



**higher education
& training**

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NASIENRIGLYN

NASIONALE SERTIFIKAAT

BOU- EN STRUKTUUROPMETING N6

1 AUGUSTUS 2019

Hierdie nasienriglyn bestaan uit 9 bladsye.

VRAAG 1

- 1.1 Voorpeiling is die laaste lesing wat geneem word voordat 'n instrument geskuif word.
- 1.2 'n Waterpaslyn lê op die kontoeroppervlak en is dus normaalweg te alle tye in die rigting van swaartekrag.
- 1.3 Bodemhoogte is die laagste vlak van 'n pyplyn waar water sal vloei.
- 1.4 'n Kettingafstand is die posisie van 'n punt van die oorsprong af, 'n kettingafstand van 500 beteken byvoorbeeld die punt is 500 m van die oorsprong af.
- 1.5 Agoniese lyne is denkbeeldige lyne wat plekke op die oppervlak van die aarde waar die helling sero is, verbind.

(5 × 2)

[10]**VRAAG 2**

Stasie	Sirkel-links	Sirkel-regs	Gemiddelde hoek	Korreksie	Aangepaste hoek
B1	300:42:16	120:41:32			
B2	71:43:04	251:42:24			
	131:00:48	131:00:52	131:00:50	-00:00:02	131:00:48✓
B2	71:43:04	251:42:24			
B3	169:39:22	349:38:52			
	97:56:18	97:56:28	97:56:23	-00:00:02	97:56:21✓
B3	169:39:22	349:38:52			
B1	300:42:04	120:41:56			
	131:02:42	131:03:04	131:02:53	-00:00:02	131:02:51✓
			360:00:06	-00:00:06	360:00:00✓

Verbind T1 – B2:

$$Dy_{T1-B2} = -2\,991,62 - (-2\,562,56) \\ = -429,09✓$$

$$Dy_{T1-B1} = +3\,012,34 - 3\,862,12 \\ = -849,78✓$$

$$\text{Rigting } T1 - B2 = \frac{-429,06}{-849,78} \text{ 3de kwadrant}$$

$$\text{Tan}\theta = 0,50490715✓$$

$$5,061 = 78:49:22$$

Rigting T1 – B2: 206:47:22 258:49:22
 Hoek B2; T1; B2 97:56:21✓ 97:56:21
 T1 – B3 304:43:43 356:45:43
 Hoek B3; T1; B1 131:02:51✓
 T1 – B1 75:46:34
 Hoek B1; T1; B2 131:00:48
 T1 – B2 206:47:22✓

[10]

VRAAG 3

NAAM	VER-BIND	ΔY	ΔX	NAAM	Y	X
L				L	+1 882,96	+1 282,85
278:33:21		-255,99✓	+38,51✓			
258,87 m		-0,26✓	+0,24✓			
N1				N1	+1 626,71✓	+1 321,60✓
309:04:15		-118,44✓	+96,16✓			
152,56 m		-0,15✓	+0,14✓			
N2				N2	+1 508,12✓	+1 417,90✓
252:34:23		-239,00✓	-75,02✓			
250,50 m		-0,25✓	+0,23✓			
N3				N3	+1 268,87✓	+1 343,11✓
224:31:47		-186,00✓	-189,08✓			
265,24 m		-0,27✓	+0,24✓			
M				M	+1 082,60	+1 154,27
927,17✓		-799,43✓	-129,43✓		-800,36✓	-128,58✓
		-800,36✓	-128,58✓			
		-0,93✓	+0,85✓			

$\frac{-1,66}{927,17} \times \text{leg} \checkmark \quad \frac{+1,64}{927,17} \times \text{leg} \checkmark$

$7 \times 1 = 7$
 $26 \times 0,5 = \frac{13}{20}$ [20]

VRAAG 4

Stasie		Afstand		HI of middel- haar MH	Hoeke		HI – MH + -	Hoogte- komponent + -	Hoogte- verskil + -	Elevation of point	Remarks
Van	Tot	Stadia	Hor		Hor	Vert					
D				1,48						724,00✓	
	D1	3,98 1,26	267,20✓	2,62✓	84:34:00	97:38:00	-1,14✓	-35,81✓	-36,95✓	687,05✓	
	D2	2,84 1,24	155,88✓	2,04✓	182:46:00	80:46:00	-0,56✓	+25,34✓	+24,78✓	748,78✓	
	D3	4,26 1,48	276,21✓	2,87✓	268:02:00	85:24:00	-1,39✓	+22,22✓	+20,83✓	744,83✓	
	D4	3,98 1,28	262,99✓	2,63✓	344:44:00	99:16:00	-1,15✓	-42,91✓	-44,06✓	679,94	BM 1

$$\begin{aligned}
 16 \times 1 &= 16 \\
 8 \times 0,5 &= \underline{4} \\
 &= 20 \quad \mathbf{[20]}
 \end{aligned}$$

VRAAG 5

5.1

HOOGTE	KERE GEBRUIK	PRODUK
130,16	1	130,16✓
145,06	2	290,12✓
137,00	1	137,00✓
146,70	2	293,40✓
140,42	4	561,68✓
146,18	2	292,36✓
142,48	1	142,48✓
130,84	2	261,68✓
132,00	1	132,00✓
	16	2 240,88✓

$$\begin{aligned} \text{Gemiddelde hoogte} &= \frac{2\,240,88}{16} = 140,055\checkmark \\ &= 140,055 - 130,00 \\ &= 10,055 \\ &= 10,06 \text{ m}\checkmark \end{aligned}$$

$$\begin{aligned} V &= 4(30 \times 30) \times 10,06 \\ &= 3\,600 \times 10,06 \\ &= 36\,216,08 \text{ m}^3\checkmark \end{aligned}$$

$$\begin{aligned} 13\% &= 36\,216 \times 0,13 \\ &= 4\,708,08 \text{ m}^3\checkmark \end{aligned}$$

$$\begin{aligned} \text{Totale volume} &= 36\,216 + 4\,708,08 \\ &= 40\,924,08 \text{ m}^3\checkmark \end{aligned}$$

$$\begin{aligned} 10 \times 0,5 &= 5 \\ 5 \times 1 &= \underline{5} \\ &= 10 \quad (10) \end{aligned}$$

5.2 Die 136 m-kontoerlyn gaan deur tussen:

A1 en A2
A1 en B1
C2 en C1
C2 en B2
C3 en B3

Verskil in hoogte:

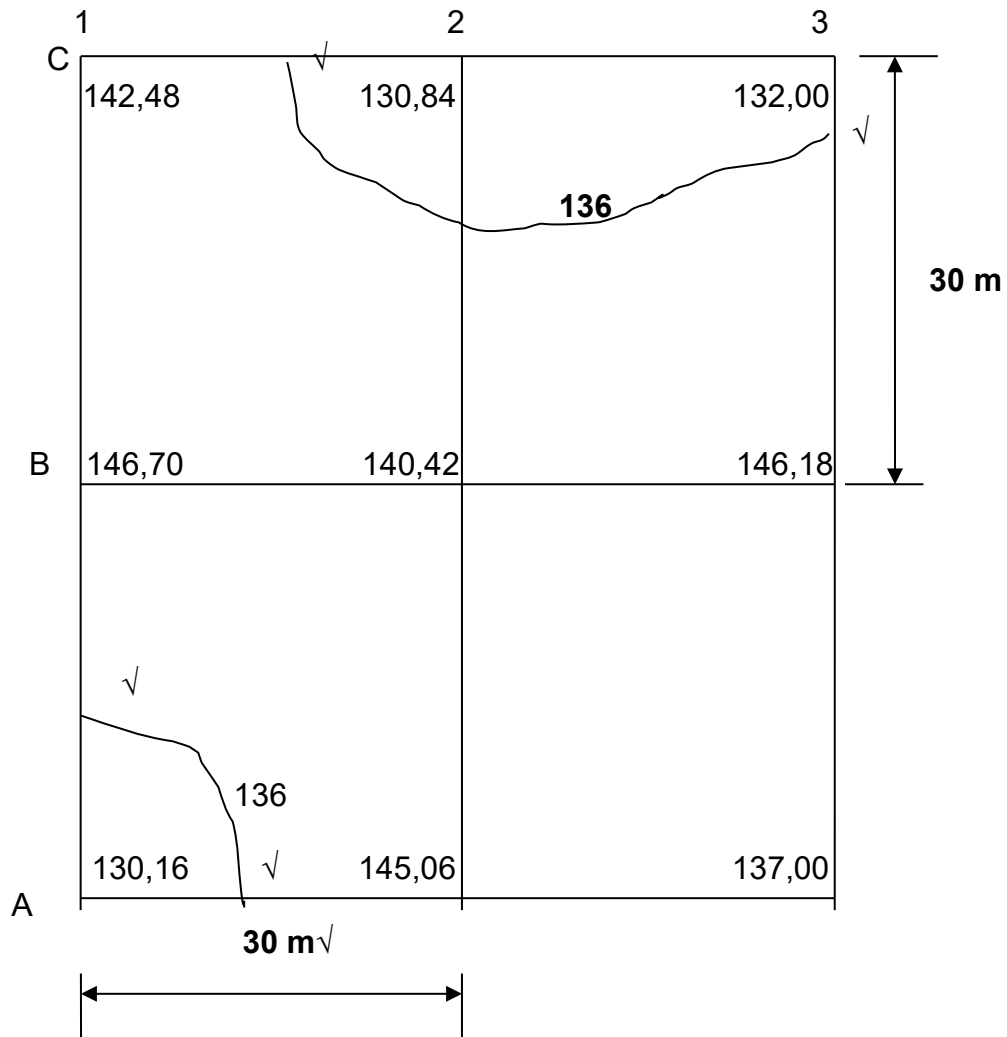
$$\begin{aligned} \text{A1 en A2} &= 145,06 - 130,16 = 14,90 \text{ m}\checkmark \\ \text{A1 en B1} &= 146,70 - 130,16 = 16,54 \text{ m}\checkmark \\ \text{C2 en C1} &= 142,48 - 130,84 = 11,64 \text{ m}\checkmark \\ \text{C2 en B2} &= 140,42 - 130,84 = 9,58 \text{ m}\checkmark \\ \text{C3 en B3} &= 146,18 - 132,00 = 14,18 \text{ m}\checkmark \end{aligned}$$

Verskil in hoogte na 136 m-kontoer (van laer vlak af):

$$\begin{aligned} \text{A1 en A2} &= 136,00 - 130,16 = 5,84 \text{ m}\checkmark \\ \text{A1 en B1} &= 136,00 - 130,16 = 5,84 \text{ m}\checkmark \\ \text{C2 en C1} &= 136,00 - 130,84 = 5,16 \text{ m}\checkmark \\ \text{C2 en B2} &= 136,00 - 130,84 = 5,16 \text{ m}\checkmark \\ \text{C3 en B3} &= 136,00 - 132,00 = 4,00 \text{ m}\checkmark \end{aligned}$$

Horisontale afstand na kontoer (van laer vlak af):

$$\begin{aligned} \text{B4 en C4} &= \frac{5,84}{14,90} \times 30 \text{ m} = 11,76 \text{ m}\checkmark \\ \text{D4 en C4} &= \frac{5,84}{16,54} \times 30 \text{ m} = 10,60 \text{ m}\checkmark \\ \text{B3 en C3} &= \frac{5,16}{11,64} \times 30 \text{ m} = 13,30 \text{ m}\checkmark \\ \text{D3 en C3} &= \frac{5,16}{9,58} \times 30 \text{ m} = 16,16 \text{ m}\checkmark \\ \text{C2 en C3} &= \frac{4,00}{14,18} \times 30 \text{ m} = 8,46 \text{ m}\checkmark \end{aligned}$$



(20 × ½)

(10)
[20]

VRAAG 6

6.1 $\Delta = 123:08:56 - 86:28:36$
 $= 36:40:20$

$$La = \frac{\pi \Delta R}{180} \checkmark$$

$$= \frac{\pi \times 36:40:20 \times 249,45}{180} \checkmark$$

$$= 159,66 \text{ m} \checkmark$$

$$BC = EC - LA \checkmark$$

$$= 1\,727,36 - 159,66 \checkmark$$

$$= 1\,567,70 \text{ m} \checkmark$$

$$(a = 12,30) = \frac{1\,718,9 \times 12,30}{249,45 \times 60} = 01:24:45 \checkmark$$

$$(a = 20,00) = \frac{1\,718,9 \times 20,00}{249,45 \times 60} = 02:17:49 \checkmark$$

$$(a = 7,36) = \frac{1\,718,9 \times 7,36}{249,45 \times 60} = 00:50:43 \checkmark$$

KETTINGAFSTAND	KOORD	ρ	α
BC 1 567,70		00:00:00	360:00:00 \checkmark
580,00	12,30	01:24:45	358:35:15 \checkmark
600,00	20,00	02:17:49	356:17:26 \checkmark
620,00	20,00	02:17:49	353:59:37 \checkmark
640,00	20,00	02:17:49	351:41:48 \checkmark
660,00	20,00	02:17:49	349:23:59 \checkmark
680,00	20,00	02:17:49	347:06:10 \checkmark
700,00	20,00	02:17:49	344:48:21 \checkmark
720,00	20,00	02:17:49	342:30:32 \checkmark
EC 1 727,36	7,36	00:50:43	341:39:49 \checkmark
159,66 \checkmark	159,66 \checkmark	18:20:11 \checkmark	18:20:11 \checkmark

$$9 \times 1 = 9$$

$$14 \times 0,5 = \underline{7}$$

$$= 16 \quad (16)$$

6.2

$$Cd = T \tan \frac{\Delta}{4}$$

$$T = R \tan \frac{\Delta}{2}$$

$$T = 249,45 \times \tan 18 : 20 : 10 \checkmark$$

$$T = 82,67 \checkmark$$

$$Cd = 82,67 \times \tan 09 : 10 : 05 \checkmark$$

$$Cd = 13,34 \text{ m} \checkmark$$

(4)

[20]**TOTAAL: 100**