac{1}{60}$; $\text{cosec}\,\alpha = 5\frac{6}{11}$.

4. $-\frac{1}{2}$.

5. 2.

7. $\text{tg}^2(45° + \frac{1}{2}\alpha)$.

8. 9,18272—10 ; 9,83968 — 10 ;
0,01866 ; 0,06592.

Bldz. 73. **11.** $2\sqrt{3}$.

12. $\sqrt{3}$; $-\sqrt{3}$; $\frac{1}{2}\sqrt{2}$; $\frac{\sqrt{6}-\sqrt{2}}{4}$.

14. 18,503 cM.

15. $\cos 2\alpha$; $\frac{2}{\cos 2\alpha}$; $\frac{1}{\sin\alpha}$.

16. neg : pos ; pos ; pos.

17. 9,4404 cM.

18. $\sin 2\alpha$.

19. $\frac{\sin 2\alpha}{2}$; $\cos\alpha$.

20a. $x = 11° 15' \pm k \times 90°$ en
$x = 33° 45' \pm k \times 90°$.

20b. $x = 7° 3' 10'',8 \pm k \times 72°$
en $x = 28° 56' 49'',2 \pm k \times 72°$.

22. $\cos 2a = \frac{7}{25}$; $\sin 2a = \pm\frac{24}{25}$.

23. 1e en 4e ; 3e en 4e ; 1e en 2e ; 2e en 3e ;
de tangens ; de cotangens.

24. $\frac{a^2 + b^2 - 2}{2}$.

25. Ja.

Bldz. 74. **26.** $x = \frac{a\sin\beta\cos\delta}{\sin(\beta+\delta)}$.

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27. $5° 25' 54''$; $41° 25' 54''$; $77° 25' 54''$; $113° 25' 54''$; $149° 25' 54''$; $185° 25' 54''$; $221° 25' 54''$; $257° 25' 54''$; $293° 25' 54''$; $329° 25' 54''$.

29. $x = (-1 \pm 12k)\,30°$ en $x = (7 \pm 12k)\,30°$.

30. $1°\ x = (24m - 1)\,15°$; $2°\ (24m + 7)\,15°$.

31. 0.

32. $\frac{\sin A}{\sin B}$.

33. $1°\ x = 0° \pm k \times 45°$; $2°\ x = 18° \pm k \times 72°$.

34. $\cot A = \frac{2p+1}{2p\,(p+1)}$; $\sec A = \pm \frac{2p^2+2p+1}{2p+1}$; $\cos A = \pm \frac{2p+1}{2p^2+p+1}$

$\sin A = \pm \frac{2p\,(p+1)}{2p^2+2p+1}$;

$\operatorname{cosec} A = \pm \frac{2p^2+2p+1}{2p\,(p+1)}$.

35. 4 cos A cos B sin C.

36. Ja, — voor waarden van α in het 2e en 3e kwadrant. De formule geldt niet voor $\alpha = -30°$, tenzij de tweede wortel negatief en de eerste positief gerekend wordt.

37. $-\sqrt{2}$; -1 ; $-\sqrt{2}$; $-\frac{1}{3}\sqrt{3}$.

38. tg $(p+q)$.

39. $\frac{\pi}{9}$, $\frac{5\pi}{18}$ en $\frac{11\pi}{18}$; de zijden verhouden zich als 34202 : 76604 : 93969.

40. $\pm(\sin\frac{1}{2}x + \cos\frac{1}{2}x)$ en $\pm(\sin\frac{1}{2}x - \cos\frac{1}{2}x)$.

Bldz. 75. **41.** $\frac{1}{2}$.

43. — 1,9207.

44. 1.

46. $1°.\ x = -(k\pi + \alpha)$; $2°.\ x = \frac{(2k+1)\pi}{8}$.

47. $86° 25' 0''$; $58° 48' 40''$; $34° 46' 20''$.

50. $x = 311° 59' 57'' \pm k \times 540°$.

51. $-\frac{\cos^4 a}{\sin a}$.

52. $x = \pm 85° 24' 30'' \pm (2k+1) \times 180°$.

54. $\operatorname{tg} 3a = \frac{3\operatorname{tg} a - \operatorname{tg}^3 a}{1 - 3\operatorname{tg}^2 a}$; $\sec 3a = \frac{\sec^3 a}{4 - 3\sec^2 a}$

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Rechthoekige Driehoeken.

Aanteekeningen.

§ 50. 1. 8,184 dM ; 10, 825 dM ; 50° 54′ 39″.

Bldz. 84. 2a. 1,5449 cM ; 60° 57′ 17″ ; 29° 2′ 43″.

2b. 0,052732 M ; 84° 9′ ; 5° 51′.

3. 9,902 KM ; 15,335 KM ; 40° 13′ 2″.

4. 3,0601 M ; 10,464 M ; 72° 59′ 47″.

5a. 32,148 cM ; 29° 25′ 3″ ; 60° 34′ 57″.

5b. c = 45,099000075 cM ; 89° 59′ 48″ ; 12″.

6a. 83° 53′ 34″ ; 48° 3′ 13″ ; 48° 3′ 13″.

6b. 51′ 34″ ; 89° 34′ 13″ ; 89° 34′ 13″.

7. 9,8760 dM ; 75° 27′ 6″,5.

8. 1° 55′ 34″ ; 1,44546 cM.

Bldz. 85. 22. $\frac{1}{4} c^2 \sin 2A$; $\frac{1}{2} a \sqrt{(c-a)(c+a)}$;

$\frac{1}{2} a^2 \cot A$; $\frac{1}{2} a^2 \operatorname{tg} B$; $\frac{1}{2} ab$.

23. 44,299 dM² ; 2,1488 cM² ; 0,013542 M² ; 57,976 KM² ; 15,515 M² ; 221,09 cM² ; 0,058629 cM².

25. 50° 37′ 30″ ; 39° 22′ 30″ ; de zijden zijn = 18,713 dM ; 15,357 dM ; 24,208 dM ; de zwaartelijnen zijn = 20,227 dM en 17,984 dM.

26. 70° 31′ 44″ ; 19° 28′ 6″ ; de zijden zijn = 42,426 cM en 14,1421 cM ; de biss. zijn = 17,320 cM, 40,585 cM en 14,776 cM.

27. 0,78615 ; 38° 10′ 22″ ; 51° 49′ 38″.

28. De zijden zijn = 15,619 M en 5,966 M ; de diagonaal is = 16,72 M ; de hoeken zijn = 20° 54′ 19″, 69° 5′ 41″, 138° 11′ 22″ en 41° 48′ 38″.

29. 2,3083 M ; 3.3745 M ; 7,3198 M².

30. 4,1509 cM ; 1,9972 cM.

Bldz. 86. 31. 19° 6′ 24″ ; 21° 47′ 12″.

33. AB = 11,3748 dM ; AC = 9,2394 dM ; BC = 6,6345 dM ; A = 35° 40′ 51″.

34. 395,15 maal.

35. 2015,8 M.

36. AD = 6,4823 dM ; BC = 6,827 dM ; AC = 13,478 dM ; C = 71° 42′ 39″ ; D = 108° 17′ 21″.

37. 74° 14′ 5″ ; 105° 45′ 55″ ; 11,532 dM.

38. 4,814 M ; 8,118 M ; 54° 48′ ; 125° 12′.

39. 30° en 150° ; 100,15 cM ; 51,841 cM ; 1343,75 cM².

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Scheefhoekige Driehoeken.

Aanteekeningen.

§ 56. Bldz. 100.

1. C = 61° 38′ 50″; a = 11,118 dM; b = 7,4836 dM.
2. C = 86° 21′ 26″; a = 5,7998 M; c = 9,8195 M.
3. B = 102° 39′ 1″; C = 32° 20′ 54″; a = 247,52 dM.
4. A = 77° 24′ 20″ of 102° 35′ 40″; C = 53° 16′ 17″ of 28° 5′ 57″; c = 10,594 of 6,2241 M.
5. Onmogelijk.
6. B = 90°; C = 22° 27′ 27″; c = 11,195 dM.
7. A = 35° 47′ 34″; B = 46° 59′ 6″; C = 97° 13′ 20″.
8. A = 36° 52′ 10″; B = 53° 7′ 50″; C = 90°.
9. B = 34° 17′ 44″; C = 109° 6′ 2″; a = 222,14 cM.
10. 37,297 dM.
11. 48° 38′ 50″; 28° 6′ 2″; 67° 44′ 54″,5; 35° 30′ 12″,5.
12. 80° 11′ 20″; 99° 48′ 40″; 80,542 cM; 149,22 cM.
13. 117° 25′ 50″; 62° 34′ 10″; 141° 11′ 16″; 38° 48′ 44″; 37,771 dM; 17,06 dM.
14. 61° 28′ 19″; 118° 31′ 41″; 136° 48′ 29″; 43° 11′ 31″; 5,8291 dM; 7,4757 dM; 133° 31′ 14″; 2 hoeken van 20° 56′ 48″; 2 hoeken van 25° 31′ 58″; 35° 58′ 11″; 97° 34′ 53″; 111° 16′ 31″; 22° 14′ 43″.
15. 5,9073 cM; 8,2102 cM.

Bldz. 101.

16. A = 63° 23′ 46″; B = 52° 53′ 32″; C = 63° 42′ 42″; a = 10,672 cM; b = 11,965 cM; c = 13,452 cM; PA = 7,1768 cM; PB = 6,5003 cM; PD = 3,3071 cM.
17. 25,896 M; 17,687 M; 70° 50′ 56″; 109° 9′ 4″.
18. 135° 54′ 35″; 107° 49′ 7″,5; 9,0546 dM.
19. 113° 57′ 8″; 14,407 cM; 6,4846 cM.
20. AB = 23,017 cM; BC = 21,063 cM. ∠ B = 92° 57′ 3″; ∠ C = 64° 55′ 48″; ∠ D = 96° 1′ 14″.
21. h_b = 57,343 M.
22. 17,148 cM.
23. PM = 54,643 M.

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24. EF = 15,864 cM.
25. 27° 6′ 45″ ; 46° 11′ 20″.
26. AF = 5,430 M ; FD = 6,126 M ;
AE = 6,197 M ; EC = 6,197 M ;
BF = 39,860 M ; BE = 37,593 M ;
EF = 2,267 M.
27. A = 78° 34′ 49″ ; B = 70° 54′ 35″ ;
C = 30° 30′ 36″ ; $a = 195$; $b = 188$.
28. 35,4 M ; 22,677 M ; 67° 25′ 15″ ; 36° 15′ 49″.

Bldz. 102. **29.** C = 68° 58′ 12″.
31. R = 8,2474 dM.
32. A = 107° 41′ 9″ ; B = 36° 56′ 33″ ;
C = 35° 22′ 18″ ; $a = 1170{,}2$; $b = 738{,}2$.
33. 14,813 M ; 12,539 M ; 46° 59′ ; 12° 45′ 30″.
34. B = 33° 44′ ; C = 86° 16′ ; $a = 11{,}1511$;
$b = 7{,}1511$; $c = 12{,}8489$.
35.

$$a = \frac{(m+n)(1-\cos A) \pm \sqrt{\{m^2\cos^2 A + n^2\cos^2 A + mn(1-2\cos A-\cos^2 A)\}}}{1-2\cos A};$$

$b = m - a$; $c = n - a$;

$$\sin B = \frac{(m-a)\sin A}{a} ; \quad \sin C = \frac{(n-a)\sin A}{a}$$

§ 58.
Bldz. 105.
1. O = 1595,7 cM².
2. O = 6045,1 M².
3. O = 85804 dM².
4. O = 5,6097 M².
5. O = 20167 cM².
6. O = 74,04 M².
7. O = 337,22 dM².
8. O = 50786 M² of 2470,4 M².
9. O = 273,18 cM².
10. O = 344231 M².
11. O = 190240 cM².
12. O = 5,4945 dM².
13. O = 1009,8 cM².
14. O = 78,276.
15. O = 1703,4 M².
16. O = 13,486 cM² ; diag. = 225,44 cM ;
hoek der diag. = 99° 31′ 31″ ;
zijden : 136,56 cM en 118,84 cM.
17. O = 133,62 M² ; 9,4068 M ; 15,123 M ;
69° 55′ 9″ ; 110° 4′ 51″.
18. O = 2965,28 M².
19. 58° 30′ 48″ ; 121° 29′ 12″ ; 20,325 M ;
O = 547,81 M².

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20. $O = 377{,}3\ dM^2$.
21. $O = 69{,}794\ cM^2$.
Bldz 106. 22. $O = 732{,}33\ cM^2$.
23. $O = 174{,}42\ M^2$.
24. $O = 388{,}13\ dM^2$.
25. $O = 94{,}63\ cM^2$.
26. $76° 58' 53''$; $103° 16' 30''$; $134° 31' 51''$; $45° 12' 46''$; 57,50 dM. ; 100,21 dM ; $O = 3065\ dM^2$.
27. $\angle S = 60° 22' 36''$; QR = 23,110 cM ; PS = 32,348 cM ; $O = 279{,}58\ cM^2$.
28. c = 15,197 M.
29. 9,982 M ; 7,148 M ; $O = 31{,}40\ M^2$.
30. $\angle D = 50° 4' 20''$.
31. AM = 130,91.

Merkwaardige Lijnen in den Driehoek.

§ 65. Bldz 117. 1. $BD = \frac{a \cos B \sin C}{\sin A}$; $CD = \frac{a \cos C \sin B}{\sin A}$; BD = 18,295 dM ; CD = 9,119 dM.
2. $44° 24' 56''$; $78° 27' 46''$; $57° 7' 18''$.
Bldz. 118. 3. 49,45 M.
4. 12,126 cM ; 5,3357 cM ; 9,9988 cM ; $100° 2' 11''$; $25° 40' 33''$.
5. 2,4984 M ; 1,4366 M ; 2,9080 M.
6. CD = 9,371.
7. $34° 41' 30''$; $88° 34' 4''$: $56° 44' 26''$; 475,26.
8. $108° 37' 8''$.
9. $50° 29' 33''$; $39° 30' 27''$.
10. 6,4313 ; 5,7187.
11. AB = 374,38 ; AC = 655,13 ; AD = 447,74.
12. 12,352.
13. 28,954.
14. $83° 56' 8''$; $53° 56' 8''$.
15. 23,225 ; 85,148.
16. AB = 34,125 ; $B = 62° 32' 34''$.
Bldz. 119. 17. $38° 27' 22''$; $30° 53' 31''$; $15° 55' 7''$.

Toegepaste Driehoeksmeting.

§ 69. 1. 20,925 M ; 47,925 M. *)

*) De uitkomsten van de opgaven van deze § kunnen (en moeten soms) belangrijk ingekort worden. De opgave van zooveel mogelijk decimalen dient als contrôlemiddel van de juistheid der interpolaties.

Aanteekeningen.

Bldz. 125. 2. 25,437 M.
3. 286,38 M.
4. 43,706 M.
5. 54,231 M.
Bldz. 126. 6. 496,32 M.
7. $\frac{a\sqrt{3}}{6} ; \frac{1}{2}\ a\ \text{tg}\ 2\alpha.$
8. $\frac{h\cos\alpha\cos\beta}{\sin(\alpha-\beta)} - \frac{a}{2\pi}.$
9. $\frac{h\sqrt{\sin(\alpha+\gamma)\sin(\alpha-\gamma)}}{\sin\alpha\sin\gamma} -$
$\frac{h\sqrt{\sin(\alpha+\beta)\sin(\alpha-\beta)}}{\sin\alpha\sin\beta}.$
10. 3550 M.
11. 1607,7 M.
12. 124,65 M.
13. Ja; BF = 5,455 KM.
Bldz. 127. 14. AC = 1,102 KM.
15. AL = 9,062 KM; BL = 9,110 KM.
16. CD = 1230 M.
17. AO = 771,1 M.
18. AB = 3658 M.

§ 71. 1. PA = 1614; PB = 2908; PC = 2008.
Bldz. 131. 2. PA = 1836; PB = 1990; PC = 2336.
3. PA = 10184; PB = 8926; PC = 10059.
4. PA = 3539; PB = 630,9; PC = 4267,5.
5. PA = 1778; PB = 4124; PC = 4526.
Bldz. 132. 6. PA = 5839; PB = 3009; PC = 2713.
7. PA = 2363; PB = 1768; PC = 3653,5.
8. PA = 6483; PB = 7763; PC = 2687.
9. PA = 2,4264 òf 6,3524;
$\angle$ APC = 135° 31′ 21″ òf 15° 31′ 21″.
10. BD = 79,433.
11. BD = 149,56.

Derde Herhaling.

§ 72. 2. A = 86° 41′ 40″; B = 27° 45′ 56″;
Bldz. 132. a = 3,8146; b = 1,7800.
3. A = 74° 23′ 37″; B = 50° 2′ 57″;
a = 149,96 cM; b = 119,36 cM.
4. 36° 35′ 13″; 23° 24′ 47″.
Bldz. 133. 6. CD = 16070 M.
7. h_c = 36,35.
9. 5,5748.

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10. $O = 75\ M^2$; $R = 8{,}602$ M.
12. $AD = 14{,}66$ cM.
13. 9,5176.

Bldz. 134. 14. In elken driehoek, want men kan beide leden herleiden tot $\frac{1}{r}$.

15. $A = 67° 14' 54''$; $B = 56° 38' 26''$; $MC = 8{,}504$ cM.
16. $B = 49° 26' 3''$; $AB = 37{,}32$.
19. $O = s^2 \operatorname{tg} \frac{1}{2}\alpha \operatorname{tg} \frac{1}{2}\beta \cot \frac{1}{2}(\alpha + \beta)$; $O = 510{,}4$.
20. 10 mM.
21. $B = 111° 24' 35''$; $C = 28° 35' 25''$; R 16,834 cM.
22. $C = 44° 53' 16''$.

Bldz. 135. 23. $A = 35° 21' 12''$; $C = 94° 38' 48''$; $b = 1{,}1108$; $c = 1{,}4452$.
24. $r = 4{,}4816$.
25. $\operatorname{tg} \frac{1}{2}A = \sqrt{\frac{(s-a)(s-d)}{(s-b)(s-c)}}$;
$\operatorname{tg} \frac{1}{2}B = \sqrt{\frac{(s-a)(s-b)}{(s-c)(s-d)}}$;
$\operatorname{tg} \frac{1}{2}C = \sqrt{\frac{(s-b)(s-c)}{(s-a)(s-d)}}$;
$\operatorname{tg} \frac{1}{2}D = \sqrt{\frac{(s-c)(s-d)}{(s-a)(s-b)}}$.
$O = \sqrt{(s-a)(s-b)(s-c)(s-d)}$.
$\operatorname{tg} \frac{1}{2}A = 0{,}91856$; $A = 85° 8' 18''$;
$\operatorname{tg} \frac{1}{2}B = 0{,}95876$; $B = 87° 35' 16''$;
$\operatorname{tg} \frac{1}{2}C = 1{,}08865$; $C = 94° 51' 42''$;
$\operatorname{tg} \frac{1}{2}D = 1{,}043$; $D = 92° 24' 44''$.
$O = 123{,}02$.
26. 5,2010 dM (of 3,9008 dM).
28. $92° 49'$; $87° 11'$.
29. $O_1 = 39{,}585\ cM^2$; $O_2 = 10{,}099\ cM^2$.
30. 49,575 M.
32. $r = \frac{a \cos A}{\sin A + \cos A + 1} = \frac{a \cos A}{4 \cos 45° \cos \frac{1}{2}A \cos (A - 45°)}$.

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33. $A = 74° 29' 54''$; $B = 62° 39' 54''$; $C\ 42° 50' 12''$.

34. $O = 69440$.

35. 8,9443 M.

Bldz. 136. **36.** $R = 103{,}50$.

37. $B = 129° 2' 52'',5$; $C = 10° 21' 52'',5$; $a = 3{,}6434$ M ; $b = 4{,}3491$ M ; $c = 1{,}0075$ M.

38. $b = 12{,}77$; $c = 10{,}65$; $A = 56° 50' 7''$; $C = 52° 5' 4''$.

39. $OB = 5{,}101$.

41. $R = 3{,}8137$.

42. $A = 75° 57' 30''$; $B = 39° 2' 30''$.

43. $O = r^2 \cot \frac{1}{2} A \cot \frac{1}{2} B \cot \frac{1}{2} C$.

45. 104,9 M.

Cyclometrische Vormen.

§ 76. Bldz. 150. **4.** $bg \cos \sqrt{\frac{a+b-x}{2b}} = \text{bg tg} \sqrt{\frac{-a+b+x}{a+b-x}}$.

5. $\frac{4}{5}$.

6a. 0,44721 ; **6b.** 0,96824 ; **6c.** $\frac{1}{2}$.

Bldz. 151. **7a.** $\frac{1}{3}\sqrt{3}$; **7b.** 1 ; **7c.** $\frac{1}{4}\sqrt{2}$.

10a. $x = \frac{156}{205}$; **10b.** $x = \frac{140}{221}$; **10c.** als $p^2 < q^2$, dan bg sin $(pq + \sqrt{1-p^2}\sqrt{1-q^2})$; als $p^2 > q^2$, dan $180° -$ bg sin $(pq + \sqrt{1-p^2}\sqrt{1-q^2})$.

10d. bg cos $(p\sqrt{1-q^2} - q\sqrt{1-p^2})$;

10e. $144° 41' 57''$; **10f.** $77° 20'$.

11a. $x = \frac{ab-1}{a+b}$ **11b.** $x = \frac{ab-1}{a+b}$.

12. $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.

14. $a^2 + b^2 = c^2$.

15. bgtg $3n$.

18. $180°$.

Bldz. 152. **21a.** 0 ; **21b.** 0.

22. $135°$.

23a. 13 ; **23b.** $\frac{1}{14}\sqrt{21}$; **23c.** $2b\sqrt{\frac{b}{a+3b}}$.

24a. $\sqrt{3}$; **24b.** $\pm \sqrt{\frac{abc}{a+b+c}}$.

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25. $\frac{a-b}{ab+1}$.

26. -1.

29. $x = \pm \sqrt{\frac{2 \operatorname{tg} \alpha}{1 + \operatorname{tg}^2 \alpha}} = \pm \sqrt{\sin 2\alpha}$.

Goniometrische Vergelijkingen.

§ 80. Bldz. 158.

1a. $x = k.\ 360° \pm 120° = (3k \pm 1)\ 120°$;

1b. $x = (4k - 1)\ 45°$; 1c. $(3k + 1)\ 60°$.

2a. $2\ k.\ 180° + 30°$; $(2k + 1)\ 180° - 30°$.

2b. $(4\ k + 1)\ 90° \pm 45°$; $(4\ k - 1)\ 90° \pm 45°$.

2c. Zie 2b.

3a. $x = 30° + k \times 180°$.

3b. $x = \frac{1}{2} \operatorname{bg} \sin \pm \sqrt{\frac{6}{7}} = \pm 33° 54'$ of $\pm 56° 6'$.

3c. $x = \operatorname{bg.\ cos.} \pm \sqrt{\frac{3}{5}} = \pm 39° 13' 53''$ of $\pm 140° 46' 7''$.

4a. $x = k.\ 120° \pm 20°$; $x = k.\ 180°$.

4b. $x = k.\ 180° + 75°$; $x = k.\ 180° + 15°$.

4c. $k.\ 120° \pm 30°$; $(4\ k + 1).\ 90° \pm 60°$.

5a. $(2\ k + 1)\ 180° \pm 60°$.

5b. $x = (2\ k + 1)\ 180° \pm 60°$; $x = k.\ 360° \pm 60°$.

5c. $x = k.\ 180°$; $x = (4\ k + 1)\ 90°$.

6a. $x = k.\ 180° \pm 61° 34' 40''$;
$k.\ 180° \pm 37° 25' 45''$.

6b. $x = k.\ 360° \pm 30°$; $x = k.\ 360° \pm 150°$.

6c. $x = k.\ 360° + 28° 23' 55''$;
$x = (2\ k + 1)\ 180° - 28° 23' 55''$.

7a. $x = k.\ 360° \pm 45°$; $x = (2k + 1)\ 180° \pm 45°$.

7b. $k.\ 360° \pm 30°$.

7c. $33° 22' 2'' \pm k.\ 360°$; $146° 37' 58'' \pm k\ 360°$;
$(2\ k + 1)\ 90°$.

8a. $x = (4\ k + 1)\ 90° \pm 30°$.

8b. $x = k.\ 180°$; $x = \pm 65° 54' 19'' + k.\ 360°$;
$x = \pm 114° 5' 41'' + k.\ 360°$.

8c. $x = k.\ 360°$; $x = \pm 120° + k.\ 360°$.

Bldz. 159.

9a. $x = k.\ 180°$.

9b. $x = (4\ k - 1)\ 90° \pm 60°$.

9c. $x = k.\ 180°$; $x = (4\ k + 1)\ 90° \pm 60°$.

10a. $2\ k.\ 180° \pm 74° 27' 28''$.

10b. $2\ k.\ 180° \pm 66° 49' 34''$.

10c. $k.\ 180° + 45°$.

11a. $x = 120° + k.\ 360°$.

11b. $x = (4\ k - 1)\ 90° + \alpha$; $x = (4\ k - 1)\ 90° - \alpha$.

11c. $x = k.\ 360°$; $x = k.\ 180° \pm 45°$.

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12a. $x = 30° + k.\,180°$; $x = 45° + k.\,180°$.

12b. $x_1 = 31°\,35'\,43'' + k.\,360°$;
$x_3 = 13°\,48'\,13'' + k.\,360°$;
$x_2 = 148°\,24'\,17'' + k.\,360°$;
$x_4 = 166°\,11'\,47'' + k.\,360°$.

12c. $x = k.\,360° \pm 46°\,42'\,42''$;
$x = k.\,360° \pm 58°\,3'\,21''$.
$x = k.\,360° \pm 133°\,17'\,18''$;
$x = k.\,360° \pm 121°\,56'\,39''$.

13a. $x = k.\,120° \pm 30°$, $x = k.\,180° \pm 60°$.

13b. $x = 8° + k.\,360°$; $x = 168° + k.\,360°$.

13c. $x = (4k + 1)\,90° \pm 60°$;
$x = (4k - 1)\,90° \pm 60°$.

14a. $x = k,\,180°$; $x = 45° + k,\,180°$.

14b. $x = \text{bg cos} \pm \sqrt{\dfrac{b - c - d}{a + b - 2c}}$.

14c. $x = k.\,60°$; $x = k.\,90° \pm 15°$.

15a. $x = (4k + 1)\,18°$; $x = (4k + 1)\,90°$.

15b. $x = k.\,180°$; $x = k.\,45°$.

15c. $x = k.\,180°$; $x = 22\frac{1}{2}° + k.\,45°$.

16a. $x = \dfrac{1}{7}\left(\dfrac{1}{4}\pi + 2k.\pi\right)$; $x = \dfrac{1}{4}\pi + 2k.\pi$.

16b. $x = \dfrac{1}{6}\pi + 2k.\pi.$; $x = \dfrac{2}{9}\pi + \dfrac{2}{3}k\pi$.

16c. $x = \dfrac{1}{3}(\alpha + \dfrac{1}{4}\pi + k\pi)$;

$x = \dfrac{1}{3}(-\alpha - \dfrac{1}{4}\pi + k\pi)$.

17a. $x = (2k + 1)\,22\frac{1}{2}°$.

17b. $x = (2k + 1)\,22\frac{1}{2}°$; $x = (2k - 1)\,45°$.

17c. $x = (2k + 1)\,15°$.

18a. $(2k + 1)\,22°\,30'$; $(2k + 1)\,45°$; $k.\,180°$.

18b. $x = k.\,180°$; $x = k.\,90° + 22\frac{1}{2}°$.

18c. $x = \dfrac{(4k + 1)\,90°}{m + n}$; $x = \dfrac{(4k + 1)\,90°}{m - n}$.

19a. $x_1 = (2k + 1)\,18°$; $x_2 = (2k + 1)\,45°$.

19b. $x = k.\,360°$; $x = k.\dfrac{720°}{n + 1}$; $x = k.\dfrac{720°}{n - 1}$.

19c. $x = \dfrac{12}{7}k\pi - \dfrac{1}{2}\pi$; $x = 12k\pi + \dfrac{1}{2}\pi$.

20a. $7°\,58'\,18'' + k.\,180°$; $52°\,1'\,42'' + k.\,180°$.

20b. $17°\,11'\,57'' + k.\,180°$;
$-61°\,11'\,57'' + k.\,180°$.

20c. $69°\,55'\,35'' + k.\,180°$; $30°\,4'\,25'' + k.\,180°$.

21a. $26°\,30'\,47'' + k.\,180°$.

21b. $6°\,15'\,40'' + k.\,180°$.

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21c. $353° 34' 57'' + k.\ 180°$.

22a. $\frac{1}{2}$ bg cos $(\frac{p-1}{p+1}$ cos 2 $a)$.

22b. $18° + k.\ 72°$; $\pm 90° + k.\ 360°$.

22c. $\frac{1}{2}$ bg sin $\left(\frac{p+1}{p-1}\ \sin\ 2\ a.\right)$

§ 84. 1. $k.\ 360° + 36° 51' 12''$; $k.\ 360° - 126° 51' 12''$.

Bldz. 169. 2. $x = 82° 45' 39'' + k.\ 360°$;
$x = (2k + 1)180° + 7° 14' 21''$.

3. $x = 8° 18' 37'' + k.\ 90°$.

4. $x = 45° + k.\ 180°$; $x = k.\ 360° - 90°$;
$x = k.\ 360° - 180°$.

5. $x = k.\ 120° - 5°$; $x = k.\ 120° + 35°$.

6. $x = 15° + k.\ 180°$.

7. $x = -3° + k.\ 72°$; $15° + k.\ 72°$.

8a. $x = 28° 47' 7'' + k.\ 360°$;
$x = 104° 49' 3'' + k.\ 360°$.

8b. $x = 75° 10' 57'' + k.\ 360°$;
$x = 151° 12' 53'' + k.\ 360°$.

8c. $x = 32° 29' 35'' + k.\ 360°$;
$x = 193° 54' 15'' + k.\ 360°$.

8d. $x = -32° 29' 35'' + k.\ 360°$;
$x = -193° 54' 15'' + k.\ 360°$.

Bldz. 170. 9. $x = 12° 7' 7'' + k.\ 360°$;
$x = 190° 30' 3'' + k.\ 180°$.

10. $k.\ 360° - 12''$; $143° 17' 44'' + k.\ 360°$.

11. $13° 59' 20'' + k.\ 360°$;
$27° 53' 20'' + k.\ 360°$.

12. $x = -4° 58' 48'' + k.\ 120°$;
$13° 29' 52'' + k.\ 120°$.

13. $9° 52' 20'' + k.\ 360°$; $80° 7' 40'' + k.\ 360°$.

14. $x = 30° + k.\ 360$; $x = 60° + k.\ 360°$.

15. $-39° 37' 32'' + k.\ 180°$;
$45° 59' 24'' + k.\ 180°$.

16. $x = 10° 22' 15'' + k.\ 45°$;
$x = -4° 13' 51'' + k.\ 45°$.

17. $49° 3' 39'' + k.\ 180°$; $136° 22' 25'' + k.\ 180°$.

18. $x = 81° 57' 24'' + k.\ 180°$;
$x = 99° 8' 16'' + k.\ 180°$.

19. $x = 166° 17' 1'' + k.\ 180°$.

20. $x = 42° 46' 7'' + k.\ 60°$ of
$x = 58° 40' 35'' + k.\ 60°$.

21. $-16° 59' 16'' + k.\ 180°$;
$48° 59' 36'' + k.\ 180°$.

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22. $x = 70° 59' 27'' + k.\ 180°$;
$x = 55° 40' 27'' + k.\ 180°$.

23. $x = 13° 58' 49'' + k.\ 180°$;
$x = 91° 41' 57'' + k.\ 180°$.

24. $x = 9'' + k.\ 90°$; $x = 50° 29' 16'' + k.\ 90°$.

25. $x = k.\ 180°$; $x = 45° + k.\ 90°$;
$x = 7° 10' 51'' + k.\ 360°$;
$x = 172° 49' 9'' + k.\ 360°$.

26. $x = k.\ 180° \pm 30°$.

27. $x = k.\ 180° \pm 63° 26' 6''$.

28. $x = k.\ 90°$; $x = k.\ 180°$;
$x = 135° + k.\ 180°$.

29. $x = 45° + k.\ 90°$; $x = 20° + k.\ 120°$;
$x = 40° + k.\ 120°$.

30. $x = k.\ 180°$; $x = k.\ 360° \pm 120°$;
$x = k.\ 360° \pm 82° 49' 10''$.

31. $x = k.\ 180° \pm 45°$; $x = k.\ 360° \pm 90°$;
$x = 255° 31' 21'' + k.\ 360°$;
$x = 104° 28' 39'' + k.\ 360°$.

Bldz. 171. 32. $0°, 180°$; $45°, 135°, 225°, 315°$;
$14° 28' 39''$; $165° 31' 21''$.

33. $x = 45° + k.\ 180°$;
$x = -\ 54° 44' 7'' + k.\ 180°$.

34. $x_1 = (4k + 1)\ 90°$; $x_2 = 30° \pm k.\ 360°$;
$x_3 = 150° \pm k.\ 360°$.

35. $x = (4k + 1)\ 90°$; $x = (4k + 1)\ 90° \pm 60°$.

36. $x = 36° + k.\ 72°$; $x = 90° + k.\ 180°$;
$x = 180° + k.\ 360°$.

37. $7° 14' 20'' + k.\ 180°$; $82° 45' 40'' + k.\ 180°$.

38. $x = 45° + k.\ 90°$.

39. $x = (4k + 1)\ 45° \pm 30°$.

40. $x = (2k + 1)\ 45°$;
$x = (4k + 1)\ 45° \pm 12° 18' 35''$.

41. $x = 45° + k.180°$; $x = -11° 18' 36'' + k.180°$.

42. $x = k.\ 90°$.

43. $x = (2k + 1)\ 90°$;
$x = k.\ 360° \pm 70° 31' 44''$.

44. $x = (4k + 1)\ 22\frac{1}{2}°$;
$x = (2k + 1)\ 180° \pm 60°$.

45. $x = k.\ 360° + 19° 28' 16''$;
$x = k.\ 360° + 160° 31' 44''$.

46. $x = 60° + k.\ 360°$; $x = 120° + k.\ 360°$.

47. $x = (2k + 1)\ 180° - 60°$;
$x = (2k + 1)\ 180° - 40°$.

48. $x = 45° + k.\ 180°$; $x = (4k - 1)\ 45° \pm 30°$;
$x = (4k + 1)\ 45°$.

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49. $k.\,180° + 40°\,23'\,25'' ;\ k.\,180° - 66°\,57'\,20''$.

50. $k.\,90° - 26°\,33'\,54''$.

51. $k.\,720° \pm 53°\,8' ;\ k.\,720° \pm 306°\,52'$.

52. $x = k.\,360° - 49°\,9'\,39'' ;$
$x = k.\,360° + 111°\,5'\,19''$.

53. $x = k.\,360° \pm 60° ;\ x = (2k+1)\,180 \pm 45°$.

54. $x = (4k+1)\,90° ;\ x = (4k+1)\,90° \pm 60°$.

55. $22°\,30' + k.\,90°$.

56. $(4k-1)\,45°$.

57. $x = k.\,90° ;\ x = k.\,60° - 15°$.

58. $x = k.\,180° ;\ x = (4k-1)\,90° ;$
$x = (2k+1)\,180°$.

59. $x = 15° + k.\,180° ;\ x = 75° + k.\,180°$.

Bldz. 172. **60.** $x = k.\,180° \pm 27°\,22'\,7''$.

61. $x = (4k+1)\,45° ;\ x = (4k-1)\,45°$.

62a. $x = k.\,180° - p° ;\ x = (2k+1)\,180° \pm 60° ;$

b. $x = (4k \pm 1)\,90° - p° ;$
$x = (2k+1)\,180° \pm 60° ;$

c. $x = \dfrac{2k\pi}{n} ;\ x = \dfrac{2k\pi - 2p}{n-1}$.

d. $x = \dfrac{2k\pi}{n} ;\ x = \dfrac{(2k+1)\pi - 2p}{n-1}$.

63. $x = k.\,30° ;\ x = (2k+1)\,30° ;$
$x = k.\,360° \pm 60°$.

64. $x = \dfrac{(2k+1)\,180°}{17} ;\ x = (2k+1)\,20° ;$
$x = (2k+1)\,60° \pm 20°$.

65. $x = \text{bg cos} \pm \sqrt{\dfrac{a+1 \pm \sqrt{a^2+2a-3}}{2}}$

66. $2k.\,180° + \text{bg sin}\,\dfrac{1}{2}\left(a \pm \sqrt{a^2+4}\right) ;$

$(2k+1)\,180° - \text{bg sin}\,\dfrac{1}{2}\left(a \pm \sqrt{a^2+4}\right)$

67. $x = \dfrac{1}{2}\,\text{bg sin}\,\dfrac{1}{2}\left(2a+1 \pm \sqrt{4a+5}\right)$.

68. $x = \dfrac{1}{2}\,\text{bg sin}\,\dfrac{2a^2 \pm 2a\sqrt{a^2+b^2}}{b^2}$

69. $x = \dfrac{1}{2}\,\text{bg cos}\left\{\dfrac{1}{4}\left(1 \pm \sqrt{9-16a}\right)\right\}$.

70. $x = k.\,360° \pm 90° ;\ x = \text{bg cos} \pm \sqrt{\dfrac{3}{4-a}}$.

71. Stel $\sin x + \cos x = y$, dan is $y + \dfrac{2}{y-1} = a ;$

$y = \dfrac{1}{2}\left(a+1 \pm \sqrt{a^2-2a-7}\right)$.

Aanteekeningen.

§ 86. Bldz. 174.

1. $x = 40° 1' 22''$; $y = 10° 11' 22''$.
2. $x = 24° 45' 48''$; $y = 59° 51' 52''$.
3. $x = 80°$; $y = 70°$.
4. $x = 65°$; $y = 25°$.
5. $x = 65° 2' 36''$ en $y = 26° 57' 24''$.
6. $x = 108° 53' 4''$; $y = 18° 23' 4''$.
7. $x = 40° 1' 9''$; $y = 29° 58' 51''$.
8. $\begin{cases} x = 70° 12' 22\frac{1}{2}'' \\ y = 10° 12' 22\frac{1}{2}'' \end{cases} \quad \begin{cases} x = 79° 47' 37\frac{1}{2}'' \\ y = 79° 47' 37\frac{1}{2}'' \end{cases}$
9. $x = 14° 51' 42''$; $y = 25° 8' 18''$ of omgekeerd.
10. $24° 8' 55''$; $14° 8' 55''$.
11. $x = 45°$; $y = 30°$; $x = 225°$; $y = 210°$.
12. $x = 180°$; $y = 90°$.
13. $x = 90°$; $y = 30°$.
14. $\dfrac{x \mid 45° \mid 81° \mid 9° \mid 27°}{y \mid 45° \mid 45° \mid 225° \mid 225°}$.
15. $x = 45°$; $y = 15°$.
16. $\begin{cases} x = -14° 53' 10'' \\ y = 35° 13' 30'' \end{cases} \quad \begin{cases} x = 125° 13' 30'' \\ y = -104° 53' 10''. \end{cases}$
17. $x = 9° 37' 36''$; $y = 66° 46' 24''$.
19. $x = 37° 30'$; $y = 7° 30'$; $z = 15°$.

Radialen.

§ 89. Bldz. 184.

1. $135°$; $720°$; $450°$; $150°$.
2. $-\sqrt{2}$; $\sqrt{2}$.
3. $(4k + 3)\,45°$; $\frac{1}{2}\sqrt{2}$; $-\frac{1}{2}\sqrt{2}$; $\frac{1}{2}\sqrt{2}$; $-\frac{1}{2}\sqrt{2}$; $\frac{1}{2}\sqrt{2}$; $-\frac{1}{2}\sqrt{2}$.
4. $\sin\frac{1}{6}\pi = \frac{1}{2}$; $\cos\frac{1}{6}\pi = \frac{1}{2}\sqrt{3}$; $\operatorname{tg}\frac{1}{6}\pi = \frac{1}{3}\sqrt{3}$; $\cot\frac{1}{6}\pi = \sqrt{3}$; $\sec\frac{1}{6}\pi = \frac{2}{3}\sqrt{3}$; $\operatorname{cosec}\frac{\pi}{6} = 2$.
5. -1 ; -1 ; $-\frac{2}{3}\sqrt{3}$.
6. $x_1 = \left(2k + \frac{1}{6}\right)\pi$; $x_2 = \left(2k + \frac{5}{6}\right)\pi$; $x = \left(2k \pm \frac{2}{3}\right)\pi$.

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7. $\cos \frac{1}{3} \pi$.
8. Negatief.
9. $x = \pi - \alpha$.

Staatsexamen tot toelating aan de Universiteiten.

§ 91. Bldz. 191.
1. $x = k.\,360°$; $x = (2k + 1)\,90°$; $x = (2k + 1)\,90° \pm 30°$.
2. 1,7814.
4. $\angle B = 60° 28''$; $\angle C = 47° 35' 32''$.
5. $x = (2k+1)\,90°$. $x = 24° 17' 42{,}5'' + k.\,180°$; $x = 65° 42' 17{,}5'' + k.\,180°$.
6. $\dfrac{O - r^2 \cot \frac{1}{2} A}{2r \sin A}$.
7. $x = 45° + k.\,180°$; $x = k.\,360°$; $x = 90° + k.\,360°$.
8. $\angle B = 34° 12' 50''$.
9. $x = k.\,72°$; $x = k.\,120°$; $x = k.\,180°$.
12. 10723.
13. $x = k.\,60°$; $x = (4k+1)\,18°$; $x = (4k+3)\,90°$.
14. $\frac{1}{9}\,m^2\,(\sin 2\alpha + \sin 2\beta)$.
15. $x = 39° 20' 40'' + k.\,90°$; $x = k.\,180°$.

Bldz. 192.
17. $x = k.\,180° \pm 30°$.
18. $38° 56' 34''$.

Eindexamen Gymnasia 1915.

§ 92. Bldz. 192.
1. $x = 18° + k.\,360°$; $x = 164° 36' 21'' + k.\,360°$.
3. 0° ; 15° ; 75° ; 180° ; 195° ; 255°.
4. 1,9584.
5. 0° ; 90° ; 155° 42′ 18″ ; 180° ; 270° ; 294° 17′ 42″.
6. 21,367 M.
8. $\angle A = 78° 11' 14''$; $\angle C = 41° 23' 23''$; $a = 23{,}608$; $b = 20{,}976$.
9. $22° 29' 55''$ en $32° 21' 17''$.

Bldz. 193.
11. 167,16 M².
13. $\angle A = 74° 15' 15''$; $\angle B = 20° 44' 45''$, $c = 19{,}9238$.
15. $x = 45° + k.\,90°$; $x = 90° + k.\,180°$; $x = k.\,360° \pm 104° 28' 39''$.
17. $x = 11° 44'' + k.\,180°$; $x = 78° 59' 16'' + k.\,180°$.
18. $85° 4' 1''$.

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19. $\angle A = 73° 3' 22''$; $\angle B = 36° 31' 41''$; $\angle C = 70° 24' 57''$; $c = 221{,}6$.
20. $x = 15° + k.\,90°$.
21. $23° 24' 48''$ en $36° 35' 12''$.
23. $x = 45° + k.\,90°$; $x = 30° + k.\,360°$; $x = 150° + k.\,360°$.
24. 15,197.
25. $x =$ oneindig.
26. 0,24188 dM.

Bldz. 194.

28. $15°$; $75°$; $195°$; $255°$.
29. 300 M.
30. $\angle A = 86° 54' 52''$; $\angle B = 23° 5' 8''$.
31. $38° 10' 22''$; $51° 49' 38''$.
32. 2184 M.
33. $\frac{7}{10}\sqrt{2}$.
34. 1,8535 M².
35. $0°$; $135°$; $270°$; $315°$.
36. $46° 8' 46''$.
37. $x = 45° + k.\,90°$.
38. $DE = 2$; $DE = \dfrac{C \sin \frac{1}{2} A \sin \frac{1}{2} B}{\cos A \cos \frac{1}{2}(B - A)}$.

Eindexamen H. B. S. met Vijfjarigen Cursus.

§ 93. 1. $54° 44' 8''$; $125° 15' 52''$.

Bldz. 195.

3. 13,221 M.
4. $285°$; $345°$.
6. 162,57 M.
7. $55° 47' 19''$; $124° 12' 41''$; $235° 47' 19''$; $304° 12' 41''$.
8. $135° + k.\,180°$; $x = 67° 5' 19'' + k.\,180°$.
9. 7,5095 M ; $61° 56' 42''$.

Bldz. 196.

10. $30°$; $90°$; $120°$; $150°$; $240°$; $270°$.
12. 9,982 M en 7,148 M ; 31,397 M².
13. $x = k.\,90°$; $x = k.\,180° \pm 49° 47' 50''$.
15. 25,645 M.
16. $0°$, $180°$; $45°$, $135°$, $225°$, $315°$; $14° 28' 39''$; $165° 31' 21''$.
17. $25° 54' 12'' + (2k + 1)\,30°$.
18. 9,9245.
19. $0°$; $15°$; $75°$.
21. $19° 17' 5''$.
22. $26° 33' 54''$; $153° 26' 6''$; $199° 35' 51''$; $340° 24' 9''$.

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Aanteekeningen.

23. $(\sqrt{3} - \sqrt{2})(\sqrt{2} - 1) = 0{,}13165$.

Bldz. 197. 24. 184,39.

25. 135° ; 315° ; 58° 38′ : 211° 22′.

26. 80,52 M².

28. 1,9585 cM ; 0,315 cM².

29. 5,7237 cM.

30. 0°, 90°, 180°, 270°, 70° 31′ 43″ en 289° 28′ 17″.

31. $\angle D = 69° 4′ 48″$; 24112 ; $R = 75{,}585$.

33. $15° 36′ 12″ + k.\ 60°$.

Bldz. 198. 34. $\angle C = 59° 29′ 23″$; $\angle A = 120° 30′ 37″$; $\angle B = \angle D = 90°$; 65 ; 25.

35. $\text{tg}\,(a + b) = -\frac{33}{56}$.

36. $90° + k.\ 180°$; $45° + k.\ 180°$.

37. 120° ; 150° ; 300° ; 330°.

38. 22,87 cM².

39. 21,187 cM.

40. 67° 30′ ; 126° 29′ 3″.

41. $3\frac{1}{3}$ cM.

42. 12,638 M².

43. 45°, 225°, 60° en 240°.

45. 9,7114.

Acte Wiskunde L. O.

§ 94. *) 1. $26\frac{1}{3}$.

Bldz. 199. 2. $\begin{cases} 53° 24′ 57″ \\ 330° 47′ 38″ \end{cases} \begin{cases} 125° 35′ 3″ \\ 209° 12′ 22″ \end{cases}$

$\begin{cases} 234° 24′ 57″ \\ 150° 47′ 38″ \end{cases} \begin{cases} 305° 35′ 3″ \\ 29° 12′ 22″ \end{cases}$

3. $\angle B = 56° 51′ 8″$; $\angle C = 52° 54′ 40″$.

5. $x = (4k + 1)\,45°$; $x = (4k + 1)\,11° 15′$.

6. $\angle A = 59° 13′ 10″$; $\angle B = 81° 46′ 10″$; $\angle C = 39° 0′ 40″$.

7. $126° 27′ 46″ + k.\ 180°$.

8. $\alpha = 10° 53′ 56″$.

9. 30°.

10. $154° 14′ 41″ + k.\ 180°$.

Bldz. 200. 11. $30° + k.\ 120°$; $x = k.\ 360°$.

13. 41° 17′ 26″ ; 78° 42′ 34″ ; 161° 17′ 26″ ; 198° 42′ 34″ ; 281° 17′ 26″ ; 318° 42′ 34″.

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*) De oplossingen vindt men in : „H. G. A. Verkaart Gids Wiskunde L. O." van 1908—1912 ; van de volgende jaren in het N. T. v. Wiskunde.

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14. $\angle A = 80° 42' 17\frac{1}{2}''$; $\angle B = 39° 17' 42\frac{1}{2}''$.

15. $60° + k.\,120°$.

16. $x = 1{,}1498$; $y = 296° 48' 3''$.

17. $x = \text{bg sin}\left(-1 + \sqrt{\frac{m}{m-1}}\right)$.

18. $\text{tg}\,\varphi = \frac{\text{tg}\,a}{\text{tg}\,b}$.

19. $x = 119° 44' 10'' \pm k \times 180°$.

20. $\angle B = \text{bg cot}\,\frac{a + \sqrt{a^2 + 3h^2}}{3h}$;
$\angle C = 2 \times \angle B$.

Bldz. 201. 21. $\cos\varphi_1 = \sqrt{\cot\beta \cot\gamma}$; enz.
($\angle$ $\angle$ van $\triangle$ ABC zijn α, β en γ).

22. Rechthoekig in C.

23. $x = k.\,360° \pm 60°$.
$y = k.\,360° \pm 109° 28' 17''$.

24. $20° 42' 17''$.

25. $x = 3\frac{1}{8}$.

26. $28° 36' 8''$ en $25° 15' 37''$.

27. $\angle A = 62° 48' 25''$; $\angle B = 142° 18' 44''$;
$\angle C = 67° 11' 35''$; $\angle D = 87° 41' 16''$.

Algemeene Herhaling.

§ 95. 2. $4 \cos A \cos B \cos C$.

Bldz. 202. 7. $60°$.

8. *a*) 2e en 3e; *b*) 6e en 7e; *c*) 4e en 5e. (Zie nr. 3132 Jg. IV, N. T. v. W.).

10. 2,22735.

11. $1° 8' 45''$; $1° 8' 46''$.

12. 1.

13. $\angle B_1 = 80° 39' 30''$ $\angle C_1 = 43° 7' 45''$,
$c_1 = 2136{,}95$, $O_1 = 2738940$; $r_1 = 700{,}57$,
$\angle B_2 = 99° 20' 30''$, $\angle C_2 = 24° 26' 45''$,
$c_2 = 1293{,}55$, $O_2 = 1657960$; $r_2 = 475{,}34$.

17. $\sqrt{a^2 - b^2}$.

18. 22,627 KM.

20. $1\frac{1}{4}$.

21. $x = (4k + 1)\,45°$;
$x = (4k + 3)\,45° \pm 35° 15' 52''$.

Bldz. 203. 22. CD = 7,2392; CE = 11,814.

23. $120° 17' 52''$, $300° 17' 52''$.

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Aanteekeningen.

25. 1148 M.
26. $^1/_3$.
27. $x = 30° 30' 34''$ en $y = 75° 45'$.
30a. $x = k.\,180°$; $x = (4k + 1)\,90° \pm 60°$.
30b. $(2k + 1)\,180° \pm 60°$.
30c. $x = k.\,180°$; $x = (4k + 1)\,90° \pm 45°$;
$x = (4k - 1)\,90° \pm 45°$.
31. 39 : 33 : 25.
32. 15°.
33. 13,966.
35. AP = 4622,2 ; BP = 7334,5 ; CP = 8449.
36. 90°.

Bldz. 204.

38a. $x = \pm 60° + k.\,360°$.
38b. $x = k.\,180°$; $x = k.\,180° - 45°$.
38c. $x = (4k + 1)\,45° \pm 15°$.
39a. $x = 2$. **39b.** $x = 3$.
41. 115,136.
42. $\operatorname{tg} x = \pm \sqrt{2}$; $\operatorname{tg} 3x = \mp \frac{1}{5}\sqrt{2}$.
43. $x = (4k + 1)\,45°$; $x = (4k - 1)\,45°$;
$x = \text{bgtg} \pm \sqrt{\frac{m-2}{m}}$.
45. $\frac{1}{8}(\cos 16a + \cos 12a) - \frac{3}{8}(\cos 8a + \cos 4a)$
$- \frac{1}{2}(\cos 6a + \cos 2a) + 1\frac{1}{5}$.
46. $x = 19875$.
49. $76° 50' 20'' + k.\,180°$; $21° 17' 25'' + k.\,180°$.
50. 20,854 ; opstaande 19,21 en 38,116 ;
$69° 59' 6''$ en $28° 15' 50''$.
51. $\frac{-2mn}{m^2 + n^2}$.
52. $-$ 0,0008675.
53. $x = \frac{1}{6}\sqrt{3}$.
54. $97° 41' 22''$ en $277° 41' 22''$.
55. CD = 207,66.

Bldz. 205.

57. $12° 9'$.
59a. $x = \text{bg cos}\left(\frac{1}{2}m \pm \sqrt{\frac{1}{4}m^2 - 1}\right)$;
59b. $x = \text{bg cos} \pm \sqrt{\frac{m+1}{2}}$.

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Aanteekeningen.

62.

	$\frac{\pi}{8} = 22° 30'$	$\frac{\pi}{16} = 11° 15'$	$\frac{\pi}{15} = 12°$	$\frac{4\pi}{15} = 48°$
sin	0,38268	0,19509	0,20791	0,74314
cos	0,92388	0,98079	0,97815	0,66913
tg	0,41421	0,19891	0,21256	1,11061
cot	2,41421	5,02734	4,70463	0,90040
sec	1.08239	1,01959	1,02234	1,49448
cosec	2,61313	5,12583	4,80973	1,34563

64. $4 \sin 2a \cos 3a \cos 4a$;
$4 \sin s \sin (s - a) \sin (s - b) \sin (s - c)$.

65. 0,83016.

66. 17,680 KM.

67. $x_2 = 2 \sin 18°$; $x_3 = -2 \sin 54°$.

Bldz. 206. **70a.** $2 \sqrt{2}$. **70b.** 1.

71. $70° 29' 36'' + k.\ 45°$.

73. 180°.

74. 14168,4.

75. $\frac{1}{2} b^2 \sin 2A$.

76a. 0. **76b.** 0.

77. 168,35 M.

79. $5° 16' 53'' + k.\ 45°$.

81. Midd. hoek moet zijn 51° 25′ 43″ ; wordt 51° 19′ 6″ ; fout 6′ 37″.

Bldz. 207. **82.** $(n^2 - m^2)^2 = 16\, mn$.

83a. $x = k.\ 180°$; $x = 15° + k.\ 180°$.

83b. $x = (2k. + 1)\ 180°$; $x = 45° + k.\ 180°$.

84a. $\frac{2ac}{a^2 + b^2}$; **b.** $\frac{c^2 - b^2}{a^2 + b^2}$; **c.** $\frac{2bc}{a^2 + b^2}$;

d. $\frac{c^2 - a^2}{a^2 + b^2}$; **e.** $\frac{2a}{b + c}$; **f.** $\frac{c - b}{c + b}$.

85. 0,110433.

87. 132706000 KM².

88. 32° 32′ 4″ ; 126° 22′ 34″.

89. 48,241 ; — 1,3117.

91a. $x_1 = -4233$; $x_2 = 0,8679$.

91b. $x_1 = 28,388$; $x_2 = 6,6603$.

92. $x_1 = 2\ (\text{bgtg}\ \frac{1}{2} + k.\ 180°)$;

$x_2 = 2\ (\text{bgtg}\ \frac{1}{m} + k.\ 180°)$.

93. $\frac{a^2}{m(p+n)} = \frac{b^2}{n(p+m)} = \frac{c^2}{p(m+n)}$;

$\frac{a}{4\sqrt{11}} = \frac{b}{\sqrt{203}} = \frac{c}{15}$.

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94a. $x = k.\,180° - 19°\,53'\,45''$;
$x = (2k+1)\,90° + 19°\,53'\,45''$.

94b. $\sin x = \sqrt{3}\sin a$.

95. $4°\,2'\,17'' + k.\,90°$.

Bldz. 208. **96.** $\cot\frac{1}{2}a - \cot 2^{n-1}a$.

97. $\frac{\sin 20a \sin 21a}{\sin a}$; — 1,077.

98. $b = 29{,}193$; $c = 25{,}338$; $\angle A = 33°\,44'\,33''$;
$\angle B = 86°\,15'\,27''$; $\angle C = 60°$.

99. $\sin 2x = \frac{2a^2 \pm 2a\sqrt{a^2+b^2}}{b^2}$.

100. $\sin 2x - 1{,}5\cos 2x = a + \frac{1}{2}$. ;

$a^2 + a - 3 < 0$;
$-1 - \sqrt{13} > 2a > -1 + \sqrt{13}$.
$x = 44°\,3'\,20'' + k.\,180°$;
$x = 102°\,15'\,18'' + k.\,180°$.

Veilige gids voor de studie Wiskunde L. O. en Kl.

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LOGARITHMENTAFELS.

Dr. B. GONGGRIJP.

D. Logarithmische en Goniometrische Tafels en Bijtafels . . . . . geb. *f* 1.70

Inhoud van tafel D:

I. Gewone Log. van de getallen van 1—10800.
II. Log. der Gon. Functies van 0°—90°.
III. Bijtafels.

A. Anti-Logarithmen.
B. Machten, Wortels en Omgekeerden.
C. Lengten van cirkelbogen.
D. Log. van rentefactoren.
E. Eenige constanten met hun logarithmen.
F. Tafel voor de omzetting van gewone log. in nep.
G. „ „ „ „ „ nep. log. in gewone.
H. Lengte van koorden voor $r = 1$.
K. Bases van gelijkb. △△ met hoogte = 1.

IV. Gon. functies van hoeken tot 90° met opklimming van één min. Aanhangsel: Sinus en Tangens in 5 cijfers nauwk. van 0° tot 6°.

A. Beknopte Log. en Gon. Tafels . . . . . gec. *f* 1.—
Deze omvat van tafel D. I, II en III D.

B. Beknopte Log. en Gon. Tafels en Bijtafels, geb. - 1.30
Bevat I, II, III en de Gon. functies om de tien minuten.

C. Tafel der rechtstreeksche waarden der gon. functies . . . . . gec. - 0.65
Bevat tafel IV van uitgave D.

P. WIJDENES, Logarithmen- en Rentetafels.

UITGAVE A. 3e druk . . . . . gec. - 0.40

INHOUD:

Eigenschappen. Aanwijzingen voor het gebruik van de logarithmentafel. Gewone of Briggsche logarithmen van de getallen 1—10800. Log. van eenige constanten bij cirkel en bol. Logarithmen van rentefactoren in 7 decimalen. Rentetafels: I $(1 + i)^n$ en II $(1 + i)^{-n}$ voor de percenten 2, $2^1/_2$, 3, $3^1/_2$, 4, $4^1/_2$, 5, $5^1/_2$ en 6; $i = \frac{p}{100}$. Machten, wortels en omgekeerden.

UITGAVE B. . . . . gec. *f* 0.50

Deze omvat uitgave A en bovendien: Rentetafel III $\Sigma\ (1 + i)^n$, aanwijzende het eindbedrag, als men ieder jaar *f* 1.— à p % op sam. interest zet. Deze geeft de sommen der getallen uit tafel I. Rentetafel IV $\Sigma\ (1 + i)^{-n}$, aanwijzende de contante waarde van n keer *f* 1.—. Deze geeft de sommen der getallen uit tafel II.

Rentetafel V $\frac{1}{\Sigma\ (1 + i)^{-n}}$, dit is de z.g. annuïteitentafel, aanwijzende met welk bedrag per jaar een kap. incl. de rente à p % kan worden afgelost.

UITGAVE C. . . . . *f* 0.25

Inhoud als A maar zonder aanwijzingen en rentetafels.

Al deze werken zijn stevig gecartonneerd of soliede gebonden.

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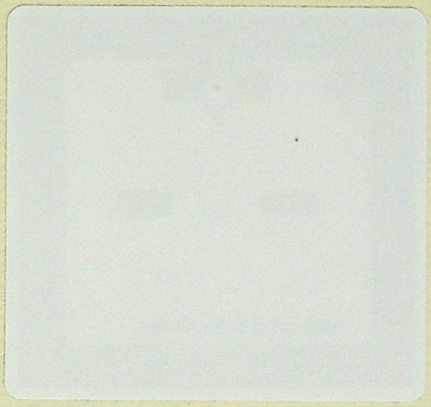

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