

GAUTENG DEPARTMENT OF EDUCATION
SENIOR CERTIFICATE EXAMINATION
GAUTENGSE DEPARTEMENT VAN ONDERWYS
SENIORSER TIFIKAAT-EKSAMEN

FUNCTIONAL MATHEMATICS SG
FUNKSIO NELE WISKUNDE SG
(Second Paper: Geometry)
(Tweede Vraestel: Meetkunde)

Possible Answers / Moontlike Antwoorde
Feb / Mar / Maart 2006

SECTION / AFDELING 1

QUESTION / VRAAG 1

$$\begin{aligned}
 1.1 \quad AB &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \checkmark \\
 &= \sqrt{(7-1)^2 + (5+3)^2} \checkmark \\
 &= \sqrt{36+64} \checkmark \\
 &= \sqrt{100} \\
 &= 10 \checkmark
 \end{aligned}$$

$$\begin{aligned}
 1.2 \quad D &\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2} \right) \checkmark \\
 &= D \left(\frac{7+1}{2}; \frac{5-3}{2} \right) \checkmark \\
 &= D \left(\frac{8}{2}; \frac{2}{2} \right) \\
 &= D(4; 1) \checkmark
 \end{aligned}$$

$$\begin{aligned}
 1.3 \quad M_{AC} &= \frac{y_2 - y_1}{x_2 - x_1} \checkmark \\
 &= \frac{5+2}{7-8} \checkmark \\
 &= \frac{7}{-1} \\
 &= -7 \checkmark
 \end{aligned}$$

(4)

(4)

(3)

[11]

QUESTION / VRAAG 2

$$\begin{aligned}
 M_{AB} &= \frac{-3+4}{4-2} \checkmark \\
 &= \frac{1}{2} \checkmark \\
 M_{BC} &= \frac{-6+3}{-2-4} \checkmark \\
 &= \frac{3}{-6} \\
 &= \frac{1}{2} \checkmark
 \end{aligned}$$

$$\therefore M_{AB} = M_{BC} \checkmark$$

\therefore A,B,C points on the same line/
punte op dieselfde lyn.

[5]

QUESTION / VRAAG 3

$$(-4; m)x^2 + y^2 = 20$$

$$\therefore (-4)^2 + m^2 + 20 \checkmark$$

$$\therefore m^2 + 16 - 20 = 0$$

$$\therefore m^2 - 4 = 0 \checkmark$$

$$\therefore (m-2)(m+2) = 0 \checkmark$$

$$\therefore m = 2 \text{ of } m = -2$$

[5]

$$\checkmark \quad \checkmark$$

QUESTION / VRAAG 4

4.

$$3y - 12x = 15$$

$$\therefore 3y = 12x + 15 \quad \ddot{\cup}$$

$$\therefore y = 4x + 5$$

$$\therefore m = 4$$

$$\therefore m = 4 \quad (1;2)$$

$$y - y_1 = m(x - x_1) \quad \ddot{\cup}$$

$$\therefore y - 2 = 4(x - 1) \quad \ddot{\cup}$$

$$\therefore y = 4x - 4 + 2$$

$$\therefore y = 4x - 2 \quad \ddot{\cup}$$

[5]

QUESTION / VRAAG 5

$$5.1 \quad x^2 + y^2 = r^2 \quad (-3; 2) \quad \ddot{\cup}$$

$$\therefore (-3)^2 + 2^2 = r^2 \quad \ddot{\cup}$$

$$\therefore 9 + 4 = r^2$$

$$\therefore r^2 = 13 \quad \ddot{\cup} \ddot{\cup}$$

$$\therefore x^2 + y^2 = 13$$

(4)

$$5.2 \quad x^2 + y^2 = 26 \dots (1)$$

$$y = -5x \dots (2)$$

2 in 1

$$\therefore x^2 + (-5x)^2 = 26 \quad \ddot{\cup}$$

$$\therefore x^2 + 25x^2 = 26 \quad \ddot{\cup}$$

$$\therefore 26x^2 - 26 = 0 \quad \ddot{\cup}$$

$$\therefore 26(x^2 - 1) = 0 \quad \ddot{\cup}$$

$$\therefore 26(x-1)(x+1) = 0 \quad \ddot{\cup}$$

$$\therefore x = 1 \quad \text{of} \quad x = -1 \quad \ddot{\cup} \ddot{\cup}$$

$$y = -5(1)$$

$$y = -5(-1)$$

$$y = -5$$

$$y = 5$$

$$\therefore (1; -5)$$

$$(-1; 5) \quad \ddot{\cup}$$

(8)

[12]

TOTAAL A: [38]

SECTION / AFDELING B

QUESTION / VRAAG 6

$$6.1.1 \quad r^2 = p^2 + q^2 - 2pq \cos R \quad \ddot{\cup} \ddot{\cup} \quad (2)$$

$$6.1.2 \quad A_{Opp} = \frac{1}{2} pq \sin R \quad \ddot{\cup} \quad (1)$$

$$6.2.1 \quad AC^2 = AB^2 + BC^2 - 2AB \cdot BC \cos B \quad \ddot{\cup}$$

$$= 9^2 + 9^2 - 2(9)(9) \cos 114^\circ \quad \ddot{\cup}$$

$$= 81 + 81 - 162(-0,406736\dots) \quad \ddot{\cup}$$

$$= 227,89\dots \quad \ddot{\cup}$$

$$\therefore ac = 15,1 \text{ cm} \quad \ddot{\cup} \quad (5)$$

$$6.2.2 \quad Opp.v. \Delta ABC = \frac{1}{2} AB \cdot BC \cdot \sin B \quad \ddot{\cup}$$

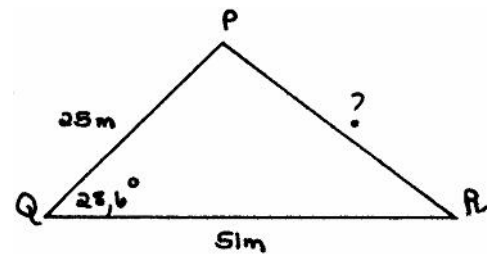
$$= \frac{1}{2} (9)(9) \sin 114^\circ \quad \ddot{\cup}$$

$$= 37,0 \text{ cm}^2 \quad \ddot{\cup} \quad (3)$$

[11]

QUESTION / VRAAG 7

7.1.1



$$PR = PQ^2 + QR^2 - 2PQ \cdot QR \cos Q \quad \ddot{\cup}$$

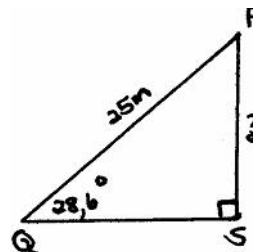
$$= 25^2 + 51^2 - 2(25)(51) \cos 28,6^\circ \quad \ddot{\cup}$$

$$= 625 + 2601 - 2550(0,877982975) \quad \ddot{\cup}$$

$$= 987,1434\dots \quad \ddot{\cup}$$

$$= \underline{PR = 31,42} \quad \ddot{\cup} \quad (5)$$

7.1.2



$$\frac{PS}{\sin Q} = \frac{PQ}{\sin S} \quad \ddot{u}$$

$$\therefore PS = \frac{25}{\sin 28,6^\circ} \sin 90^\circ \quad \ddot{u}$$

$$\therefore PS = \frac{25 \sin 28,6^\circ}{\sin 90^\circ} \quad \ddot{u}$$

$$\therefore PS = 11,97 \text{ m} \quad \ddot{u}$$

(4)

OR / OF

$$\sin Q = \frac{RS}{PQ} \quad \ddot{u}$$

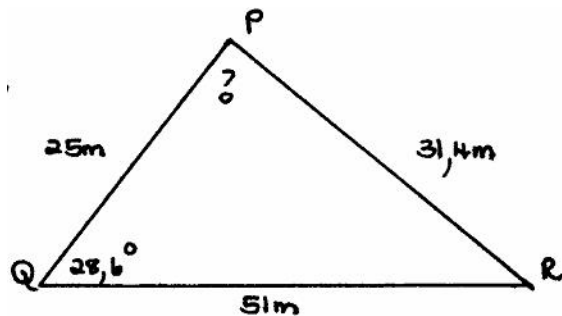
$$\therefore \sin 28,6^\circ = \frac{PS}{25} \quad \ddot{u}$$

$$\therefore PS = 25 \sin 28,6^\circ \quad \ddot{u}$$

$$\underline{\therefore PS = 11,97 \text{ m} \quad \ddot{u}}$$

(4)

7.2



$$\frac{\sin P}{QR} = \frac{\sin Q}{PR} \quad \ddot{u}$$

$$\therefore \frac{\sin P}{51} = \frac{\sin 28,6^\circ}{31,4}$$

$$\therefore \sin P = \frac{51 \sin 28,6^\circ}{31,4} \quad \ddot{u}$$

$$\therefore \sin P = 0,7774 \dots \quad \ddot{u}$$

$$\therefore \hat{P} = 51^\circ \quad \ddot{u}$$

$$\therefore \hat{QPR} = 180^\circ - 51^\circ$$

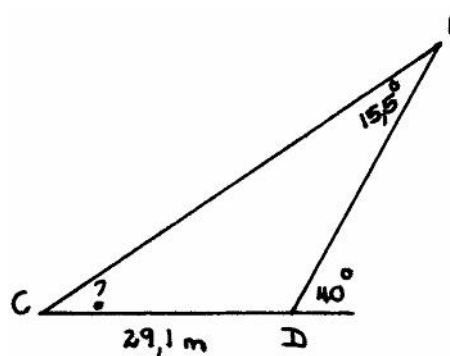
$$\therefore \hat{QPR} = 129^\circ \quad \ddot{u}$$

(5)

[14]

QUESTION / VRAAG 8

8.1

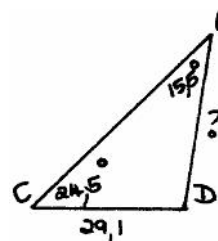


$$\hat{C} = 40^\circ - 15,5^\circ \text{ buite } \angle \Delta$$

$$\therefore \hat{C} = 24,5^\circ \quad \ddot{u}$$

(1)

8.2



$$\frac{AD}{\sin C} = \frac{CD}{\sin A} \quad \ddot{u}$$

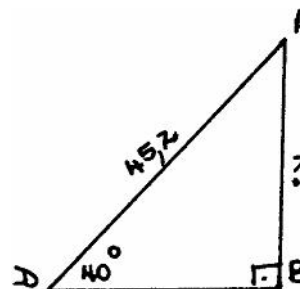
$$\therefore AD = \frac{29,1}{\sin 24,5^\circ} \sin 15,5^\circ \quad \ddot{u}$$

$$\therefore AD = \frac{29,1 \sin 24,5^\circ}{\sin 15,5^\circ} \quad \ddot{u}$$

$$\therefore AD = 45,2 \text{ m} \quad \ddot{u}$$

(4)

8.3



$$\frac{AB}{\sin D} = \frac{AD}{\sin B} \quad \ddot{u}$$

$$\therefore AB = \frac{45,2}{\sin 40^\circ} \sin 90^\circ \quad \ddot{u}$$

$$\therefore AB = \frac{45,2 \sin 40^\circ}{\sin 90^\circ} \quad \ddot{u}$$

$$\therefore AB = 29,1 \quad \ddot{u}$$

(4)

OR / OF

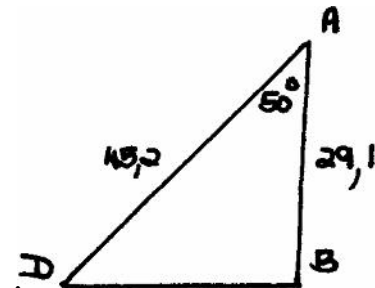
$$\sin D = \frac{AB}{AD} \ddot{u}$$

$$\therefore \sin 40^\circ = \frac{AB}{45,2} \ddot{u}$$

$$\therefore AB = 45,2 \sin 40^\circ \ddot{u}$$

$$\therefore AB = 29,1 \ddot{u}$$

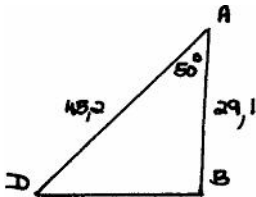
8.4



$$\hat{A} = 180^\circ - 130^\circ \ddot{u}$$

$$\hat{A} = 50^\circ$$

8.5



$$Opp = \frac{1}{2} AD \cdot AB \sin A \ddot{u}$$

$$= \frac{1}{2} 45,2 \cdot 29,1 \sin 50^\circ \ddot{u}$$

$$= 503,8 m^2 \ddot{u}$$

(4)

(1)

[13]

Afdeling B: [38]

SECTION / AFDELING C

QUESTION / VRAAG 9

9.1 $3\ 950 \times 12$
 $= 47\ 400 \ddot{u}$

(1)

9.2 Tax/belasting = $10\ 450 + 38\% \times 7\ 400 \ddot{u}$
 $= 10\ 450 + 2812 \ddot{u}$
 $= 13\ 262 \ddot{u}$

(4)

9.3 $13\ 484 \div 12$ $13\ 262 \div 12$
 $= R1\ 123 \ddot{u}$ $R1\ 105,17$

(1)

[6]

QUESTION / VRAAG 10

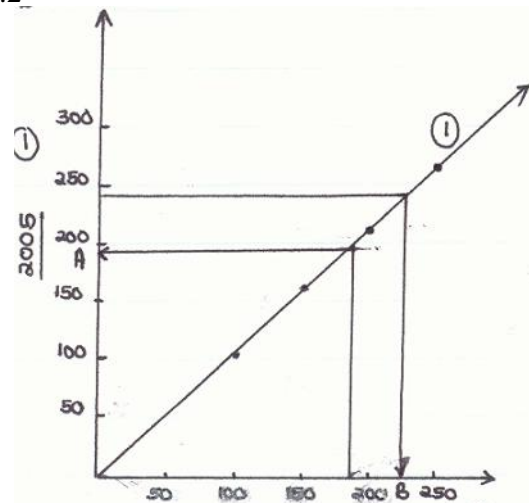
10.1

R100	R150	R200	R250
108	162	216	270

\ddot{u} \ddot{u} \ddot{u} \ddot{u}

(4)

10.2



(3)

10.3.1 At / By A = R194

(2)

10.3.2 At / By B = R220 - 229

(2)

[11]

QUESTION / VRAAG 11

11.1 $A = P \left(1 + \frac{r}{100} \right)^n \ddot{u}$

$$\therefore A = 28\ 000 \left(1 + \frac{14 \div 2}{100} \right)^{nx2} \ddot{u} \ddot{u}$$

$$\therefore A = 28\ 000 \left(1 + \frac{7}{100} \right)^{2n} \ddot{u}$$

$$\therefore A = 28\ 000 (1,07)^{2n} \ddot{u} \quad (5)$$

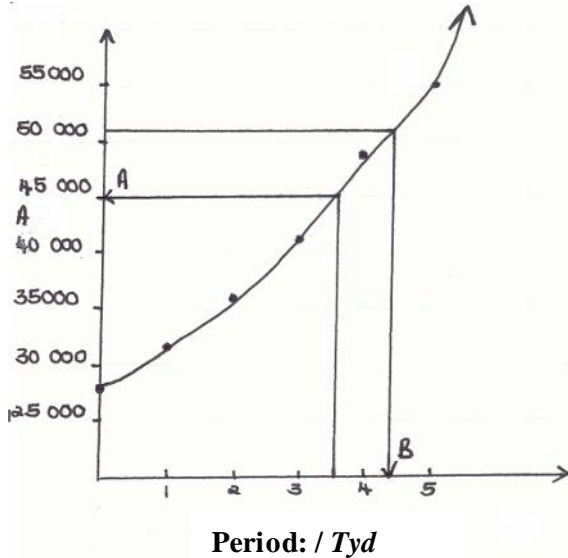
11.2

T	1	2	3	4	5
A	32 057	36 702	42 000	48 109	55 080

\ddot{u} \ddot{u} \ddot{u} \ddot{u}

(4)

11.3



(3)

11.4.1 R45 000 (By A) (2)

11.4.2 4½ years/jaar (By B) (2)

$$\begin{aligned}
 11.5 \quad I &= \frac{Krt}{100} \text{ ¤} \\
 &= \frac{28000 \times 14 \times 5}{100} \text{ ¤} \\
 &= 19\,600 \text{ ¤}
 \end{aligned}$$

$$\begin{aligned}
 \text{Total/Totaal} &: \text{R}28\,000 + \text{R}19\,600 \\
 &= \underline{\text{R}47\,600} \text{ ¤} \quad (4)
 \end{aligned}$$

[20]

Totaal Afdeling C: [37]**SECTION / AFDELING D****QUESTION / VRAAG 12**

12.1 1 radian/radiaal (1)

$$\begin{aligned}
 12.2 \quad 29,6^\circ &\div 57,3 \text{ ¤} \\
 &= 0,52 \text{ rad. ¤} \quad (2)
 \end{aligned}$$

$$\begin{aligned}
 12.3 \quad 2,41 \times 57,3 \text{ ¤} \\
 &= 138^\circ \text{ ¤} \quad (2)
 \end{aligned}$$

$$\begin{aligned}
 12.4.1 \quad \frac{\pi}{6} \times \frac{180}{\pi} \text{ ¤} \\
 &= 30^\circ \text{ ¤} \quad (2)
 \end{aligned}$$

$$\begin{aligned}
 12.4.2 \quad \frac{120^\circ}{1} \times \frac{\pi}{180^\circ} \text{ ¤} \\
 &= \frac{2}{3} \pi \text{ rad. ¤} \quad (2)
 \end{aligned}$$

[9]

QUESTION / VRAAG 13

$$\begin{aligned}
 13.1 \quad 70^\circ &\div 57,3 \text{ ¤} \\
 &= 1,22 \text{ rad. ¤} \quad (2)
 \end{aligned}$$

$$\begin{aligned}
 13.2 \quad S &= r? \\
 \therefore 180 &= r (1,22) \text{ ¤ ¤} \\
 \therefore r &= 147,5 \text{ ¤} \quad (3)
 \end{aligned}$$

$$\begin{aligned}
 13.3 \quad A_{\text{Opp}} &= \frac{1}{2} r^2? \\
 &= \frac{1}{2} (148)^2 (1,22) \text{ ¤ ¤} \\
 &= 13\,361,44 \text{ ¤} \quad (3)
 \end{aligned}$$

[8]

QUESTION / VRAAG 14

$$\begin{aligned}
 14.1 \quad 120^\circ &\div 57,3 \\
 &= 2,09 \text{ rad.} \quad (2)
 \end{aligned}$$

$$\begin{aligned}
 14.2 \quad A_{\text{Opp}} &= \frac{1}{2} r^2 (? - \sin ?) \\
 &= \frac{1}{2} (30)^2 (2,09 - \sin 120^\circ) \text{ ¤ ¤ ¤} \\
 &= 450 (1,22) \\
 &= 550,8 \text{ ¤} \quad (4)
 \end{aligned}$$

$$\begin{aligned}
 14.3 \quad \text{Vol} &= \text{oppv.} \times L \\
 &= 550,8 \times 125 \text{ ¤ ¤} \\
 &= 68\,850 \text{ ¤} \quad (3)
 \end{aligned}$$

[9]

QUESTION / VRAAG 15

$$\begin{aligned}
 A_{\text{Opp}} &= \frac{1}{2} rs \\
 \therefore 40 &= \frac{1}{2} r (10) \text{ ¤ ¤} \\
 \therefore 40 &= 5r \text{ ¤} \\
 \therefore r &= 8 \text{ cm ¤} \quad (4)
 \end{aligned}$$

QUESTION / VRAAG 16

$$16.1 \quad \begin{aligned} w &= 2\pi f \\ &= 2\pi (35) \text{ } \ddot{\text{U}} \\ &= 219,9 \text{ rad/sek. } \ddot{\text{U}} \end{aligned} \quad (2)$$

$$16.2.1 \quad \begin{aligned} 42 \text{ cm } \ddot{\text{U}} \\ = 0,42 \text{ m } \ddot{\text{U}} \end{aligned} \quad (2)$$

$$16.2.2 \quad \begin{aligned} V &= Wr \\ &= 219,9 (0,042) \text{ } \ddot{\text{U}} \ddot{\text{U}} \\ &= 92,4 \text{ m/s } \ddot{\text{U}} \end{aligned} \quad (3)$$

[7]

Totaal Afdeling D: [37]

SECTION / AFDELING E

QUESTION / VRAAG 17

$$17.1.1 \quad \text{parallel / ewewydig } \ddot{\text{U}} \quad (1)$$

$$17.1.2 \quad \frac{AD}{DB} = \frac{AE}{EC} \text{ } \ddot{\text{U}} \ddot{\text{U}} \quad (2)$$

OR / OF

any other proportionality/
enige ander eweredigheid.

$$17.2.1 \quad \frac{AD}{DB} = \frac{AE}{EC} \quad DE \parallel B \quad C \ddot{\text{U}} \\ \therefore \frac{x+5}{12} = \frac{x}{8} \ddot{\text{U}} \\ \therefore (x+5) = 12x \ddot{\text{U}} \\ \therefore 8x+40 = 12x \\ \therefore 4x = 40 \\ \therefore x = 10 \ddot{\text{U}} \quad (4)$$

$$17.2.2 \quad \begin{aligned} AB &= 10 + 5 + 12 \\ &= 27 \text{ cm } \ddot{\text{U}} \end{aligned} \quad (1)$$

[8]

QUESTION / VRAAG 18

$$18.1 \quad \frac{BE}{ED} \text{ } \ddot{\text{U}} \ddot{\text{U}} \quad (2)$$

$$18.2 \quad \frac{CF}{FD} \text{ } \ddot{\text{U}} \ddot{\text{U}} \quad (2)$$

$$18.3 \quad \frac{BE}{ED} = \frac{CF}{FD} \text{ } \ddot{\text{U}} \ddot{\text{U}} \quad (2)$$

$$18.4 \quad BC \parallel EF \quad (1)$$

$$18.5.1 \quad \frac{DC}{FC} = \frac{DB}{EB} \text{ } \ddot{\text{U}} \ddot{\text{U}}$$

$$\therefore \frac{16}{FC} = \frac{8}{5} \text{ } \ddot{\text{U}} \ddot{\text{U}}$$

$$\therefore 8 FC = 80$$

$$\therefore FC = 10 \text{ } \ddot{\text{U}} \ddot{\text{U}} \quad (3)$$

OR / OF

$$FC = \frac{5}{8} \times 16 \text{ } \ddot{\text{U}} \ddot{\text{U}}$$

$$= 5 \times 2$$

$$\underline{FC = 10 \text{ cm}} \quad (3)$$

$$18.5.2 \quad \frac{AG}{GD} = \frac{BE}{ED} \text{ } \ddot{\text{U}} \ddot{\text{U}}$$

$$\therefore \frac{AG}{9} = \frac{5}{3} \text{ } \ddot{\text{U}} \ddot{\text{U}}$$

$$\therefore 3 AG = 45$$

$$\therefore \underline{AG = 15} \text{ } \ddot{\text{U}} \ddot{\text{U}} \quad (3)$$

[13]

QUESTION / VRAAG 19

- 19.1.1 \hat{K} ð (1)
- 19.1.2 \hat{L} ð (1)
- 19.1.3 \hat{R} (1)
- 19.1.4 $\frac{PQ}{KL} = \frac{QR}{LM} = \frac{PR}{MK}$ ð (2)
- 19.2.1 $\hat{A}_1 = \hat{C}_1 = 65^\circ$ given/gegee ð
 $D\hat{A}C = \hat{B} = 90^\circ$ given/gegee ð
 \hat{D} is gemeenskaplik ð (3)
- 19.2.2 $\frac{AC}{BA} = \frac{CD}{AD} = \frac{AD}{BD}$ ð (2)
- 19.2.3 (a) $\frac{AC}{AB} = \frac{AD}{BD}$ ð
 $\therefore 4 \frac{AC}{6} = \frac{8}{4}$
 $\therefore AC = 48$
 $\therefore AC = 12$ ð (3)
- 19.2.3 (b) $\frac{CD}{AD} = \frac{AD}{BD}$
 $\therefore \frac{x+4}{8} = \frac{8}{4}$ ð
 $\therefore 4(x+4) = 64$ ð
 $\therefore x+4 = 16$
 $\therefore x = 12$ ð (3)

[16]

Totaal Afde ling E: [37]

QUESTION / VRAAG 20

- 20.1 Gauteng ð (1)
- 20.2 Northern Cape/Noord-Kaap ð (1)
- 20.3 $361\ 830 - 17\ 010$ ð
 $= 344\ 820$ ð (3)
- 20.4 Free State / Vrystaat (1)
 Western Cape / Wes Kaap (1)
- 20.5 1 219 068
- 20.6 $\frac{1\ 219\ 068}{9}$ ð
 $= 135,5$ ð (3)
- 20.7 Gauteng
 Mpumalanga
 KwaZulu-Natal
 North West/Noordwes
 Limpopo
 Western Cape/Wes-Kaap ð ð
 Free State/Vrystaat
 Eastern Cape/Oos-Kaap
 Northern Cape/Noord-Kaap
- Limpopo – median/mediaan ð (3)
- 20.8 $361\ 830 - (129\ 480 + 116\ 320 + 92\ 100) = 23\ 930$ ð (2)

[15]

QUESTION / VRAAG 21

- 21.1 10,9 12,4 14,7 15,1 18,6 18,9 19,7 19,7 20,0 20,9 22,0 22,4
 23,7 23,7 23,8 25,3 26,8 26,9 27,4 28,7 31,8 31,8 33,6 34,5
 34,9 36,5 37,7 38,4 40,1 42,0 (1)
- 21.2 19,7 en 23,7 ð (1)
- 21.3 $\frac{782,2}{30}$ ð ð
 $= 26,1$ ð (3)

21.4 First Quartil/*Eerste Kwartiel*: 19,7
 Third Quartil/*Derde Kwartiel*: 33,6 34,5 (2)

$$\begin{aligned}
 21.5 \quad S &= \sqrt{\frac{\sum n^2 - nx^2}{n-1}} \\
 S &= \sqrt{\frac{22\,480,58 - 30(26,1)^2}{29}} \text{ ü} \\
 &= \sqrt{\frac{22\,480,58 - 30(681,21)}{29}} \text{ ü} \\
 &= \sqrt{\frac{22\,480,58 - 20\,436,3}{29}} \text{ ü} \\
 &= \sqrt{\frac{2\,044,28}{29}} \text{ ü} \\
 &= \sqrt{70,492413\dots\dots} \\
 &= 8,4 \text{ ü}
 \end{aligned}
 \tag{6}$$

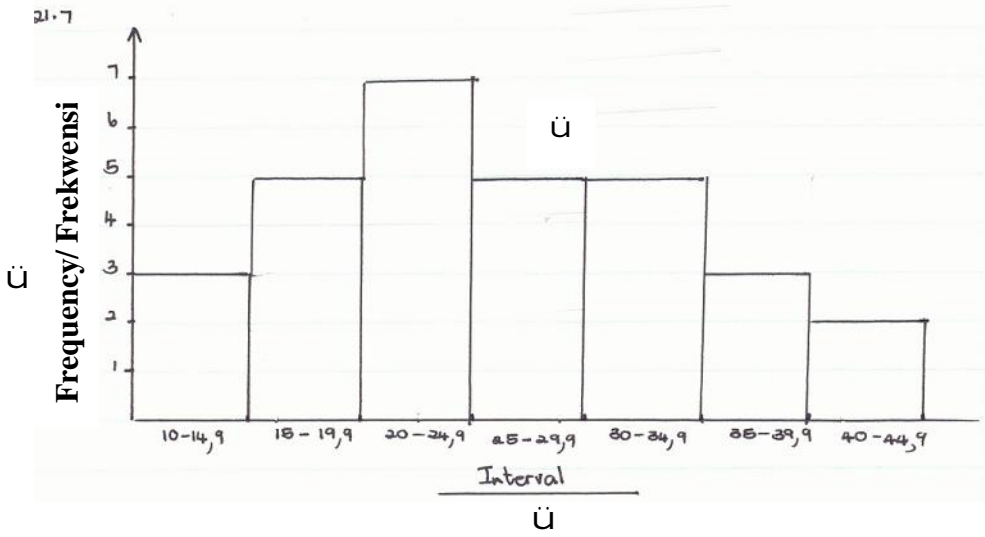
21.6

	Score/ Telling	Frequency/ Frekwensie	Cumulative Frequency/ Kumulatiewe Frekwensie	Cumulative Percentage Kumulatiewe Persentasie
10 – 14,9	lll	3	3	$\frac{3}{30} \times 100\%$
15 – 19,9	llll	5	8	$\frac{8}{30} \times 100\%$
20 – 24,9	llll ll	7	15	
25 -29,9	llll	5	20	
30 – 34,9	llll	5	25	
35 – 39,9	lll	3	28	
40 – 44,9	ll	2	30	

üü üü üü

(6)

21.7



(3)
[22]

TOTAL FOR SECTION F:
TOTAAL VIR AFDELING F: [37]
TOTAL / TOTAAL: 150