

**NATIONAL  
SENIOR CERTIFICATE**

LEARNER'S NAME  
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GRADE 12/GRAAD 12

SEPTEMBER 2016

**MATHEMATICS P2 / WISKUNDE V2  
SPECIAL ANSWER BOOK / SPESIALE ANTWOORDEBOEK**

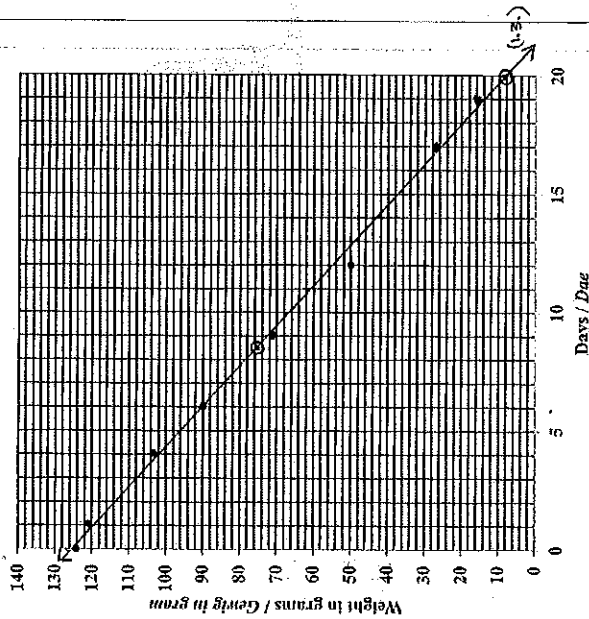
QUESTION VRAAG	MARK PUNT	INITIAL PARAAF	MOD. GEMOD.
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
TOTAL TOTAAL			

This SPECIAL ANSWER BOOK consists of 21 pages.  
Hierdie SPESIALE ANTWOORDEBOEK bestaan uit 21 bladsye.

QUESTION 1 / VRAAG 1

Day/Dag	0	1	4	6	9	12	17	19
Weight/Gewig	124	121	103	90	71	50	27	16

1.1 Daily weight of the bar of soap  
Daaglikse gewig van die steen seep



1.2

$y = A + Bx$

$A = 124,84 \checkmark$

$B = -5,83 \checkmark$

$\therefore y = 124,84 - 5,83x \checkmark$

both points / line ✓  $124,84 - 5,83 \cdot 20$

1.3	$(\bar{x}; \bar{y}) = (8,5; 75,25)$	other = $(2,0; 8,24)$	(2)
1.4	$80 = 12,4,84 - 5,83x$	$\therefore x = 7,69 \dots$	✓
	$\therefore$ day 8 → ✓		(2)
1.5	$r = -0,998$	✓	(1)
1.6	Very strong negative (linear) correlation		(1)

strong  
very strong ✓

QUESTION 2 (17-44G2)

5	7	15	16	17	22	24	28	29
4	344	29	31	31	31	34	36	38
3	111468	15	16	17	22	24	28	29
2	24899	29	31	31	31	34	36	38
1	5567	15	16	17	22	24	28	29
0	35	29	31	31	31	34	36	38

15,07

2.1  $n = 21$  ✓ (1)

2.2  $\min = 3$  ✓ (1)

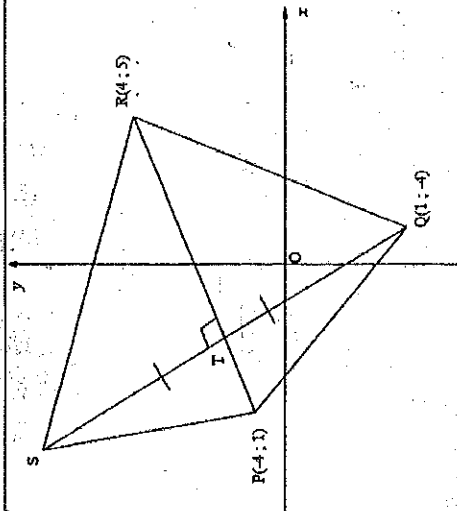
2.3  $\bar{x} = 28,19$  ✓ (2)

2.4  $\sigma = 13,12$  ✓ (1)

2.5  $\bar{x} \pm \sigma$   $28,19 - 13,12$   $28,19 + 13,12$   
 $= 15,07$   $\checkmark$   $= 41,31$   
 $3,5, 15, 15$   
 $\therefore \frac{\sqrt{8}}{21} \times 100 = 38,10\%$  ✓ (3)

3

QUESTION 3 / VRAAG 3



3.1  $m_{PQ} = \frac{5-1}{4-(-4)} \checkmark$   
 $= \frac{1}{2} \checkmark$

(2)

3.2 SO:  $y = -2x + c \checkmark$   
 Sub  $Q(1, -4) \checkmark$   
 $-4 = -2(1) + c \checkmark$   
 $-2 = c$   
 $\therefore y = -2x - 2 \checkmark$

(3)

3.3  
 SQ:  $y = -2x - 2 \checkmark$   
 PR:  $y = \frac{1}{2}x + c \checkmark$   
 Sub  $R(4;5)$   
 $5 = \frac{1}{2}(4) + c \checkmark$   
 $3 = c$   
 $\therefore y = \frac{1}{2}x + 3 \checkmark$

(5)

3.4  
 $S(1; -4) \rightarrow T(-2; 2) \rightarrow Q(1; -4)$   
 $\frac{x_S + 1}{2} = -2 \checkmark$   
 $x_S + 1 = -4 \checkmark$   
 $x_S = -5 \checkmark$   
 $\therefore S(-5; 8) \checkmark$

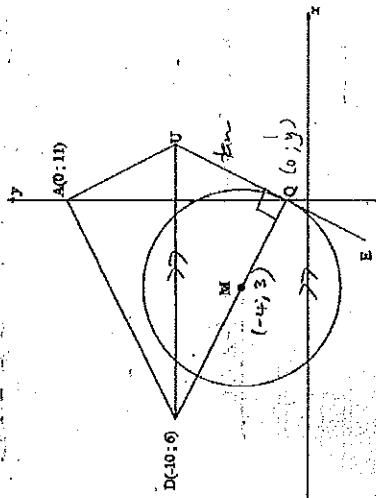
(3)

3.5  
 S(-5; 8) Q(1; -4)  
 SQ  
 $= \sqrt{(-4-8)^2 + (1-(-5))^2} \checkmark$   
 $= \sqrt{180} \checkmark$   
 area  $\Delta PQR = \frac{1}{2} (\sqrt{180} \times \sqrt{5}) \checkmark$   
 $= 15 \text{ units}^2 \checkmark$

(5)

118

QUESTION 4 / VRAAG 4



4.1

$$x^2 + 8x + (+4)^2 + y^2 - 6y + (-3)^2 = -5 + 16 + 9$$

$$(x+4)^2 + (y-3)^2 = 20 \sqrt{RHS}$$

$$\therefore M(-4, 3)$$

(4)

4.2	$y_{int}: y^2 - 6y = -5 \sqrt{x=0} \therefore Q(0;1)$ $y^2 - 6y + 5 = 0$ $(y-1)(y-5) = 0 \checkmark$ $\therefore y = 1 \text{ or } 5$	(3)
4.3	$M_{rad} = \frac{1-3}{2-(-4)} = -\frac{1}{2} \checkmark$ $\therefore M_{tan} = 2 \checkmark \text{ tan } \perp \text{ rad}$ $\therefore y = 2x + 1$	(4)
4.4	$y = 6 \checkmark$	(1)
4.5	$y = 6 \dots 1$ $y = 2x + 1 \dots 2$ $6 = 2x + 1 \checkmark$ $5 = 2x$	(2)
4.6	$M_{AU} = \frac{6-11}{2-0} = -\frac{5}{2}$ $M_{AD} = \frac{11-6}{0-(-4)} = \frac{5}{4}$ $\therefore M_{AU} \cdot M_{AD} = (-\frac{5}{2}) \cdot (\frac{5}{4}) = -\frac{25}{8}$ $= -1 \checkmark$ $\therefore AU \perp AD$ $\therefore \hat{DAU} = 90^\circ \checkmark$	(5)
	$\hat{DAU} = 90^\circ \text{ tan } \perp \text{ rad}$ $\therefore \hat{DAU} + \hat{DAU} = 90^\circ + 90^\circ = 180^\circ$ $\therefore \text{QUAD is cyclic}$ $\text{conv. circ. is cyclic}$ $\therefore \hat{QAD} = 180^\circ \checkmark$	(6)
		(20)

3

4

1

2

6

4

QUESTION 5 / VRAAG 5

5.1.1	$\cos 52^\circ = \frac{t}{r}$  $\sin(-52^\circ) = -\sin 52^\circ$ $= -\frac{\sqrt{1-t^2}}{r}$ $= -\frac{\sqrt{1-t^2}}{r}$ (3)
5.1.2	$\cos 2x = 2 \cos^2 x - 1$ $\cos 38^\circ = 2 \cos^2 19^\circ - 1$ $\sqrt{1-t^2} = 2 \cos^2 19^\circ - 1$ $\sqrt{\frac{1-t^2}{2} + 1} = \cos 19^\circ$ (4)
5.2	$2 \cos(180^\circ + x) = -2 \cos x$ $2(1 - \cos^2 x) = -2 \cos x$ $2 \cos x = 2 \cos^2 x$ $\cos x = \cos^2 x$ $\cos x - \cos^2 x = 0$ $\cos x(1 - \cos x) = 0$ $\cos x = 0$ or $\cos x = 1$ $x = 90^\circ$ or $x = 270^\circ$ or $x = 0^\circ$ or $x = 360^\circ$ $x = 90^\circ, 270^\circ, 0^\circ, 360^\circ$ (7)

$\frac{1}{r}$  3

$\frac{r}{r}$  4

7

5.3.1	Undetermined when $2(1 - \cos 2x) = 0$ $2x = k360^\circ$ $x = k180^\circ$ Let $A = 2x$ $(k \in \mathbb{Z})$ $2(1 - \cos A) = 0$ $\cos A = 1$ $A = k360^\circ$ $x = k180^\circ$ (4)
5.3.2	LHS $= \frac{2 \sin 2x}{2(1 - \cos 2x)}$ $= \frac{\sin 2x}{1 - \cos 2x}$ $= \frac{\sin 2x}{2 \sin^2 x}$ $= \frac{1}{2 \sin x}$ RHS $= \frac{1}{2 \sin x}$ $\therefore$ LHS = RHS (3)

4

3

61. Cont.  
 $\cos A = \cos(270^\circ + B)$   
 $A = 270^\circ + B + k360^\circ$   
 $2x = 270^\circ + x + 60^\circ + k360^\circ$   
 $x = 330^\circ + k360^\circ$   
 $\therefore x = 10^\circ; 130^\circ; x$   
 $x = -30^\circ; 330^\circ; x$   
 $x = -30^\circ; 10^\circ$  or  $130^\circ$

QUESTION 6 / VRAAG 6

6.1

$6x = 2x$     $B = x + 60^\circ$     $2x = 90^\circ - (x + 60^\circ) + k360^\circ$   
 $\cos A = \sin B$     $2x = 90^\circ - x - 60^\circ + k360^\circ$   
 $3x = 30^\circ + k360^\circ$   
 $\cos(90^\circ - B) = \cos(270^\circ + B)$     $x = 10^\circ + k120^\circ$   
 $\cos A = \cos(90^\circ - B)$   
 $A = 90^\circ - B + k360^\circ$

6.2

$h(x) = \frac{360^\circ}{92} = 240^\circ$  (1)  
 $h(x) = \cos 2(x - 45^\circ) - 1$  (2)  
 $= \cos(2x - 90^\circ) - 1$   
 $= \cos(2x + 270^\circ) - 1$   
 $= \cos(270^\circ + 2x) - 1$   
 $= \sin 2x - 1$

6.3

6.4

QUESTION 7 / VRAAG 7

7.1

$NP^2 = 145^2 + 103^2$  ✓  
 $NP = \sqrt{31634}$   
 $= 177,86 \text{ mm}$  ✓

7.2

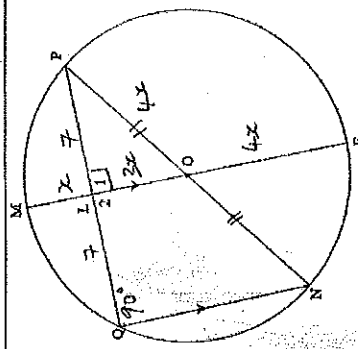
$PQ^2 = 103^2 + 103^2 - 2 \cdot 103 \cdot 103 \cdot \cos 120^\circ$  ✓  
 $PQ = \sqrt{31827}$   
 $= 178,40 \text{ mm}$  ✓

7.3

$178,40^2 = 177,86^2 + 177,86^2 - 2 \cdot 177,86 \cdot 177,86 \cdot \cos \widehat{PNQ}$   
 $\therefore 0,496 \dots = \cos \widehat{PNQ}$   
 $\therefore 60,20^\circ = \widehat{PNQ}$  ✓

QUESTION 8 / VRAAG 8

8.1 Bisects the chord ✓ (1)



8.2  $ML = x$

8.2.1  $LO \parallel ON$  ✓ given radii ✓

$PO = ON$  ✓  $\therefore OL = LP$  ✓  $CO \perp MP$  midpt thm (4)

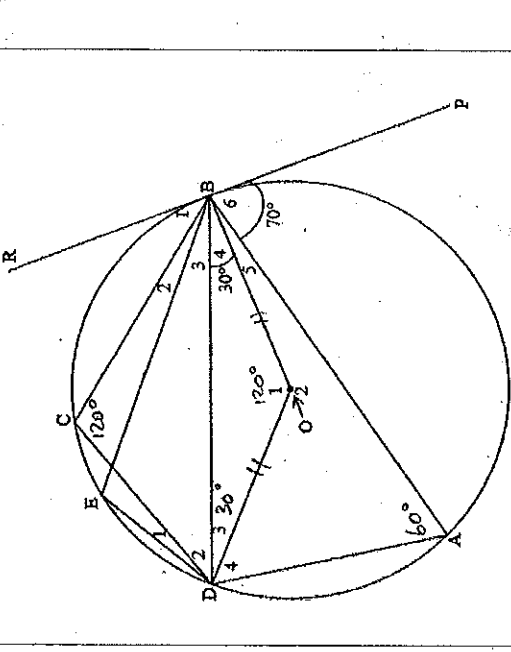
8.2.2  $MF = 8$   $ML \checkmark$   $OS$  radii (1)

8.2.3  $\hat{O} = 90^\circ$  in semi-c  $= 90^\circ$   $x^2 = 7$

$\hat{L} = 90^\circ$   $CO \perp MP$   $LO \parallel ON$   $x = \sqrt{7}$  right-  
 $\checkmark (10x)^2 = (3x)^2 + (7)^2$  Pythag  $ML = 2.65$  units  $\checkmark$   
 $16x^2 = 9x^2 + 49$   $\checkmark$  accept  $\sqrt{7}$   
 $\checkmark 7x^2 = 49$  (3)

9

QUESTION 9 / VRAAG 9



9.1  $\hat{D}_2 = 30^\circ \checkmark$   $\wedge$ 's opp = sides, radii  $\checkmark$

$\hat{O}_1 = 120^\circ \checkmark$   $\wedge$ 's  $\Delta = 180^\circ$

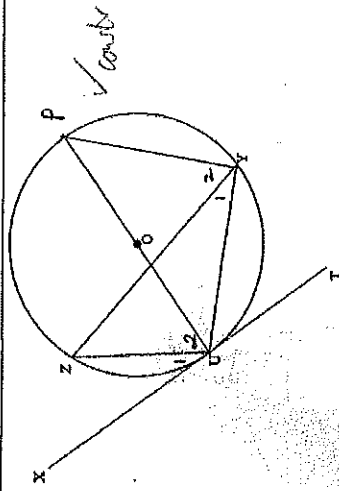
9.2  $\hat{A} = 60^\circ \checkmark$   $\wedge$  @ centre =  $2^\circ$  @  $O$ 'ca  $\checkmark$   $R$  (3)

9.3  $\hat{C} = 120^\circ \checkmark$  opp  $\wedge$ 's cyclic quad =  $180^\circ$  (2)

9.4  $\hat{AOB} = 70^\circ \checkmark$   $\wedge$  tan chord  $\checkmark$   $R$  (2)

9

QUESTION 10 / VRAAG 10



10.1

Constr: UOP (diam) and PY

$\hat{U}_1 + \hat{U}_2 = 90^\circ$  tan  $\perp$  rad ✓ SR

$\hat{Y}_1 + \hat{Y}_2 = 90^\circ$  " in semi  $\odot = 90^\circ$  ✓ SR

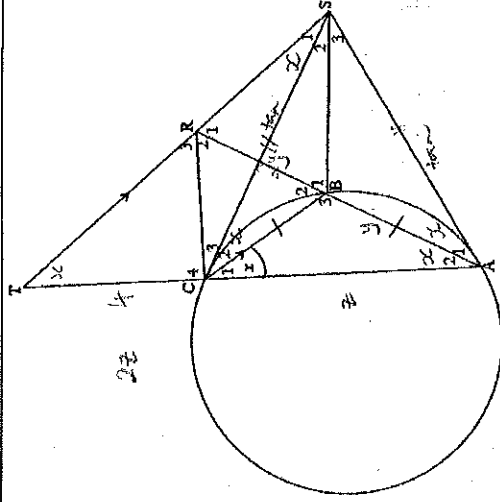
but  $\hat{U}_2 = \hat{Y}_2$  "s in same  $\odot$  segm = ✓ SR

$\hat{U}_1 = \hat{Y}_1$

$\therefore \hat{X} \hat{U} \hat{Z} = \hat{Z} \hat{Y} \hat{U}$

(5)

10.2



10.2.1

$\hat{A}_2 = x$  "s opp = sides ✓ SR

$\hat{T} = x$  conv "s =, TS || CB ✓ SR

$\hat{C}_2 = x$  " tan chord ✓ SR

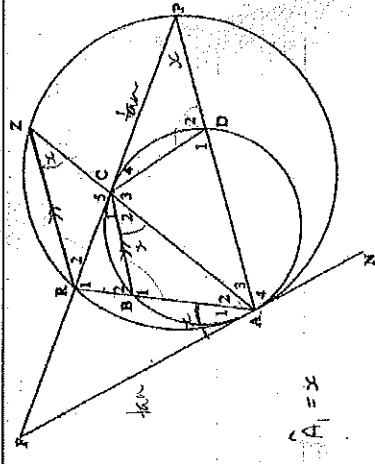
$\hat{S}_1 = x$  alt "s =, TS || CB ✓ SR

$\hat{A}_1 = x$  " tan chord ✓ SR

(5)



10.2.2	(2)	<p><math>T = S, \checkmark s</math> both <math>= x</math></p> <p><math>\therefore CT = CS \checkmark</math> sides opp <math>= \checkmark s</math></p> <p><math>\therefore \triangle SCT</math> is isosceles <math>\rightarrow</math></p>
10.2.3	(4)	<p><math>\frac{AT}{BR} = \frac{3}{2}</math></p> <p><math>\therefore \frac{AB}{BR} = \frac{1}{2} \cdot</math> Full in <math>AB = y \quad BR = 2y</math></p> <p><math>CT = 4 \checkmark \quad CS = CT</math> (10.2.2)</p> <p><math>\frac{AC}{CT} = \frac{AB}{BR} \checkmark</math> line <math>\parallel</math> side of <math>\Delta</math></p> <p><math>= \frac{1}{2} \cdot</math> Full in <math>AC = z \quad CT = 2z</math></p> <p><math>\therefore 2z = 4</math></p> <p><math>\therefore z = 2 \checkmark</math></p> <p><math>\therefore AT = 3z</math></p> <p><math>= 3(2)</math></p> <p><math>= 6 \text{ cm} \checkmark \rightarrow</math></p>
(4)		16



det  $\hat{A} = x$

11.1

$\hat{C}_2 = x \checkmark s \quad \wedge$  tan chord  $\checkmark R$

$\hat{E} = x \checkmark s \quad \wedge$  tan chord

$\therefore \hat{C}_2 = \hat{E} \quad \text{both} = x$

$\therefore BC \parallel RZ \quad \text{Corr } \hat{1} \hat{5} = \checkmark R$

4

(4)

112	<p><math>P = x \sqrt{3}</math> ✓  <math>\hat{C}_2 = \hat{P}</math> ✓  <math>BC</math> is tan chord  to <math>\odot ACP</math> ✓</p>	(3)
113	<p>2 <math>\Delta</math>'s <math>R_1 \hat{=} A_2, D_2 P, C_4</math>  1. <math>\hat{E} = \hat{P}</math> ✓  2. <math>\hat{P}_{1+2} = \hat{B}_1</math> ✓  <math>\hat{B}_2 = \hat{D}_2</math> ✓  <math>\hat{P}_{1+2} = \hat{D}_2</math> ✓  <math>\Delta R_2 A \parallel \Delta DPC</math> ✓</p>	(5)
114	<p><math>\Delta R_2 A \parallel \Delta DPC</math> ... 113  but in <math>\Delta</math>'s <math>R_1 \hat{=} A_2, B_1, C_2 A_2</math>  1. <math>\hat{R}_{1+2} = \hat{B}_1</math> ✓  2. <math>\hat{A}_2 = \hat{A}_2</math> ✓  <math>\Delta R_2 A \parallel \Delta B_2 C A_2</math></p>	(5)
<p>P.T.O</p>		(5)
<p>TOTAL/TOTAAL: 150</p>		(17)

<p>Additional Space / Bykomende Ruimte</p>	
114	<p>continued  <math>\Delta DPC \parallel \Delta B_2 CA</math> both <math>\parallel</math> to <math>\Delta R_2 A</math>  <math>\frac{DC}{PC} = \frac{CA}{AB}</math>  <math>\frac{DC}{CA} \times \frac{CA}{AB} = 1</math>  <math>\frac{DC}{CP} \times \frac{CA}{AB} = 1</math></p>