

Vertroulik



# basic education

Department:  
Basic Education  
**REPUBLIC OF SOUTH AFRICA**

**NASIONALE  
SENIOR SERTIFIKAAT**

**GRAAD 12**

**WISKUNDE V2**

**NOVEMBER 2024**

**PUNTE: 150**

**TYD: 3 uur**

**Hierdie vraestel bestaan uit 13 bladsye, 1 inligtingsblad  
en 'n antwoordeboek van 23 bladsye.**

**INSTRUKSIES EN INLIGTING**

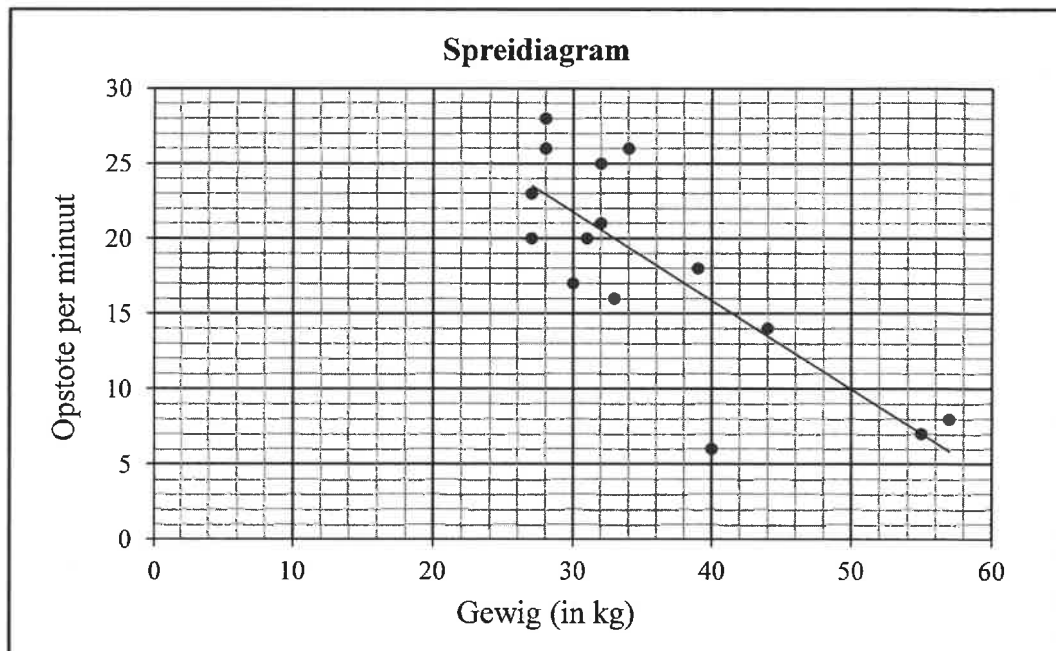
Lees die volgende instruksies aandagtig deur voordat die vrae beantwoord word.

1. Hierdie vraestel bestaan uit 11 vrae.
2. Beantwoord AL die vrae in die SPESIALE ANTWOORDEBOEK wat verskaf word.
3. Dui ALLE berekeninge, diagramme, grafieke, ens. wat jy in die beantwoording van die vrae gebruik, duidelik aan.
4. Slegs antwoorde sal NIE noodwendig volpunte verdien NIE.
5. Jy mag 'n goedgekeurde wetenskaplike sakrekenaar gebruik (nieprogrammeerbaar en niegrafies), tensy anders vermeld.
6. Indien nodig, rond antwoorde tot TWEE desimale plekke af, tensy anders vermeld.
7. Diagramme is NIE noodwendig volgens skaal geteken NIE.
8. 'n Inligtingsblad met formules is aan die einde van die vraestel ingesluit.
9. Skryf netjies en leesbaar.

**VRAAG 1**

Die afrigter van 'n junior seunsrugbyspan het aan die begin van 'n seisoen die gewig (in kg) van die 15 spelers in sy span en die aantal opstote wat elke speler in een minuut kon doen, aangeteken. Die data word in die tabel en spreidiagram hieronder verteenwoordig. Die kleinstekwadrate-regressielyn vir die data is geteken. ...

<b>Gewig (in kg) (x)</b>	34	32	40	27	33	28	27	55	39	44	30	57	28	32	31
<b>Getal opstote per minuut (y)</b>	26	21	6	20	16	26	23	7	18	14	17	8	28	25	20

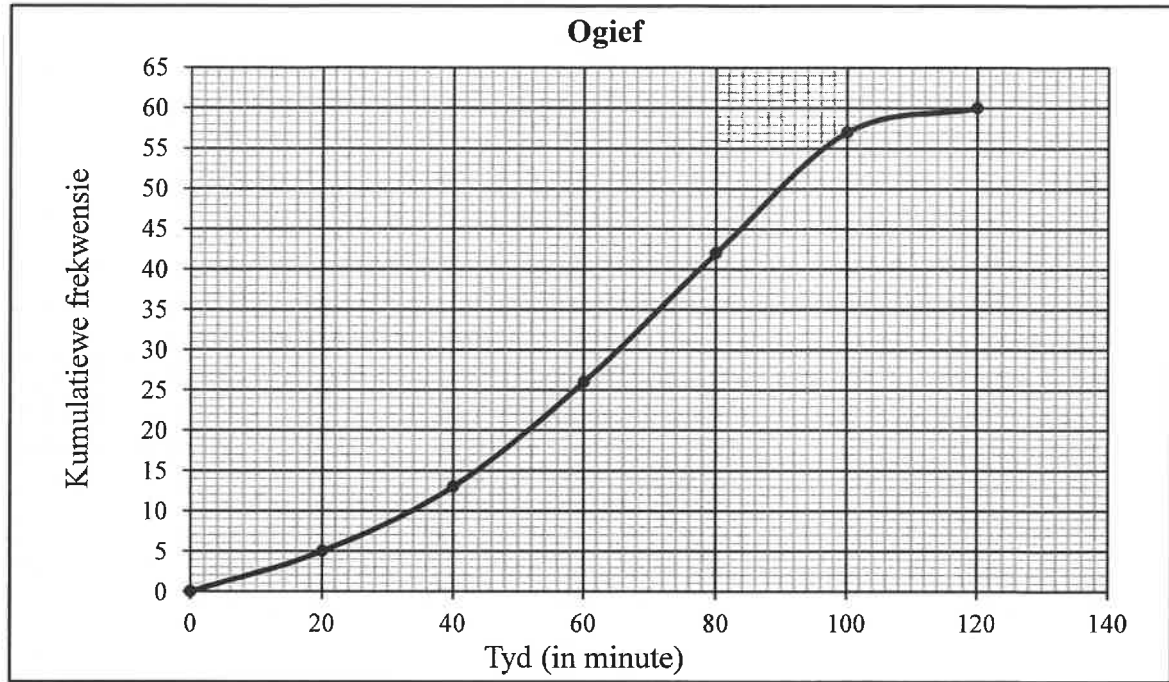


- 1.1 Bepaal die vergelyking van die kleinstekwadrate-regressielyn vir die data. (3)
- 1.2 Skryf die korrelasiekoëffisiënt neer. (1)
- 1.3 Die afrigter gebruik die kleinstekwadrate-regressielyn om die teiken vir die minimum aantal opstote vir elke spanlid, volgens hulle gewig, te stel. Voorspel die getal opstote wat 'n spanlid wat 29 kg weeg, behoort te doen om die teiken te bereik. (2)
- 1.4 Skryf die gemiddelde getal opstote vir die gegewe data neer. (1)
- 1.5 Die spelers het gedurende die seisoen hard geoefen. Die afrigter het aan die einde van die seisoen gesê dat elke speler 5 opstote per minuut meer as aan die begin van die seisoen kon doen. Hoe beïnvloed die toename in die getal opstote die standaardafwyking van die data? (1)
- 1.6 Die afrigter het aan die begin van die seisoen die kleinstekwadrate-regressielyn gebruik as die minimum teiken waarna 'n speler moes streef. Bepaal die maksimum moontlike toename in die getal opstote wat 'n speler moet doen om die minimum teiken te bereik. (2)

[10]

**VRAAG 2**

Die kumulatiewefrekwensie-grafiek (ogief) toon die tyd (in minute) wat dit 60 werknemers neem om elke oggend werk toe te reis.



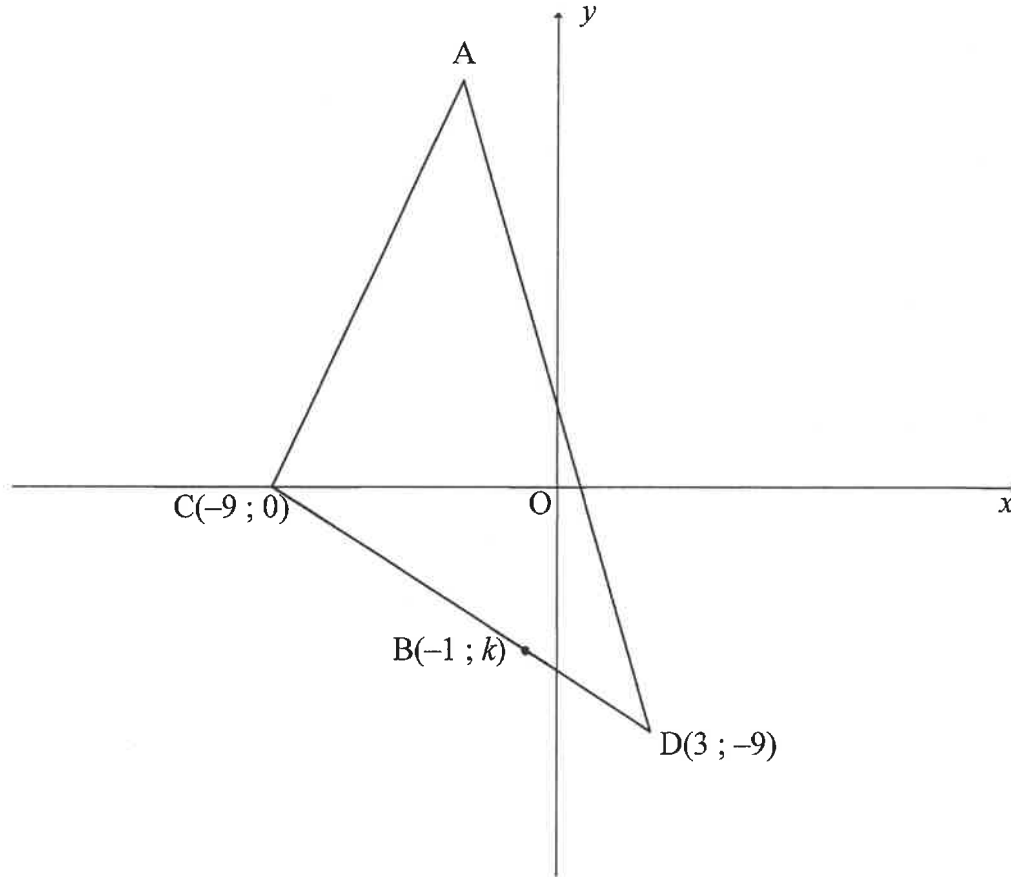
- 2.1 Skat die mediaan-reistyd. (1)
- 2.2 Skat die onderste kwartiel. (1)
- 2.3 Skat die interkwartielvariasiewydte. (2)
- 2.4 Die minimum en maksimum tye wat dit 'n werknemer neem om werk toe te reis, is onderskeidelik 5 en 120 minute. Op die getallelyn in die ANTWOORDEBOEK, teken 'n mond-en-snordigram om die verspreiding van die data, soos in die ogief hierbo voorgestel, aan te dui. (2)
- 2.5 Die maatskappybestuurder het besluit dat alle werknemers wat langer as 'n uur werk toe reis, toegelaat sal word om vir 'n gedeelte van die dag van die huis af te werk. Watter persentasie van die werknemers sal toegelaat word om vir 'n gedeelte van die dag van die huis af te werk? (2)
- 2.6 Werknemers werk 8 ure in 'n normale werksdag. Die bestuurder besluit op die volgende reël vir tyd om van die huis af te werk:
- 'n Werknemer word toegelaat om 'n halfuur van die huis af te werk vir elke tydinterval van 20 minute, of gedeelte daarvan, wat dit langer as 'n uur neem om werk toe te reis.

Op 'n sekere dag neem 'n werknemer 110 minute om werk toe te reis. Bereken die getal minute wat hierdie werknemer op hierdie dag toegelaat sal word om van die huis af te werk.

(2)  
**[10]**

**VRAAG 3**

In die diagram hieronder het  $\triangle ACD$  hoekpunte A, D(3 ; -9) en C(-9 ; 0), waar A 'n punt in die tweede kwadrant is. B(-1 ; k) lê op sy DC.

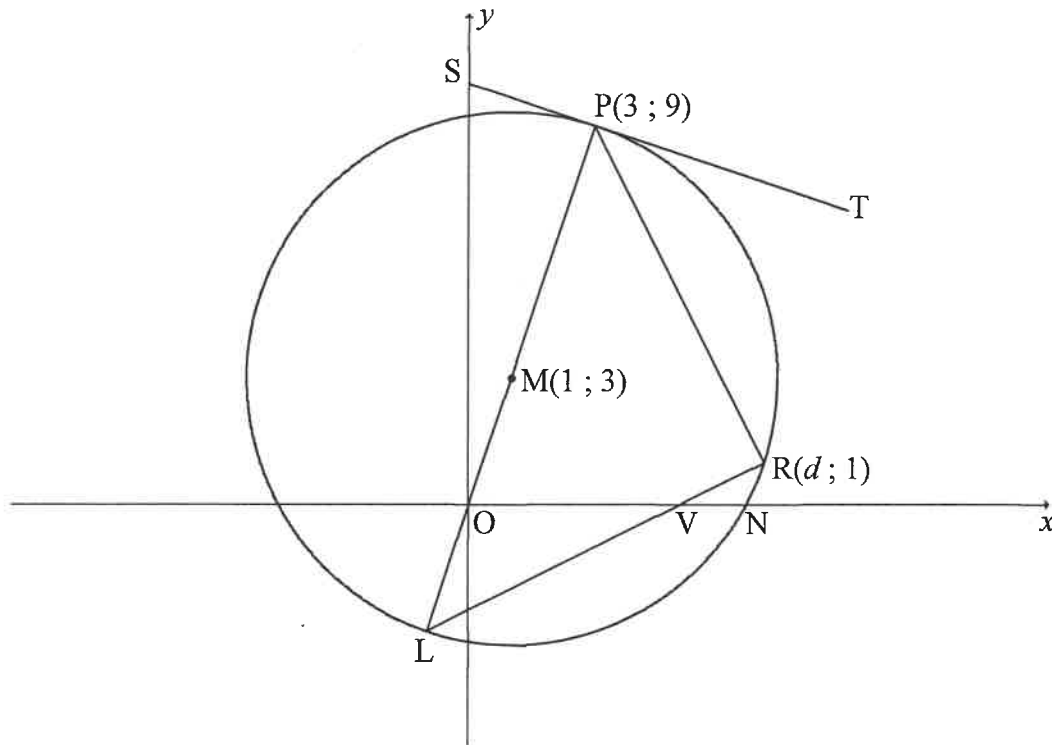


- 3.1 Bereken die helling van DC. (2)
- 3.2 Bepaal die vergelyking van DC in die vorm  $y = mx + c$ . (2)
- 3.3 Toon dat  $k = -6$ . (1)
- 3.4 Bereken die lengte van DC. (2)
- 3.5 Bereken die verhouding van  $\frac{DB}{DC}$ . (2)
- 3.6 Indien M 'n punt op AD is sodanig dat  $AC \parallel MB$ , bereken die verhouding van  $\frac{\text{Area } \triangle MBD}{\text{Area } \triangle ACD}$ . (4)
- 3.7 Indien daar verder gegee word dat die helling van AD,  $-4$  is en die lengte van AD  $\sqrt{612}$  eenhede is, bereken die koördinate van A. (6)

**[19]**

**VRAAG 4**

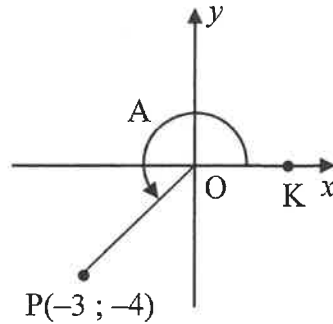
In die diagram is  $M(1 ; 3)$  die middelpunt van die sirkel. Die sirkel sny die  $x$ -as by  $N$ .  $ST$  is 'n raaklyn aan die sirkel by  $P(3 ; 9)$ .  $R(d ; 1)$ , met  $d > 0$ , en  $L$  is punte op die sirkel.  $O$  en  $V$  is die  $x$ -afsnitte van  $PL$  en  $RL$  onderskeidelik.



- 4.1 Skryf die koördinate van  $L$  neer. (2)
- 4.2 Bepaal die vergelyking van raaklyn  $ST$  aan die sirkel by  $P$ . (4)
- 4.3 Toon dat die vergelyking van die sirkel met middelpunt  $M$ ,  $x^2 + y^2 - 2x - 6y - 30 = 0$  is. (4)
- 4.4 Toon dat  $d = 7$ . (2)
- 4.5 Bereken die grootte van  $\hat{L}$ . (5)
- 4.6  $TR$  is 'n raaklyn aan die sirkel by  $R$ . Bewys dat  $PT \perp RT$ . (3)
- [20]**

**VRAAG 5**

5.1 In die diagram word lyn OP met  $P(-3; -4)$  gegee.  $\widehat{KOP} = A$ .



Bepaal, **sonder die gebruik van 'n sakrekenaar**, die waarde van:

5.1.1  $\cos A$  (2)

5.1.2  $\cos 2A$  (2)

5.1.3  $\sin(A - B)$ , indien daar verder gegee word dat  $\sin B = \frac{4}{5}$  en  $90^\circ < B < 360^\circ$  (4)

5.2 Indien  $\cos \alpha = p$ , druk die volgende uitdrukking in terme van  $p$  uit:

$$\frac{\cos\left(\frac{\alpha}{2} - 45^\circ\right)\sin\left(\frac{\alpha}{2} - 45^\circ\right)}{2} \quad (4)$$

**[12]**

**VRAAG 6**

6.1 Gegee die identiteit:  $\cos(x - y) = \cos x \cos y + \sin x \sin y$

6.1.1 Gebruik die saamgesteldehoek-identiteit wat hierbo gegee word om 'n formule vir  $\cos(x + y)$  af te lei. (2)

6.1.2 Vervolgens, of andersins, toon dat:

$$\frac{\cos(90^\circ - x)\cos y + \sin(-y)\cos(180^\circ + x)}{\cos x \cos(360^\circ + y) + \sin(360^\circ - x)\sin y} = \tan(x + y) \quad (6)$$

6.2 Gegee:  $f(x) = \sqrt{6 \sin^2 x - 11 \cos(90^\circ + x) + 7}$

Los op vir  $x$  in die interval  $x \in (0^\circ ; 360^\circ)$  as  $f(x) = 2$ . (6)

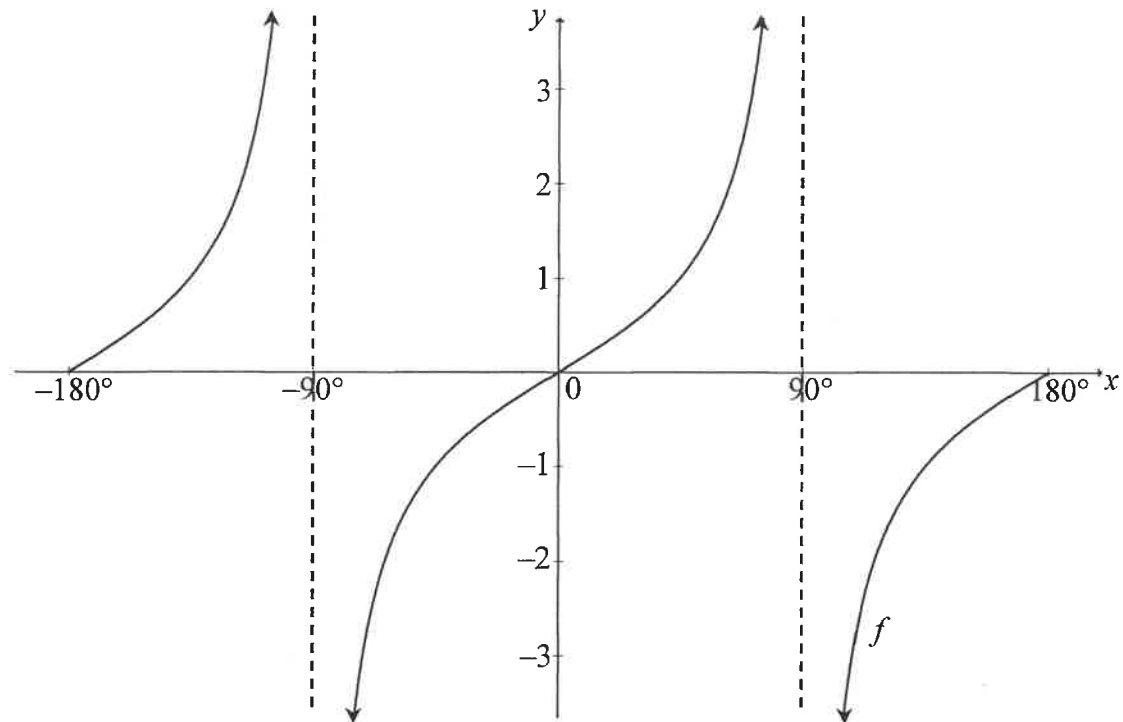
6.3 Beskou die funksie:  $g(x) = \frac{4 - 8 \sin^2 x}{3}$

6.3.1 Bereken die maksimum waarde van  $g$ . (3)

6.3.2 Skryf die kleinste moontlike waarde van  $x$  neer waarvoor  $g$  'n maksimum waarde in die interval  $x \in (0^\circ ; 360^\circ]$  sal hê. (1)  
**[18]**

**VRAAG 7**

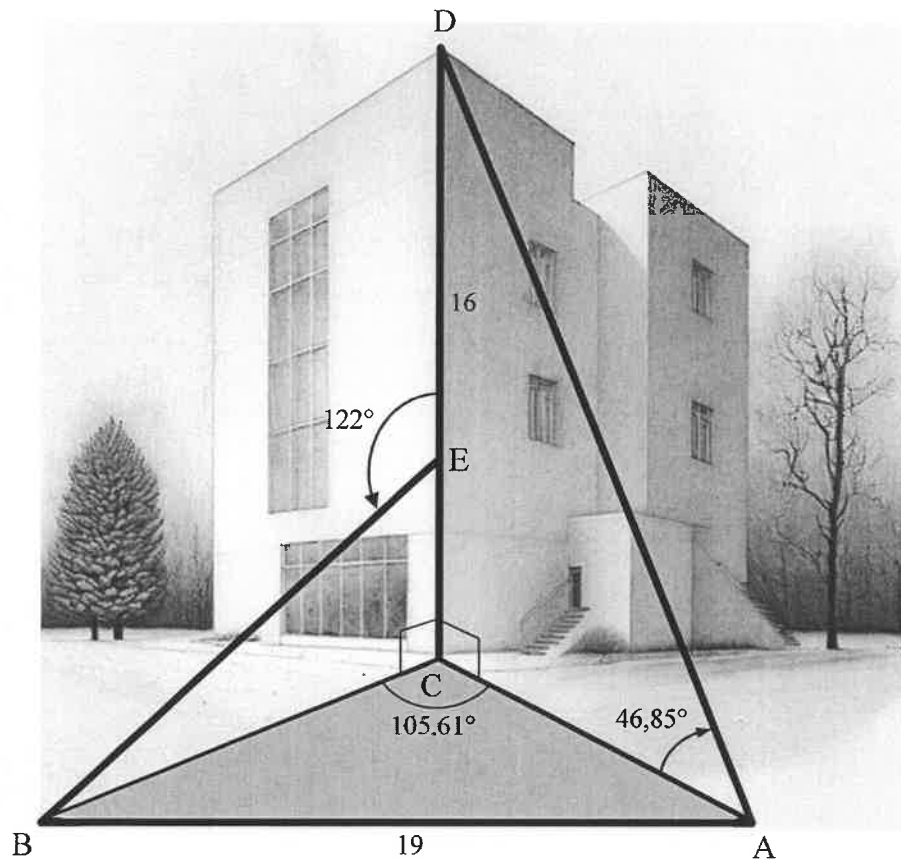
In die diagram hieronder is die grafiek van  $f(x) = \tan x$  geteken vir die interval  $x \in [-180^\circ; 180^\circ]$ .



- 7.1 Skryf die vergelyking van die asimptoot van  $f$  in die interval  $x \in [0^\circ; 180^\circ]$  neer. (1)
- 7.2 Skryf die waardes van  $x$  in die interval  $x \in [-180^\circ; 0^\circ]$  neer waarvoor  $f(x) \leq 0$ . (2)
- 7.3 Gegee:  $g(x) = \cos 2x + 1$
- 7.3.1 Skryf die periode van  $g$  neer. (1)
- 7.3.2 Op die rooster wat in die ANTWOORDEBOEK verskaf word, teken die grafiek van  $g(x) = \cos 2x + 1$  vir die interval  $x \in [-180^\circ; 180^\circ]$ . Toon duidelik die afsnitte met die asse asook die koördinate van die draaipunte. (3)
- 7.4 Gebruik die grafieke om die algemene oplossing van  $2 \cos^3 x - \sin x = 0$  te bepaal. (4)
- [11]**

**VRAAG 8**

In die diagram is  $C$  die voet van 'n vertikale gebou en  $D$  die bopunt van dieselfde gebou. Die hoogte van die gebou,  $CD$ , is 16 m. Twee waarnemers staan 19 m van mekaar af by punte  $A$  en  $B$ , waar  $A$ ,  $B$  en  $C$  in dieselfde horisontale vlak lê. 'n Verwer werk aan die gebou by punt  $E$ . Die hoogtehoek vanaf  $A$  na  $D$  is  $46,85^\circ$ .  $\hat{D}EB = 122^\circ$  en  $\hat{BC}A = 105,61^\circ$ .



8.1 Bereken die lengte van  $AC$ , die afstand tussen die waarnemer by  $A$  en die voet van die gebou. (2)

8.2 Bereken hoe ver die verwer by  $E$  vanaf die bopunt van die gebou is. (7)

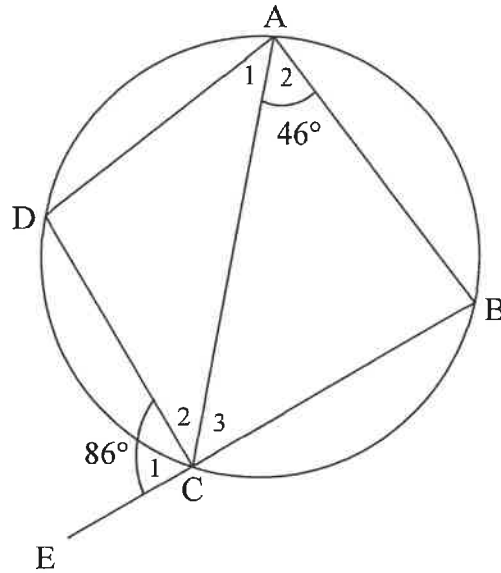
[9]

Gee redes vir jou bewerings in VRAAG 9, 10 en 11.

**VRAAG 9**

In die diagram is ABCD 'n koordevierhoek. BC is verleng na E. AC is getrek.

$$\hat{A}_1 = \frac{1}{2}\hat{B}, \hat{A}_2 = 46^\circ \text{ en } \hat{C}_1 = 86^\circ.$$



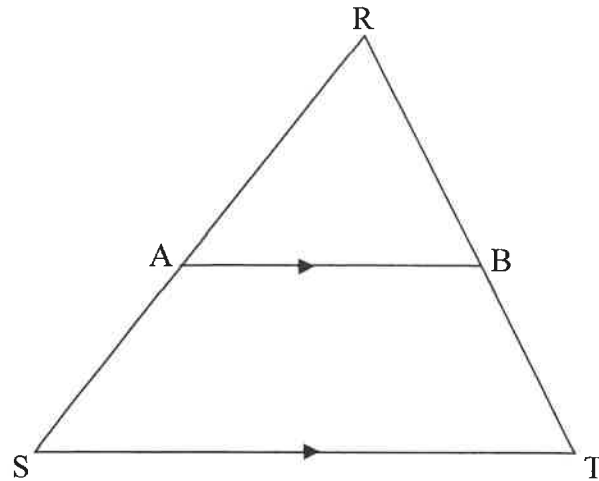
9.1 Bereken, met 'n rede, die waarde van  $\hat{A}_1$ . (2)

9.2 Bewys vervolgens dat  $AD = DC$ . (4)

[6]

**VRAAG 10**

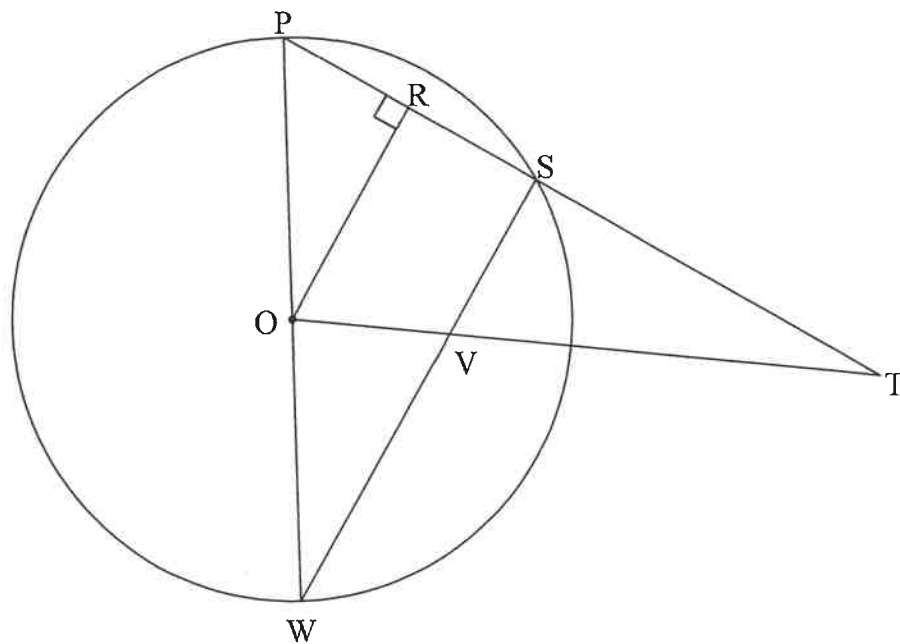
10.1 In die diagram is  $\triangle RST$  geteken. Lyn  $AB$  sny  $RS$  en  $RT$  by  $A$  en  $B$  onderskeidelik sodanig dat  $AB \parallel ST$ .



Bewys die stelling wat sê dat 'n lyn wat ewewydig aan een sy van 'n driehoek getrek word, die ander twee sye eweredig verdeel, m.a.w.  $\frac{RA}{AS} = \frac{RB}{BT}$

(6)

10.2 In die diagram is  $O$  die middelpunt van die sirkel.  $\triangle PWS$  is geteken met  $P, W$  en  $S$  op die sirkel.  $OR \perp PS$ .  $PRS$  is verleng na  $T$ .  $SW$  en  $OT$  sny by  $V$ .  $OV : OT = 1 : 4$



10.2.1 Bewys, met redes, dat  $OR : WS = 1 : 2$

(5)

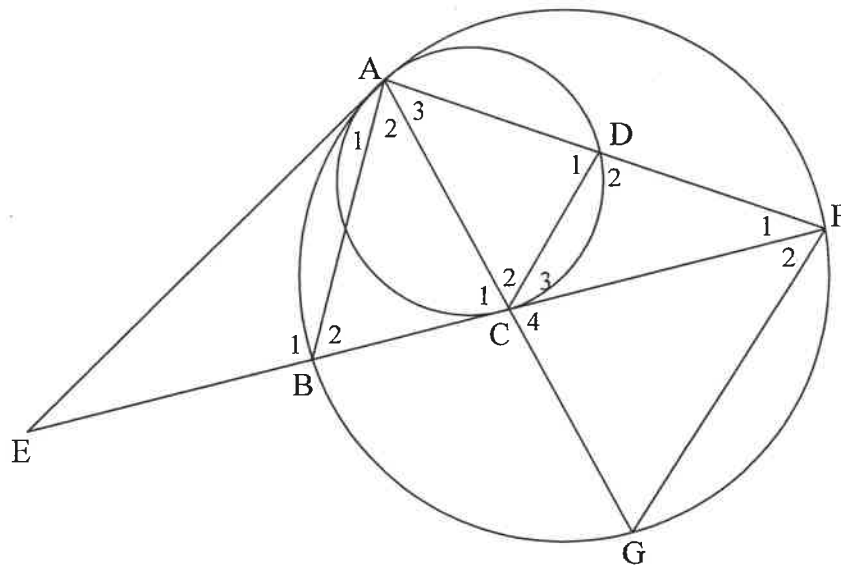
10.2.2 Bereken die lengte van  $PT$  as  $ST = 15$  eenhede.

(4)

[15]

**VRAAG 11**

In die diagram is A, B, G en F punte op die groter sirkel. 'n Kleiner sirkel is getrek om die groter sirkel inwendig by A te sny. EA is 'n gemeenskaplike raaklyn aan beide sirkels. EBCF is 'n raaklyn aan die kleiner sirkel by C. AC is verleng na G. AF sny die kleiner sirkel by D. AB, CD en GF is getrek.



- 11.1 As  $\hat{EAG} = x$ , bepaal met redes, VIER ander hoeke wat aan  $x$  gelyk is. (6)
- 11.2 Bewys dat  $AG \cdot AD = AC \cdot AF$  (4)
- 11.3 Bewys dat  $\triangle AGF \parallel \triangle ABC$  (4)
- 11.4 Bewys dat  $GF^2 = \frac{BC \cdot FC \cdot AF}{AD}$  (6)

[20]

**TOTAAL: 150**

## INLIGTINGSBLAD

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$A = P(1 + ni)$$

$$A = P(1 - ni)$$

$$A = P(1 - i)^n$$

$$A = P(1 + i)^n$$

$$T_n = a + (n - 1)d$$

$$S_n = \frac{n}{2}[2a + (n - 1)d]$$

$$T_n = ar^{n-1}$$

$$S_n = \frac{a(r^n - 1)}{r - 1}; r \neq 1$$

$$S_\infty = \frac{a}{1 - r}; -1 < r < 1$$

$$F = \frac{x[(1 + i)^n - 1]}{i}$$

$$P = \frac{x[1 - (1 + i)^{-n}]}{i}$$

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c$$

$$y - y_1 = m(x - x_1)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \tan \theta$$

$$(x - a)^2 + (y - b)^2 = r^2$$

$$\text{In } \Delta ABC: \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cdot \cos A$$

$$\text{area } \Delta ABC = \frac{1}{2}ab \cdot \sin C$$

$$\sin(\alpha + \beta) = \sin \alpha \cdot \cos \beta + \cos \alpha \cdot \sin \beta$$

$$\sin(\alpha - \beta) = \sin \alpha \cdot \cos \beta - \cos \alpha \cdot \sin \beta$$

$$\cos(\alpha + \beta) = \cos \alpha \cdot \cos \beta - \sin \alpha \cdot \sin \beta$$

$$\cos(\alpha - \beta) = \cos \alpha \cdot \cos \beta + \sin \alpha \cdot \sin \beta$$

$$\cos 2\alpha = \begin{cases} \cos^2 \alpha - \sin^2 \alpha \\ 1 - 2\sin^2 \alpha \\ 2\cos^2 \alpha - 1 \end{cases}$$

$$\sin 2\alpha = 2 \sin \alpha \cdot \cos \alpha$$

$$\bar{x} = \frac{\sum_{i=1}^n x_i}{n}$$

$$\sigma^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}$$

$$P(A) = \frac{n(A)}{n(S)}$$

$$P(A \text{ of } B) = P(A) + P(B) - P(A \text{ en } B)$$

$$\hat{y} = a + bx$$

$$b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$



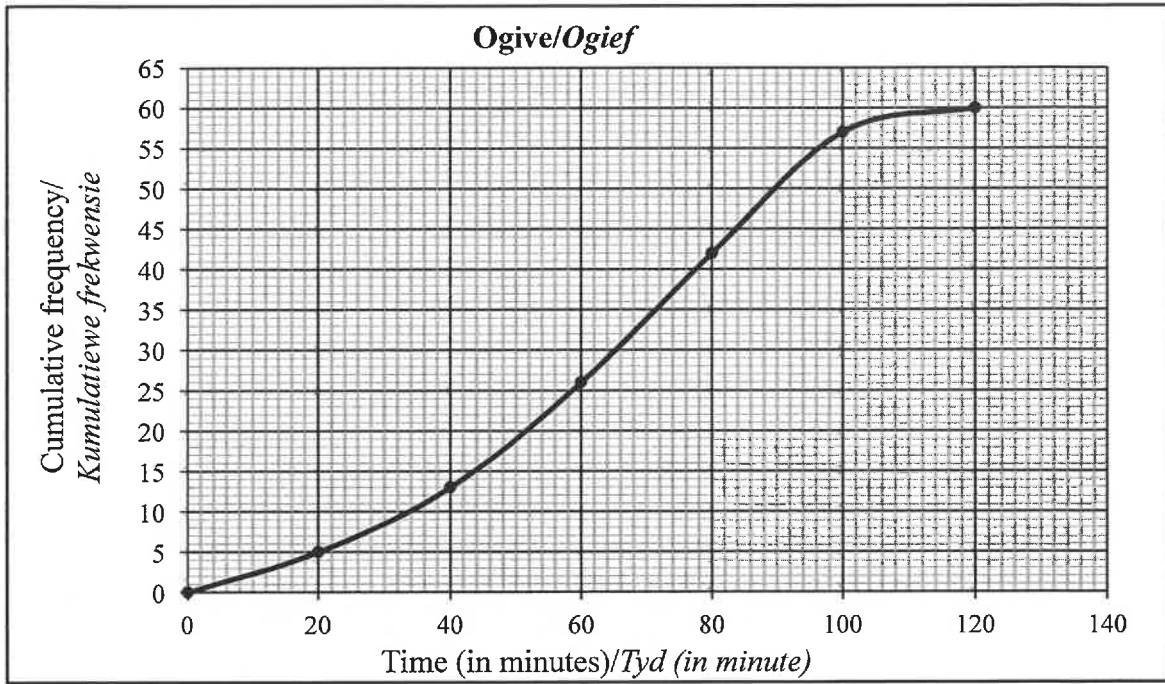
PLEASE FOLLOW THESE INSTRUCTIONS CAREFULLY	VOLG ASSEBLIEF HIERDIE INSTRUKSIES NOUKEURIG
1. Clearly write your examination number and centre number in the space provided and attach your barcode label in the space provided.	1. <i>Skryf jou eksamennommer en sentrumnummer duidelik in die ruimtes soos verskaf en plak jou stafieskodeplakker in die ruimte soos verskaf.</i>
2. Remember that your own name (or the name of your school) may not appear anywhere on or in this answer book.	2. <i>Onthou dat jou eie naam (of die naam van jou skool) nie op of in hierdie antwoordeboek mag voorkom nie.</i>
3. Answer ALL questions in the spaces provided.	3. <i>Beantwoord ALLE vrae in die ruimtes wat voorsien is.</i>
4. No pages may be torn from this answer book.	4. <i>Geen bladsye mag uit hierdie antwoordeboek geskeur word nie.</i>
5. Read the instructions printed on your timetable carefully as well as any other instructions which may be given in each examination paper.	5. <i>Lees die instruksies wat op jou eksamenrooster gedruk is, sorgvuldig deur, asook enige ander instruksies wat op elke eksamen vraestel gegee word.</i>
6. Candidates may not retain an answer book or remove it from the examination room.	6. <i>Geen antwoordeboek mag deur die kandidaat behou of uit die eksamenlokaal verwyder word nie.</i>
7. Answers must be written in black/blue ink as distinctly as possible. Do not write in the margins.	7. <i>Skryf die antwoorde so duidelik moontlik met swart/blou ink. Laat die kantlyne oop.</i>
8. Write the numbers of the questions you have answered on the front cover of the answer book where marks are to be recorded.	8. <i>Skryf die nommers van die vrae wat jy beantwoord het op die voorblad van die antwoordeboek waar die punte aangebring word.</i>
9. If you require additional space for your answers:	9. <i>In geval jy addisionele ruimte benodig vir jou antwoorde:</i>
9.1 Use the additional space provided at the end of the answer book.	9.1 <i>Gebruik die addisionele ruimte wat aan die einde van die antwoordeboek voorsien word.</i>
9.2 When answering a question in the additional space, indicate clearly the question number in the column on the LHS.	9.2 <i>As 'n vraag in die addisionele ruimte beantwoord word, dui duidelik die vraagnommer in die kolom aan die LK aan.</i>
9.3 Rule off after each answer.	9.3 <i>Trek 'n lyn na elke antwoord.</i>
10. Draw a neat line through any work/rough work that must not be marked.	10. <i>Trek 'n netjiese lyn deur enige werk/rofwerk wat nie nagesien moet word nie.</i>

**QUESTION/VRAAG 1 .**

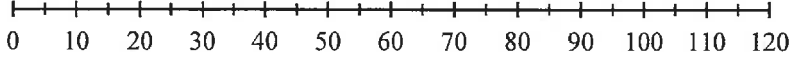
<b>Weight (in kg)/ Gewig (in kg) (x)</b>	34	32	40	27	33	28	27	55	39	44	30	57	28	32	31
<b>Number of push-ups per minute/Getal opstote per minuut (y)</b>	26	21	6	20	16	26	23	7	18	14	17	8	28	25	20

	<b>Solution/Oplissing</b>	<b>Marks Punte</b>
1.1		(3)
1.2		(1)
1.3		(2)
1.4		(1)
1.5		(1)
1.6		(2)
		<b>[10]</b>

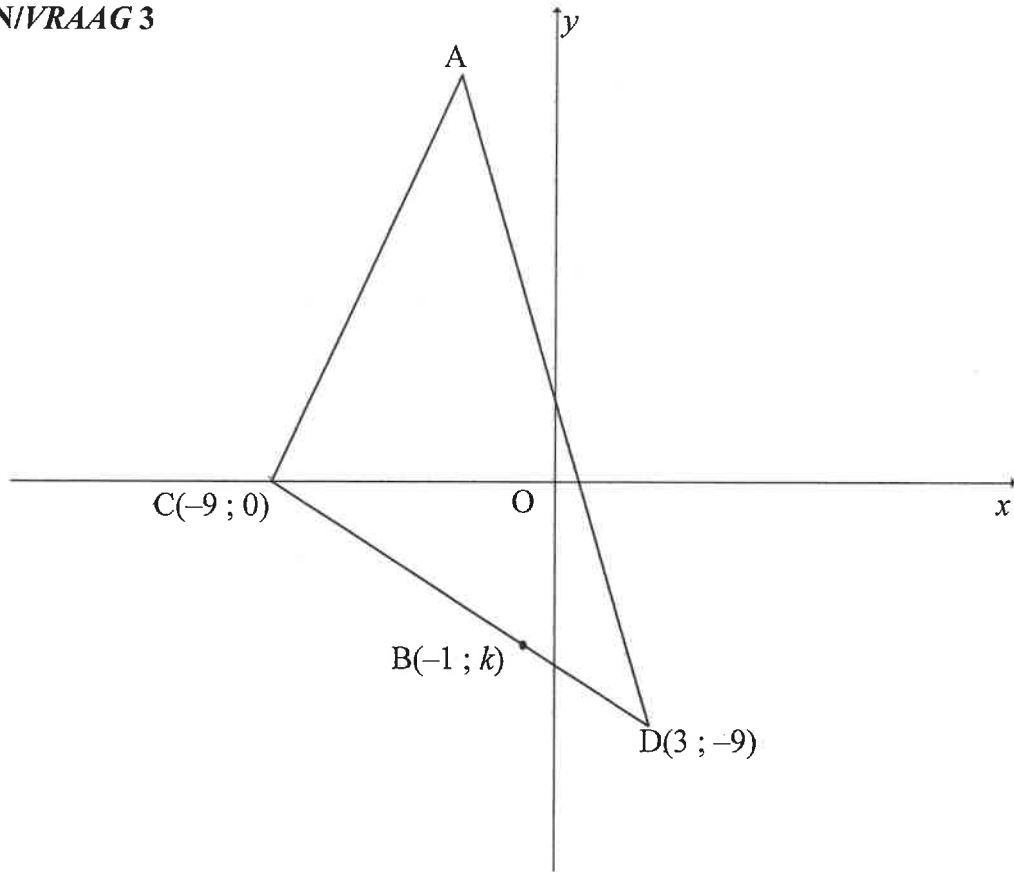
**QUESTION/VRAAG 2**



	<b>Solution/Oplissing</b>	<b>Marks Punte</b>
2.1		(1)
2.2		(1)
2.3		(2)

	<b>Solution/Oplissing</b>	<b>Marks Punte</b>
2.4		(2)
2.5	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	(2)
2.6	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	(2)
		<b>[10]</b>

**QUESTION/VRAAG 3**

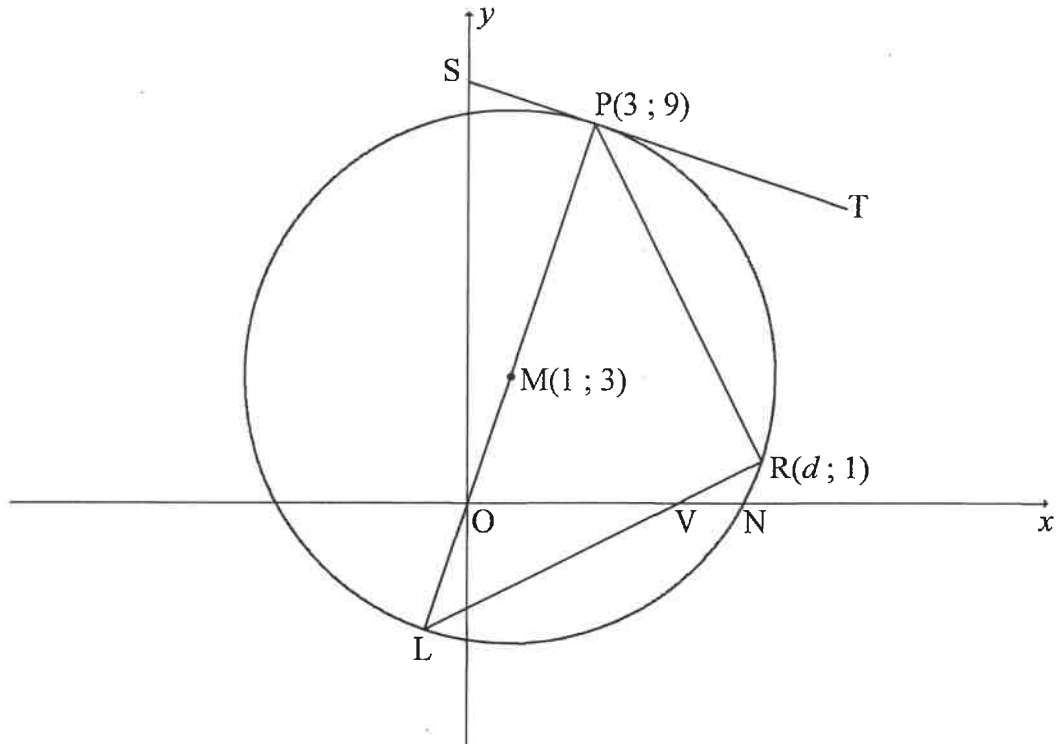


	<i>Solution/Oplissing</i>	<b>Marks Punte</b>
3.1		(2)
3.2		(2)

	<b>Solution/Oplissing</b>	<b>Marks Punte</b>
3.3		(1)
3.4		(2)
3.5		(2)
3.6		(4)



**QUESTION/VRAAG 4**



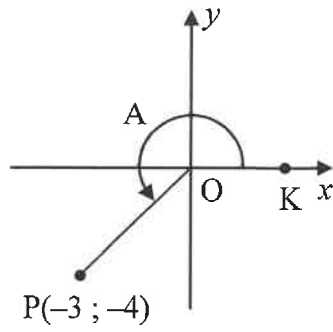
	<b>Solution/Oplissing</b>	<b>Marks Punte</b>
4.1		(2)
4.2		(4)

	<b>Solution/Oplissing</b>	<b>Marks Punte</b>
4.3		(4)
4.4		(2)
4.5		(5)



**QUESTION/VRAAG 5**

5.1



	<b>Solution/Oplissing</b>	<b>Marks Punte</b>
5.1.1		(2)
5.1.2		(2)
5.1.3		(4)



**QUESTION/VRAAG 6**

	<b>Solution/Oplissing</b>	<b>Marks Punte</b>
6.1.1		(2)
6.1.2		



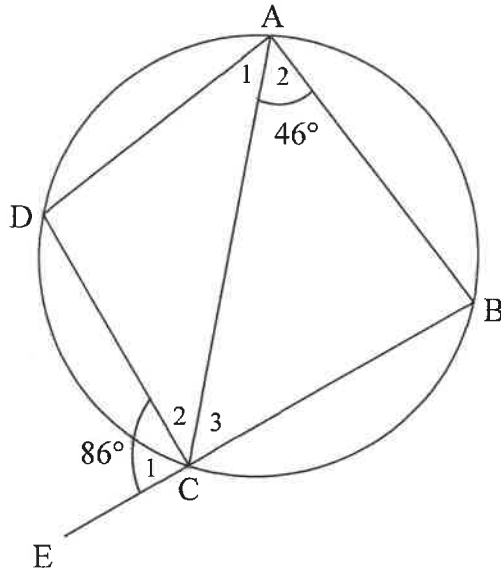




Provide reasons for your statements in QUESTIONS 9, 10 and 11.

Verskaf redes vir jou bewerings in VRAAG 9, 10 en 11.

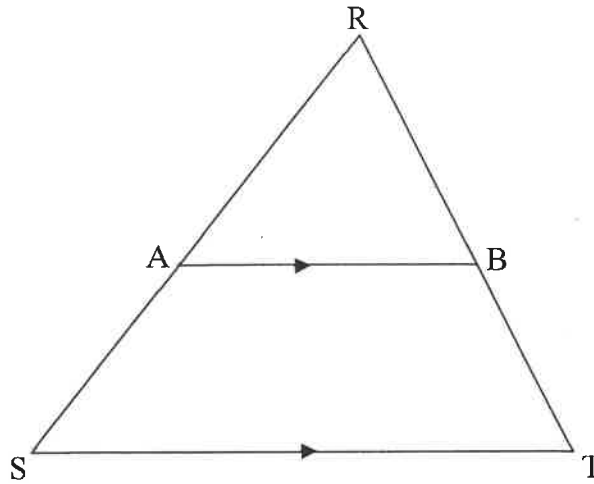
**QUESTION/VRAAG 9**



	Solution/Oplissing	Marks Punte
9.1		(2)
9.2		(4)
		<b>[6]</b>

**QUESTION/VRAAG 10**

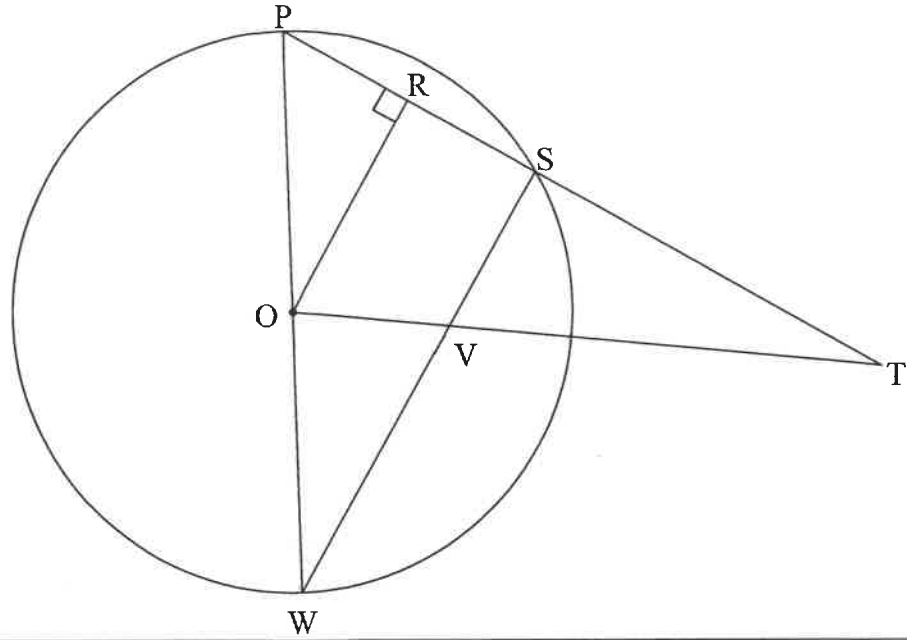
10.1



	<b>Solution/Oplissing</b>	<b>Marks Punte</b>
10.1		

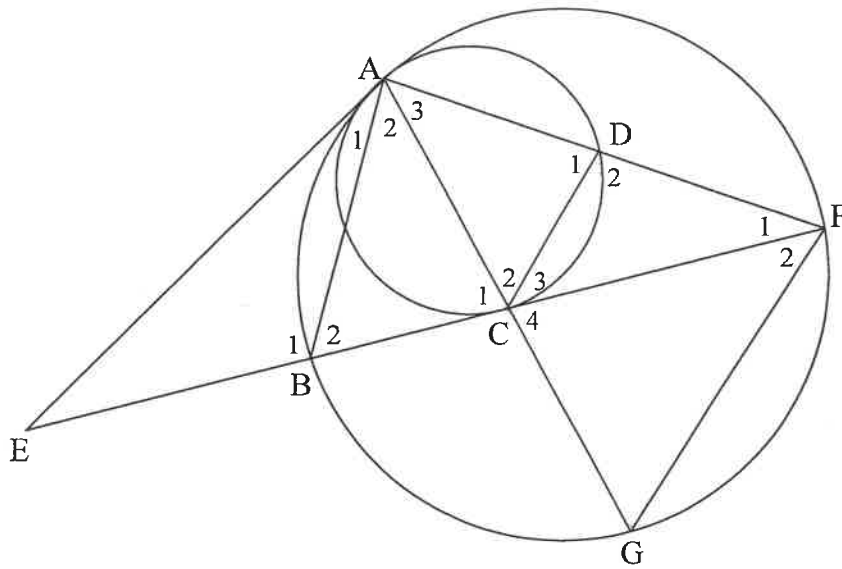
(6)

10.2



	<b>Solution/Oplissing</b>	<b>Marks Punte</b>
10.2.1		
10.2.2		(5)
		(4)
		<b>[15]</b>

**QUESTION/VRAAG 11**



	<b>Solution/Oplossing</b>	<b>Marks Punte</b>
11.1		(6)
11.2		(4)

	<b>Solution/Oplissing</b>	<b>Marks Punte</b>
11.3		
11.4		(4)
		(6)
		<b>[20]</b>







# basic education

Department:  
Basic Education  
**REPUBLIC OF SOUTH AFRICA**

**NATIONAL  
SENIOR CERTIFICATE/  
NASIONALE  
SENIOR SERTIFIKAAT**

**GRADE 12/GRAAD 12**

**MATHEMATICS P2/WISKUNDE V2**

**NOVEMBER 2024**

**MARKING GUIDELINES/NASIENRIGLYNE**

**MARKS/PUNTE: 150**

**These marking guidelines consist of 25 pages./  
*Hierdie nasienriglyne bestaan uit 25 bladsye.***

**NOTE:**

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- If a candidate has crossed out an attempt of a question and not redone the question, mark the crossed-out version.
- Consistent accuracy applies in ALL aspects of the Marking Guidelines. Stop marking at the second calculation error.
- Assuming answers/values in order to solve a problem is NOT acceptable.

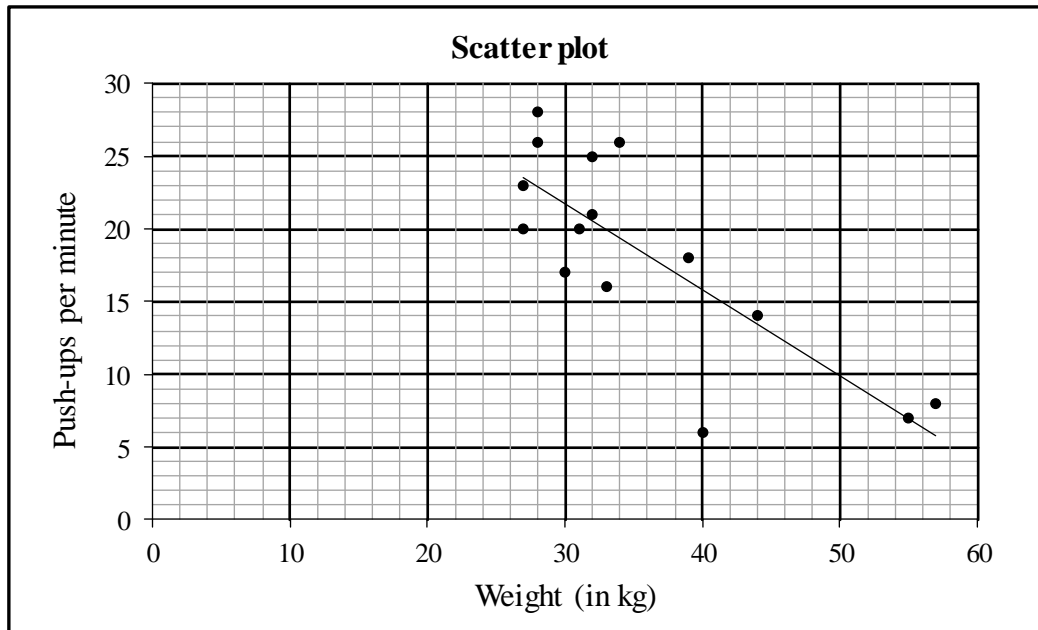
**LET WEL:**

- *As 'n kandidaat 'n vraag TWEE KEER beantwoord, sien slegs die EERSTE poging na.*
- *As 'n kandidaat 'n antwoord van 'n vraag doodtrek en nie oordoen nie, sien die doodgetrekte poging na.*
- *Volgehoue akkuraatheid word in ALLE aspekte van die Nasienriglyne toegepas. Hou op nasien by die tweede berekeningsfout.*
- *Aanvaar van antwoorde/waardes om 'n probleem op te los, word NIE toegelaat nie.*

<b>GEOMETRY • MEETKUNDE</b>	
<b>S</b>	<b>A mark for a correct statement (A statement mark is independent of a reason)</b>
	<b>'n Punt vir 'n korrekte bewering ( 'n Punt vir 'n bewering is onafhanklik van die rede)</b>
<b>R</b>	<b>A mark for the correct reason (A reason mark may only be awarded if the statement is correct)</b>
	<b>'n Punt vir 'n korrekte rede ( 'n Punt word slegs vir die rede toegeken as die bewering korrek is)</b>
<b>S/R</b>	<b>Award a mark if statement AND reason are both correct</b>
	<b>Ken 'n punt toe as die bewering EN rede beide korrek is</b>

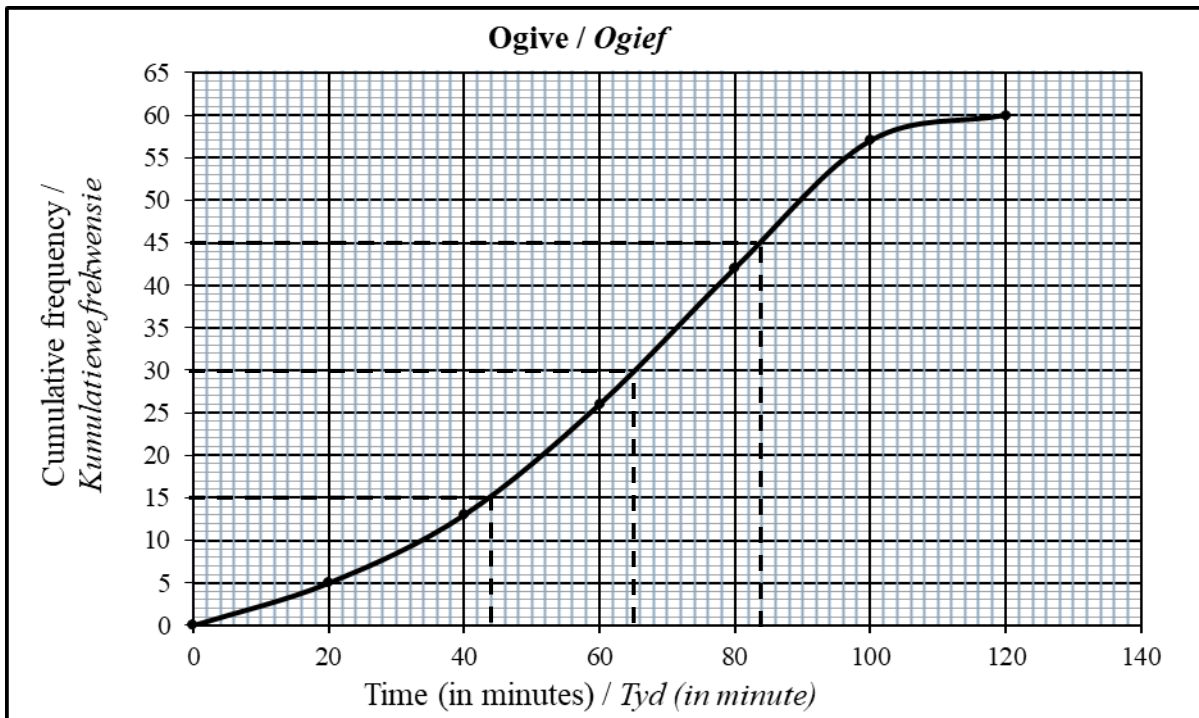
**QUESTION/VRAAG 1**

<b>Weight (in kg) (x)</b>	34	32	40	27	33	28	27	55	39	44	30	57	28	32	31
<b>Number of push-ups per minute (y)</b>	26	21	6	20	16	26	23	7	18	14	17	8	28	25	20



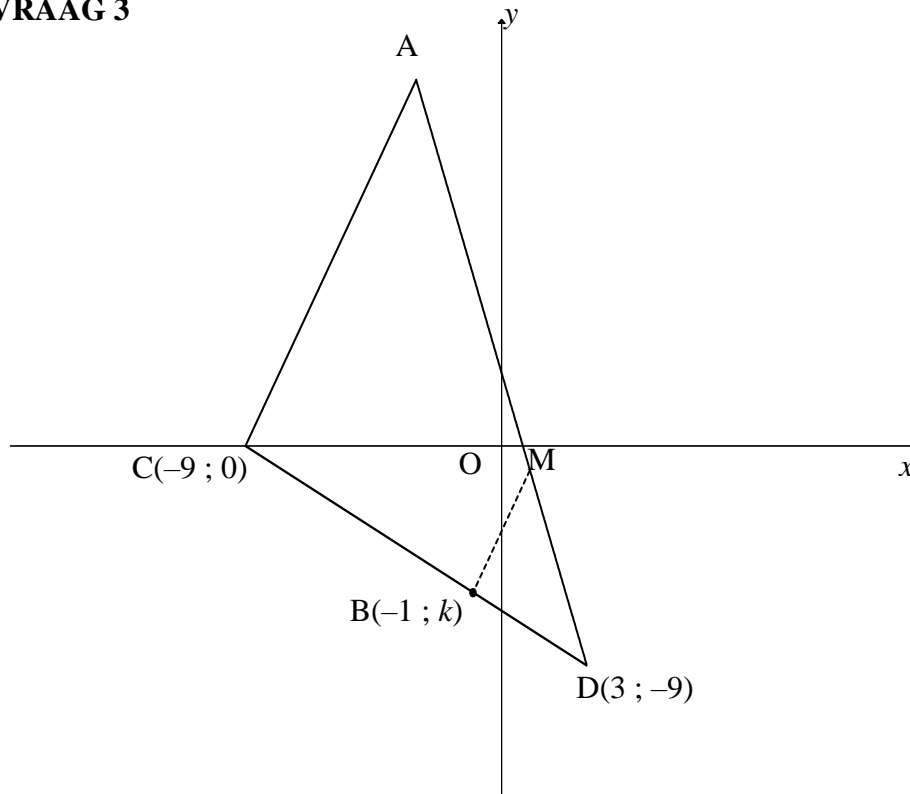
1.1	$a = 39,456001\dots$ $b = -0,590018\dots$ $\hat{y} = 39,46 - 0,59x$	✓ $a = 39,46$ ✓ $b = -0,59$ ✓ equation CORRECT ANSWER ONLY: FULL MARKS (3)
1.2	$r = -0,8$	✓(A) $-0,8$ (1)
1.3	$y = 39,46 - 0,59(29)$ $y = 22,35$  <b>OR/OF</b>  $y = 22,35$ (calculator)	✓ substitution ✓ answer (2)  ✓✓ answer (2)
1.4	$\bar{y} = 18,33$	✓(A) $18,33$ (1)
1.5	The increase in the number of push-ups will have <b>no influence</b> . The standard deviation <b>stays the same</b> .	✓ no influence <b>OR</b> standard deviation remains the same <i>geen verandering /</i> <i>bly dieselfde</i> (1)
1.6	6 is furthest y-value below the least squares regression line. An increase of 10 push-ups will get the team member to (40 ; 16), the minimum number of push-ups for a player weighing 40kg.	✓ 6 ✓ difference is 10 (2)
		<b>[10]</b>

**QUESTION/VRAAG 2**



2.1	Median = 65	✓ 65 (1)
2.2	$Q_1 = 44$	✓ 44 (1)
2.3	$IQR = 84 - 44$ $= 40$	✓ 84 ✓ IQR (2)
2.4		✓ box ✓ (A) whiskers ending at 5 & 120 (2)
2.5	Number of employees who qualify = 34 % of employees who qualify = $\frac{34}{60} \times 100$ $= 56,67\%$ of the employees <b>OR/OF</b> Number of employees who qualify = 35 % of employees who qualify = $\frac{35}{60} \times 100$ $= 58,33\%$ of the employees	✓ 34  ✓ answer (2)  ✓ 35  ✓ answer (2)
2.6	Number of intervals = 3 Time allowed to work from home = 3(30 minutes) $= 90$ minutes <b>OR/OF</b> 1,5 hours	✓ 3  ✓ answer (2)
<b>[10]</b>		

**QUESTION / VRAAG 3**

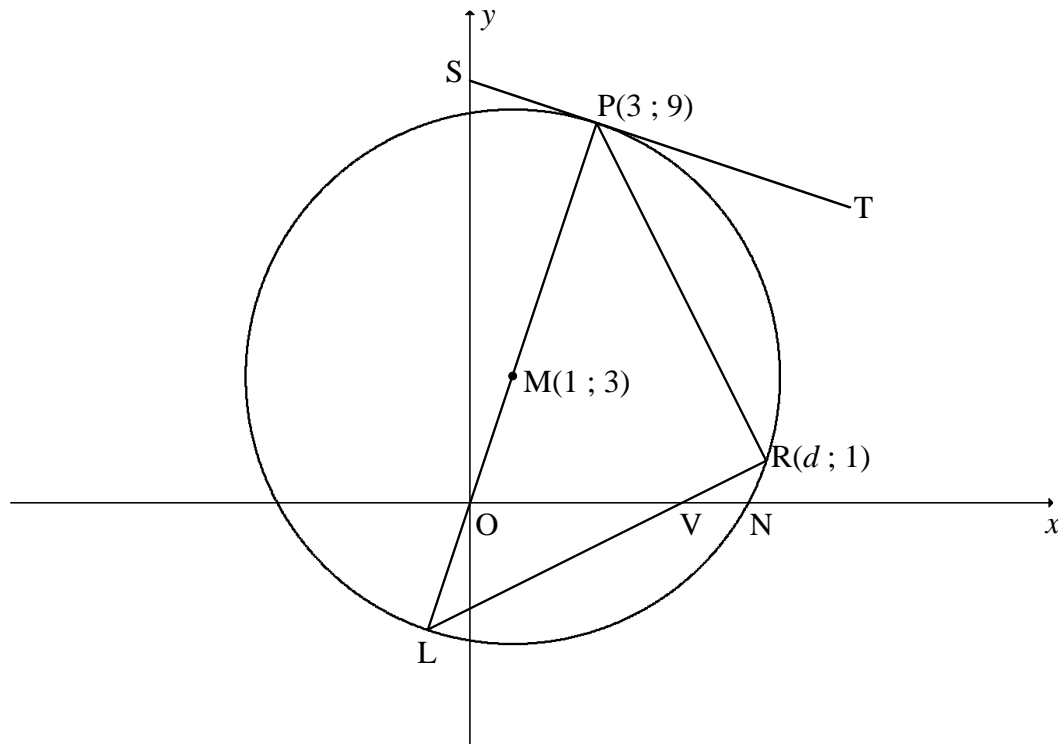


<p>3.1</p>	$m_{DC} = \frac{-9-0}{3-(-9)} \quad \text{OR/OF} \quad m_{DC} = \frac{0-(-9)}{-9-3}$ $m_{DC} = -\frac{3}{4} \quad \quad \quad m_{DC} = -\frac{3}{4}$	<p>✓ correct substitution of D(3; -9) &amp; C(-9; 0) into gradient formula</p> <p>✓ answer</p> <p style="text-align: right;">(2)</p>
<p>3.2</p>	<p>Equation of DC:</p> $0 = -\frac{3}{4}(-9) + c \quad \text{OR/OF} \quad y - 0 = -\frac{3}{4}(x - (-9))$ $c = \frac{-27}{4} \text{ or } -6\frac{3}{4} \quad \quad \quad y = -\frac{3}{4}(x + 9)$ $y = -\frac{3}{4}x - \frac{27}{4} \quad \quad \quad y = -\frac{3}{4}x - \frac{27}{4}$	<p>✓ correct substitution of C(-9; 0) or D(3; -9) into equation of line</p> <p>✓ answer</p> <p style="text-align: right;">(2)</p>
<p>3.3</p>	$k = -\frac{3}{4}(-1) - \frac{27}{4} \quad \text{OR/OF} \quad \frac{k - (-9)}{-1 - 3} = \frac{-3}{4} \quad \text{OR/OF} \quad \frac{k - 0}{-1 - (-9)} = \frac{-3}{4}$ $k = \frac{3}{4} - \frac{27}{4} \quad \text{OR/OF} \quad k + 9 = 3 \quad \text{OR/OF} \quad k = -\frac{3}{4}(8)$ $k = -6 \quad \quad \quad k = -6 \quad \quad \quad k = -6$	<p>✓ substitution of B(-1; k)</p> <p style="text-align: right;">(1)</p>
<p>3.4</p>	$DC = \sqrt{(3+9)^2 + (-9-0)^2}$ <p>DC = 15 units</p>	<p>✓ correct substitution of D(3; -9) &amp; C(-9; 0) into distance formula</p> <p>✓ answer</p> <p style="text-align: right;">(2)</p>

<p>3.5</p>	$DB = \sqrt{(3 - (-1))^2 + (-9 - (-6))^2}$ $DB = 5$ $\therefore \frac{DB}{DC} = \frac{5}{15} = \frac{1}{3}$	<p>✓ DB = 5</p> <p>✓ answer</p> <p>(2)</p>
<p>3.6</p>	$\frac{DM}{DA} = \frac{DB}{DC} = \frac{1}{3}$ $\frac{\text{Area } \triangle MBD}{\text{Area } \triangle ACD} = \frac{\frac{1}{2}(DM)(DB) (\sin \hat{D})}{\frac{1}{2}(DA)(DC) (\sin \hat{D})}$ $= \frac{1}{3} \times \frac{1}{3}$ $= \frac{1}{9}$	<p>✓ <math>\frac{DM}{DA} = \frac{DB}{DC}</math></p> <p>✓ correct use of area rule</p> <p>✓ subst. for <math>\frac{BD}{DC}</math> and <math>\frac{DM}{DA}</math> into correct formula</p> <p>✓ answer</p> <p>(4)</p>
<p>3.7</p>	$y = -4x + c$ $m_{AD} = -4$ $-9 = -4(3) + c$ $c = 3$ $y = -4x + 3$ $(x-3)^2 + (y+9)^2 = 612$ $(x-3)^2 + (-4x+3+9)^2 = (\sqrt{612})^2$ $(x-3)^2 + (-4x+12)^2 = 612$ $x^2 - 6x + 9 + 16x^2 - 96x + 144 = 612$ $17x^2 - 102x - 459 = 0$ $x^2 - 6x - 27 = 0$ $(x-9)(x+3) = 0$ $x = 9 \text{ or } x = -3$ <p>N/A</p> $y = -4(-3) + 3$ $y = 15$ $A(-3; 15)$	<p>✓ correct substitution of <math>m_{AD} = -4</math> and <math>D(3; -9)</math></p> <p>✓ <math>(x-3)^2 + (y+9)^2 = 612</math></p> <p>✓ substitution of equation AD into distance formula</p> <p>✓ standard form</p> <p>✓ x values with rejection</p> <p>✓ y coordinate</p> <p>(6)</p>

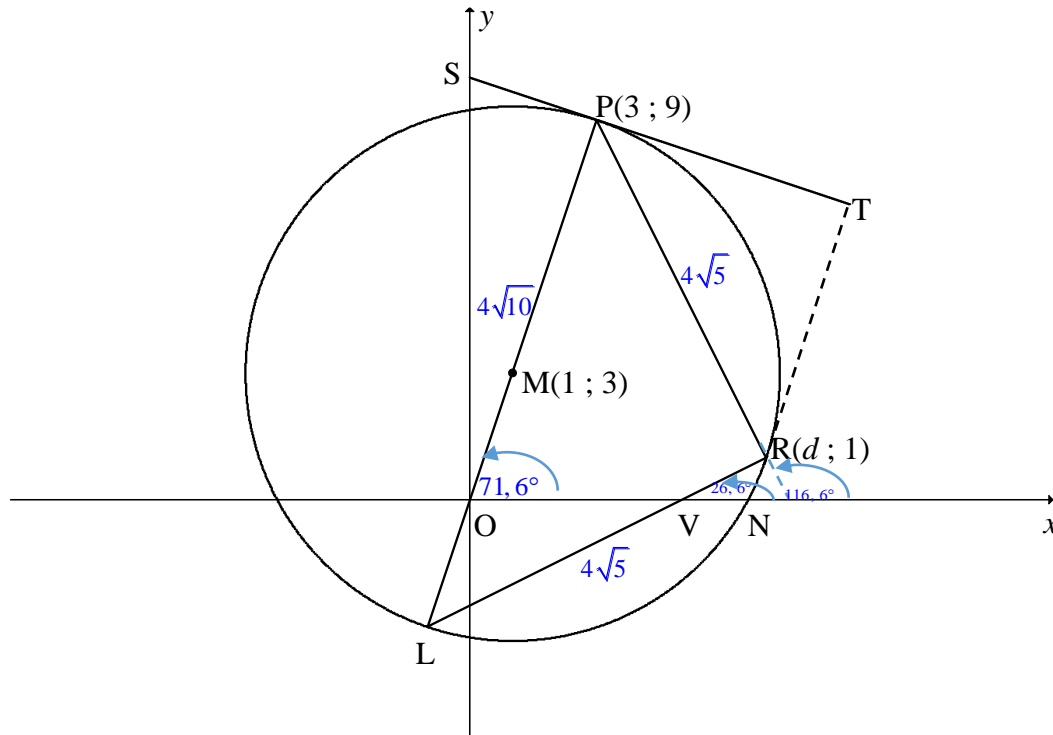
	<p><b>OR/OF</b></p> $-9 = -4(3) + c$ $c = 3$ $y = -4x + 3$ $N(0 ; 3)$ $ND = \sqrt{(3-0)^2 + (-9-3)^2}$ $= 3\sqrt{17}$ $AD = 6\sqrt{17}$ $ND = \frac{1}{2}AD$ <p>N is the midpoint of AD</p> $A(-3 ; 15)$	<p><b>OR/OF</b></p> <p>✓ correct substitution of <math>m_{AD} = -4</math> and <math>D(3 ; -9)</math></p> <p>✓ <math>N(0 ; 3)</math></p> <p>✓ substitution into distance formula to calculate ND</p> <p>✓ <math>ND = \frac{1}{2}AD</math></p> <p>✓ <math>x</math> – value    ✓ <math>y</math> – value</p> <p style="text-align: right;">(6)</p>
		<b>[19]</b>

**QUESTION/VRAAG 4**



4.1	L(-1 ; -3)	✓ $x = -1$ ✓ $y = -3$ (2)
4.2	$m_{MP} = \frac{9-3}{3-1}$ $m_{MP} = 3$ $m_{ST} = -\frac{1}{3}$ $9 = -\frac{1}{3}(3) + c$ $c = 10$ $y = -\frac{1}{3}x + 10$ <b>OR/OF</b> $y - 9 = -\frac{1}{3}(x - 3)$ $y - 9 = -\frac{1}{3}x + 1$ $y = -\frac{1}{3}x + 10$	✓ $m_{MP} = 3$ ✓ $m_{ST} = -\frac{1}{m_{MP}}$ ✓ substitution of $m_{ST}$ & P(3; 9) into equation of a line ✓ equation of tangent ST (4)
4.3	$(x-1)^2 + (y-3)^2 = r^2$ $(3-1)^2 + (9-3)^2 = r^2$ $r^2 = 40$ $(x-1)^2 + (y-3)^2 = 40$ $x^2 - 2x + 1 + y^2 - 6y + 9 = 40$ $x^2 + y^2 - 2x - 6y - 30 = 0$	✓ $(3-1)^2 + (9-3)^2 = r^2$ ✓ value of $r^2$ ✓ LHS of equation of circle ✓ expanding LHS (4)

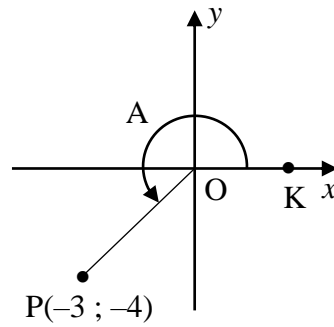
<p>4.4</p>	$d^2 + (1)^2 - 2d - 6(1) - 30 = 0$ $d^2 - 2d - 35 = 0$ $(d - 7)(d + 5) = 0$ $d = 7 \text{ or } d = -5$ $\therefore d = 7$ <p><b>OR/OF</b></p> $(x - 1)^2 + (y - 3)^2 = 40$ $(d - 1)^2 + (1 - 3)^2 = 40$ $(d - 1)^2 = 36$ $d - 1 = 6 \text{ or } d - 1 = -6$ $d = 7 \text{ or } d = -5$ $\therefore d = 7$ <p><b>OR/OF</b></p> <p><math>\hat{PRL} = 90^\circ</math> (<math>\angle</math> in semi-circle)</p> $\frac{9 - 1}{3 - d} \times \frac{1 - (-3)}{d - (-1)} = -1$ $d^2 - 2d - 35 = 0$ $(d - 7)(d + 5) = 0$ $d = 7 \text{ or } d = -5$ $\therefore d = 7$	$\checkmark d^2 + (1)^2 - 2d - 6(1) - 30 = 0$ $\checkmark \text{ standard form}$ <p style="text-align: right;">(2)</p> <p><b>OR/OF</b></p> $\checkmark (d - 1)^2 + (1 - 3)^2 = 40$ $\checkmark \text{ standard form}$ <p style="text-align: right;">(2)</p> <p><b>OR/OF</b></p> $\checkmark m_{PR} \times m_{RL} = -1$ $\checkmark \text{ standard form}$ <p style="text-align: right;">(2)</p>
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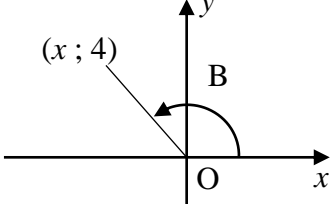


<p>4.5</p>	<p><math>m_{PO} = 3</math>  <math>\therefore \tan \hat{P}ÔV = 3</math>  <math>\hat{P}ÔV = 71,565\dots^\circ</math></p> <p><math>m_{RL} = \frac{1 - (-3)}{7 - (-1)}</math>  <math>= \frac{1}{2}</math>  <math>\therefore \tan \hat{R}ÔN = \frac{1}{2}</math>  <math>\hat{R}ÔN = 26,565\dots^\circ</math>  <math>\hat{L} = 71,565\dots^\circ - 26,565\dots^\circ</math> [ext. <math>\angle</math> of <math>\Delta</math> / buite <math>\angle</math> van <math>\Delta</math>]  <math>\hat{L} = 45^\circ</math></p> <p><b>OR/OF</b></p> <p><math>\hat{R} = 90^\circ</math> [ <math>\angle</math> in semi-circle / <math>\angle</math> in 'n halwe sirkel ]  <math>PR^2 = (3-7)^2 + (9-1)^2</math>  <math>PR = \sqrt{80} = 4\sqrt{5}</math> units  <math>PL^2 = (3-(-1))^2 + (9-(-3))^2</math> <b>OR</b> <math>RL^2 = (7+1)^2 + (1+3)^2</math>  <math>PL = \sqrt{160} = 4\sqrt{10}</math> <span style="margin-left: 100px;"><math>RL = \sqrt{80} = 4\sqrt{5}</math></span>  <math>\sin \hat{L} = \frac{4\sqrt{5}}{4\sqrt{10}}</math> <b>OR</b> <math>\cos \hat{L} = \frac{4\sqrt{5}}{4\sqrt{10}}</math> <b>OR</b> <math>\tan \hat{L} = \frac{4\sqrt{5}}{4\sqrt{5}}</math>  <math>\hat{L} = 45^\circ</math></p>	<p>✓ <math>\tan \hat{P}ÔV = m_{PO}</math>                  ✓ <math>\hat{P}ÔV</math></p> <p>✓ <math>m_{RL}</math> using <math>R(7; 1)</math> &amp; <math>L</math></p> <p>✓ <math>\hat{R}ÔN</math></p> <p>✓ answer</p> <p style="text-align: right;">(5)</p> <p><b>OR/OF</b></p> <p>✓ <math>\hat{R} = 90^\circ</math></p> <p>✓ <math>PR = \sqrt{80} = 4\sqrt{5}</math></p> <p>✓ length of <math>PL</math> <b>OR</b> <math>RL</math></p> <p>✓ trig ratio of <math>\hat{L}</math></p> <p>✓ answer</p> <p style="text-align: right;">(5)</p>
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	<p><b>OR/OF</b></p> $PL = \sqrt{(3+1)^2 + (9+3)^2} = \sqrt{160} = 4\sqrt{10}$ $PR = \sqrt{(7-3)^2 + (1-9)^2} = \sqrt{80} = 4\sqrt{5}$ $LR = \sqrt{(7+1)^2 + (1+3)^2} = \sqrt{80} = 4\sqrt{5}$ $\cos L = \frac{80+160-80}{2\sqrt{80} \times \sqrt{160}}$ $\cos L = \frac{\sqrt{2}}{2}$ $\hat{L} = 45^\circ$	<p><b>OR/OF</b></p> <p>✓ length of PL</p> <p>✓ <math>PR = \sqrt{80} = 4\sqrt{5}</math></p> <p>✓ length of LR</p> <p>✓ substitution into the cos rule</p> <p>✓ answer</p> <p style="text-align: right;">(5)</p>
<p>4.6</p>	$m_{RM} = \frac{1-3}{7-1}$ $= -\frac{1}{3}$ <p><math>m_{RT} = 3</math> (tan <math>\perp</math> rad)</p> $m_{PT} = -\frac{1}{3}$ $m_{RT} \times m_{PT} = -1$ <p>PT <math>\perp</math> RT</p> <p><b>OR/OF</b></p> $m_{MR} = \frac{3-1}{1-7}$ $= -\frac{1}{3}$ $m_{PT} = -\frac{1}{3}$ [proved in Q4.2] $m_{PT} = m_{MR}$ <p><math>\therefore</math> PT <math>\parallel</math> MR</p> <p><math>\hat{MRT} = 90^\circ</math> [radius <math>\perp</math> tangent / raaklyn <math>\perp</math> radius]</p> <p><math>\hat{PTR} = 90^\circ</math> [co-int <math>\angle</math>s; PT <math>\parallel</math> MR/ooreenkomst. <math>\angle</math>e; PT <math>\parallel</math> MR]</p> <p>PT <math>\perp</math> RT</p> <p><b>OR/OF</b></p> <p><math>\hat{TPR} = \hat{L} = 45^\circ</math> [tan-chord theorem/ <math>\angle</math> tussen raaklyn en koord]</p> <p>TP = TR [tans from common pt]</p> <p><math>\therefore \hat{TPR} = \hat{TRP} = 45^\circ</math> [<math>\angle</math>s opp equal sides/ <math>\angle</math>e teenoor gelyke sye]</p> <p><math>\therefore \hat{PTR} = 90^\circ</math> [sum of <math>\angle</math>s in <math>\Delta</math> / binne <math>\angle</math>e van <math>\Delta</math>]</p> <p>PT <math>\perp</math> RT</p>	<p>✓ <math>m_{RM}</math></p> <p>✓ <math>m_{RT}</math></p> <p>✓ <math>m_{RT} \times m_{PT} = -1</math></p> <p style="text-align: right;">(3)</p> <p><b>OR/OF</b></p> <p>✓ PT <math>\parallel</math> MR</p> <p>✓ <math>\hat{MRT} = 90^\circ</math></p> <p>✓ <math>\hat{PTR} = 90^\circ</math></p> <p style="text-align: right;">(3)</p> <p><b>OR/OF</b></p> <p>✓ <math>\hat{TPR} = \hat{L}</math></p> <p>✓ <math>\hat{TPR} = \hat{TRP}</math></p> <p>✓ <math>\hat{PTR} = 90^\circ</math></p> <p style="text-align: right;">(3)</p> <p style="text-align: right;"><b>[20]</b></p>

**QUESTION/VRAAG 5**



<p>5.1.1</p>	<p><math>r = 5</math>  <math>\cos A = -\frac{3}{5}</math></p>	<p>✓ <math>r = 5</math>                  ✓ answer                  (2)</p>
<p>5.1.2</p>	<p><math>\cos 2A = 2\cos^2 A - 1</math>  <math>= 2\left(-\frac{3}{5}\right)^2 - 1</math>  <math>= -\frac{7}{25}</math>  <b>OR/OF</b>  <math>\cos 2A = \cos^2 A - \sin^2 A</math>  <math>= \left(-\frac{3}{5}\right)^2 - \left(-\frac{4}{5}\right)^2</math>  <math>= -\frac{7}{25}</math>  <b>OR/OF</b>  <math>\cos 2A = 1 - 2\sin^2 A</math>  <math>= 1 - 2\left(-\frac{4}{5}\right)^2</math>  <math>= -\frac{7}{25}</math></p>	<p>✓ substitution of <math>\cos A</math> into double angle formula                  ✓ answer                  (2)                  ✓ substitution of <math>\cos A</math> &amp; <math>\sin A</math> into double angle formula                  ✓ answer                  (2)                  ✓ substitution of <math>\sin A</math> into double angle formula                  ✓ answer                  (2)</p>
<p>5.1.3</p>	 <p><math>x = -3</math>  <math>\sin(A - B) = \sin A \cos B - \cos A \sin B</math>  <math>= \left(-\frac{4}{5}\right)\left(-\frac{3}{5}\right) - \left(-\frac{3}{5}\right)\left(\frac{4}{5}\right)</math>  <math>= \frac{12}{25} + \frac{12}{25}</math>  <math>= \frac{24}{25}</math></p>	<p>✓ <math>x = -3</math>                  ✓✓ substitution into the compound angle formula                  ✓ answer                  (4)</p>

<p>5.2</p>	$\frac{\cos\left(\frac{\alpha}{2}-45^\circ\right)\sin\left(\frac{\alpha}{2}-45^\circ\right)}{2}$ $= \frac{2\cos\left(\frac{\alpha}{2}-45^\circ\right)\sin\left(\frac{\alpha}{2}-45^\circ\right)}{2.2}$ $= \frac{\sin(\alpha-90^\circ)}{4}$ $= \frac{-\cos\alpha}{4}$ $= \frac{-p}{4} \quad \text{OR/OF} \quad = -\frac{1}{4}p$ <p><b>OR/OF</b></p> $\frac{\cos\left(\frac{\alpha}{2}-45^\circ\right)\sin\left(\frac{\alpha}{2}-45^\circ\right)}{2}$ $= \frac{\left[\cos\frac{\alpha}{2}\cos 45^\circ + \sin\frac{\alpha}{2}\sin 45^\circ\right]\left[\sin\frac{\alpha}{2}\cos 45^\circ - \cos\frac{\alpha}{2}\sin 45^\circ\right]}{2}$ $= \frac{\left[\frac{\sqrt{2}}{2}\cos\frac{\alpha}{2} + \frac{\sqrt{2}}{2}\sin\frac{\alpha}{2}\right]\left[\frac{\sqrt{2}}{2}\sin\frac{\alpha}{2} - \frac{\sqrt{2}}{2}\cos\frac{\alpha}{2}\right]}{2}$ $= \frac{\frac{1}{2}\sin^2\frac{\alpha}{2} - \frac{1}{2}\cos^2\frac{\alpha}{2}}{2}$ $= \frac{-\frac{1}{2}\left(\cos^2\frac{\alpha}{2} - \sin^2\frac{\alpha}{2}\right)}{2}$ $= -\frac{\cos 2\left(\frac{\alpha}{2}\right)}{4}$ $= -\frac{\cos\alpha}{4}$ $= -\frac{1}{4}p$	<p>✓ multiply by <math>\frac{2}{2}</math></p> <p>✓ double angle</p> <p>✓ co function</p> <p>✓ answer</p> <p>(4)</p> <p><b>OR/OF</b></p> <p>✓ expansion</p> <p>✓ special angles</p> <p>✓ double angle</p> <p>✓ answer</p> <p>(4)</p>
		<p>[12]</p>

**QUESTION/VRAAG 6**

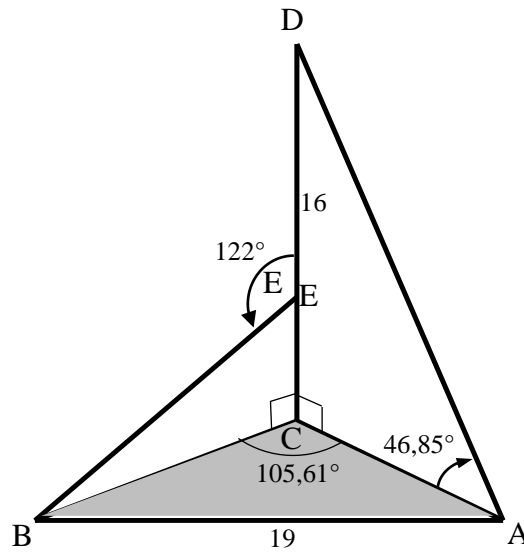
<p>6.1.1</p>	$\begin{aligned} \cos(x + y) &= \cos(x - (-y)) \\ &= \cos x \cos(-y) + \sin x \sin(-y) \\ &= \cos x \cos y - \sin x \sin y \end{aligned}$	<p>✓ <math>(x + y) = (x - (-y))</math>                  ✓ correct expansion</p> <p style="text-align: right;">(2)</p>
<p>6.1.2</p>	$\begin{aligned} \text{LHS} &= \frac{\cos(90^\circ - x)\cos y + \sin(-y)\cos(180^\circ + x)}{\cos x \cos(360^\circ + y) + \sin(360^\circ - x)\sin y} \\ &= \frac{(\sin x)\cos y + (-\sin y)(-\cos x)}{\cos x(\cos y) + (-\sin x)\sin y} \\ &= \frac{\sin x \cos y + \cos x \sin y}{\cos x \cos y - \sin x \sin y} \\ &= \frac{\sin(x + y)}{\cos(x + y)} \\ &= \tan(x + y) \\ &= \text{RHS} \end{aligned}$	<p>✓ <math>\cos(90^\circ - x) = \sin x</math>                  ✓ <math>\sin(-y) = -\sin y</math>                  ✓ <math>\cos(180^\circ + x) = -\cos x</math>                  ✓ <math>\cos(360^\circ + y) = \cos y</math>                  ✓ <math>\sin(360^\circ - x) = -\sin x</math>                  ✓ compound angle formulae</p> <p style="text-align: right;">(6)</p>
<p>6.2</p>	$\begin{aligned} \sqrt{6\sin^2 x - 11\cos(90^\circ + x) + 7} &= 2 \\ 6\sin^2 x - 11\cos(90^\circ + x) + 7 &= 4 \\ 6\sin^2 x - 11(-\sin x) + 7 &= 4 \\ 6\sin^2 x + 11\sin x + 3 &= 0 \\ (3\sin x + 1)(2\sin x + 3) &= 0 \\ \sin x = -\frac{1}{3} & \quad \text{OR/OF} \quad \sin x = -\frac{3}{2} \\ \text{ref } \angle = 19,47^\circ & \quad \text{no solution} \\ x = 199,47^\circ \text{ or } x = 340,53^\circ & \end{aligned}$	<p>✓ squaring both sides                  ✓ <math>\cos(90^\circ + x) = -\sin x</math>                  ✓ factors                  ✓ both equations                  ✓ ✓ answers</p> <p style="text-align: right;">(6)</p>
<p>6.3.1</p>	$\begin{aligned} g(x) &= \frac{4 - 8\sin^2 x}{3} \\ &= \frac{4(1 - 2\sin^2 x)}{3} \\ &= \frac{4\cos 2x}{3} \end{aligned}$ <p>Maximum value of <math>\cos 2x</math> is 1  <math>\therefore</math> maximum value of <math>g(x) = \frac{4}{3}</math></p>	<p>✓ factors                  ✓ <math>\frac{4\cos 2x}{3}</math>                  ✓ answer</p> <p style="text-align: right;">(3)</p>

	<p><b>OR/OF</b></p> <p><math>4 - 8\sin^2 x</math> is a maximum when <math>\sin^2 x</math> is a minimum</p> <p>Minimum value of <math>\sin^2 x</math> is 0</p> <p><math>\therefore</math> max. value of <math>g(x) = \frac{4-8(0)}{3}</math></p> $g(x) = \frac{4}{3}$ <p><b>OR/OF</b></p> $\sin x = \frac{-(0)}{2\left(-\frac{8}{3}\right)}$ <p><math>\sin x = 0</math></p> <p><math>\therefore</math> max. value of <math>g(x) = \frac{4-8(0)}{3}</math></p> $g(x) = \frac{4}{3}$	<p><b>OR/OF</b></p> <p>✓ min of <math>\sin^2 x = 0</math></p> <p>✓ <math>g(x) = \frac{4-8(0)}{3}</math></p> <p>✓ answer (3)</p> <p><b>OR/OF</b></p> <p>✓ <math>\sin x = \frac{-(0)}{2\left(-\frac{8}{3}\right)}</math></p> <p>✓ <math>\sin x = 0</math></p> <p>✓ answer (3)</p>
6.3.2	$x = 180^\circ$	<p>✓ <math>180^\circ</math> (1)</p>
<b>[18]</b>		

**QUESTION/VRAAG 7**

7.1	$x = 90^\circ$	✓ $x = 90^\circ$ (1)
7.2	$x = -180^\circ$ or $x \in (-90^\circ ; 0^\circ]$  <b>OR/OF</b>  $x = -180^\circ$ or $-90^\circ < x \leq 0^\circ$	✓✓ answer (2)  ✓✓ answer (2)
7.3.1	$180^\circ$	✓ answer (1)
7.3.2		✓ turning points on x-axis: $x = -90^\circ ; 90^\circ$  ✓ shape  ✓ turning point on y-axis at $(0 ; 2)$  (3)
7.4	$2 \cos^3 x - \sin x = 0$ $2 \cos^3 x = \sin x$ $2 \cos^2 x = \frac{\sin x}{\cos x}$ $2 \cos^2 x = \tan x$ $2 \cos^2 x - 1 = \tan x - 1$ $\cos 2x + 1 = \tan x$ $x = 45^\circ + k \cdot 180^\circ; k \in Z$ <b>OR/OF</b> $2 \cos^3 x - \sin x = 0$ $\cos x (2 \cos^2 x - \tan x) = 0$ $\cos x = 0 \quad \text{or} \quad 2 \cos^2 x = \tan x$ not valid $2 \cos^2 x - 1 + 1 = \tan x$ $\cos 2x + 1 = \tan x$ $x = 45^\circ + k \cdot 180^\circ; k \in Z$	✓ $2 \cos^2 x = \tan x$ ✓ $2 \cos^2 x - 1 = \tan x - 1$ ✓ $\cos 2x + 1 = \tan x$ ✓ answer (4)  <b>OR/OF</b>  ✓ $2 \cos^2 x = \tan x$ ✓ $2 \cos^2 x - 1 + 1 = \tan x$ ✓ $\cos 2x + 1 = \tan x$ ✓ answer (4)
<b>[11]</b>		

**QUESTION/VRAAG 8**



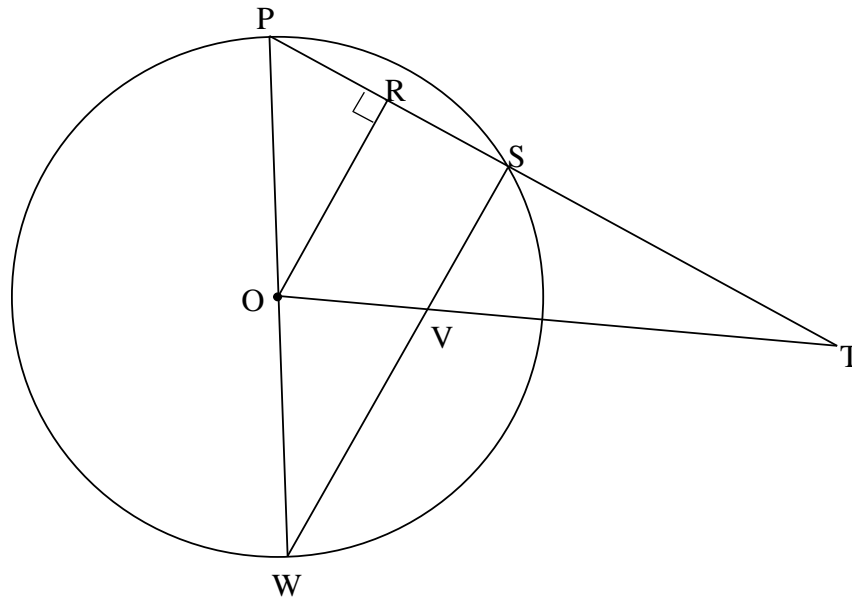
<p>8.1</p>	$\tan \hat{D}AC = \frac{DC}{AC}$ $AC = \frac{16}{\tan 46,85^\circ}$ $AC = 15 \text{ m}$	<p>✓ correct subs into trig ratio</p> <p>✓ answer</p> <p style="text-align: right;">(2)</p>
<p>8.2</p>	$(AB)^2 = (BC)^2 + (AC)^2 - 2(BC)(AC)\cos \hat{B}CA$ $(19)^2 = x^2 + (15)^2 - 2x(15)\cos 105,61^\circ$ $x^2 + 8,07x - 136 = 0$ $x = \frac{-8,07 \pm \sqrt{(8,07)^2 - 4(1)(-136)}}{2(1)}$ $x = 8,30 \text{ m or } x \neq -16,38 \text{ m}$ $\hat{B}EC = 58^\circ \qquad \text{OR/OF} \qquad \hat{E}BC = 32^\circ$ $\tan \hat{B}EC = \frac{BC}{EC} \qquad \qquad \qquad \tan \hat{E}BC = \frac{EC}{BC}$ $EC = \frac{8,3}{\tan 58^\circ} \qquad \qquad \qquad EC = 8,3 \tan 32^\circ$ $EC = 5,19 \text{ m} \qquad \qquad \qquad EC = 5,19 \text{ m}$ $DE = 10,81 \text{ m} \qquad \qquad \qquad DE = 10,81 \text{ m}$	<p>✓ correct subst. into cosine rule</p> <p>✓ quadratic equation in std form</p> <p>✓ correct subst. into quadratic formula</p> <p>✓ length of BC</p> <p>✓ size of <math>\hat{B}EC</math> OR/OF <math>\hat{E}BC</math></p> <p>✓ length of EC</p> <p>✓ answer</p> <p style="text-align: right;">(7)</p>

	<p><b>OR/OF</b></p> $\frac{\sin 105,61^\circ}{19} = \frac{\sin \hat{C}BA}{15}$ $\hat{C}BA = 49,5^\circ$ $\hat{B}AC = 24,89^\circ$ $\frac{BC}{\sin 24,89^\circ} = \frac{19}{\sin 105,61^\circ}$ $BC = 8,3 \text{ m}$ $\hat{B}EC = 58^\circ$ $\tan \hat{B}EC = \frac{BC}{EC}$ $EC = \frac{8,3}{\tan 58^\circ}$ $EC = 5,19 \text{ m}$ $DE = 10,81 \text{ m}$	<p><b>OR/OF</b></p> <ul style="list-style-type: none"> <li>✓ correct subst. into sine rule</li> <li>✓ <math>\hat{B}AC</math></li> <li>✓ correct subst. into sine formula</li> <li>✓ length of BC</li> <li>✓ size of <math>\hat{B}EC</math> <b>OR/OF</b> <math>\hat{E}BC</math></li> <li>✓ length of EC</li> <li>✓ answer</li> </ul> <p style="text-align: right;">(7)</p>
<b>[9]</b>		





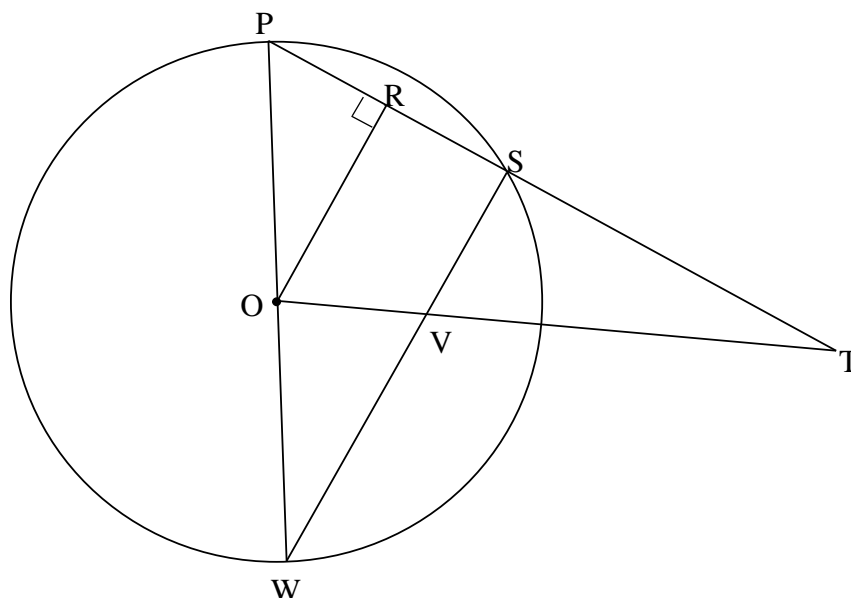
10.2



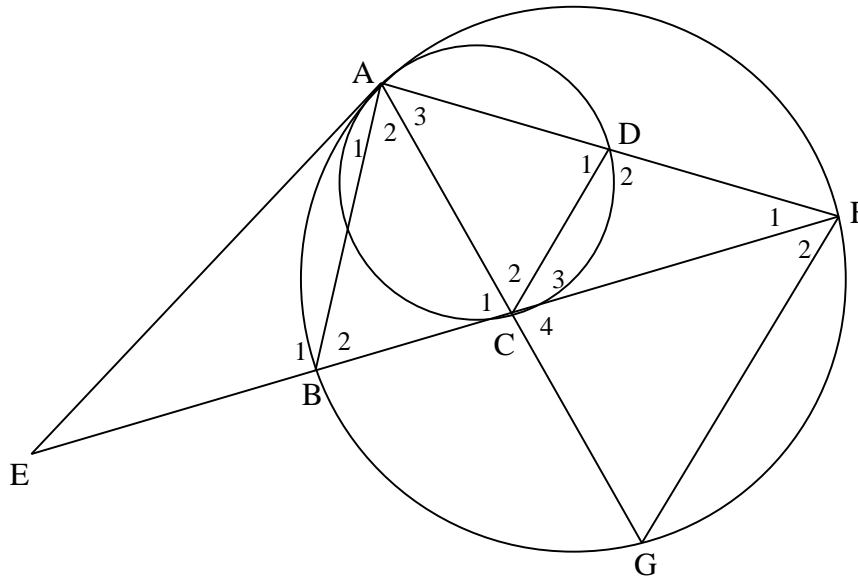
<p>10.2.1</p>	<p>PR = RS                  PO = OW  <math>\therefore OR = \frac{1}{2} WS</math>  <math>\therefore OR : WS = 1 : 2</math></p> <p><b>OR/OF</b></p> <p><math>\hat{P}SW = 90^\circ</math>  <math>\hat{P}RO = 90^\circ</math>  <math>\therefore \hat{P}RO = \hat{P}SW</math>  <math>\therefore RO \parallel SW</math></p> <p><math>\frac{PO}{OW} = \frac{PR}{RS}</math></p> <p>PO = OW  <math>\therefore PR = RS</math>  <math>\therefore OR : WS = 1 : 2</math></p>	<p>[line from centre <math>\perp</math> to chord/                  lyn vanuit midpt. sirkel <math>\perp</math> op koord]                  [radii / radiusse]                  [midpt theorem/midpt. stelling]</p> <p>[<math>\angle</math> in semi circle/<math>\angle</math> in halwe sirkel]                  [given]                  [corresp <math>\angle</math>s = / ooreenk. <math>\angle</math>e =]  <b>OR/OF</b>                  [co-int. <math>\angle</math>s suppl / ko-binne <math>\angle</math>e suppl]                  [prop theorem; RO <math>\parallel</math> SW/                  lyn // een sy van <math>\Delta</math>]                  [radii / radiusse]                  [midpt theorem/ midpt. stelling]</p>	<p>✓ S ✓ R                  ✓ S                  ✓ S ✓ R                  (5)</p> <p>✓ S                  ✓ S                  ✓ S ✓ R                  ✓ R                  (5)</p>
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	<p><b>OR/OF</b></p> <p><math>\Delta PRO</math> and <math>\Delta PSW</math>  <math>\hat{P}SW = 90^\circ</math> [∠ in semi circle/∠ in halwe sirkel]  <math>\hat{P}RO = 90^\circ</math> [given]  <math>\therefore \hat{P}RO = \hat{P}SW</math>  <math>\hat{P}</math> is common  <math>\hat{P}OR = \hat{P}WS</math> [sum of ∠s in Δ/ som van ∠e in Δ]  <math>\therefore \Delta PRO \parallel \Delta PSW</math> [∠∠∠]  <math>\therefore \frac{PO}{PW} = \frac{RO}{SW}</math> [∥∥ Δs / ∥∥ Δe]</p> <p>but <math>PW = 2 PO</math> [diameter = 2 radius/middellyn = 2 radius]  <math>\therefore \frac{RO}{SW} = \frac{PO}{2PO}</math>  <math>= \frac{1}{2}</math>  <math>\therefore OR : WS = 1 : 2</math></p>	<p>✓ S ✓ R                  ✓ S                  ✓ S                  ✓ S</p> <p>(5)</p>
<p>10.2.2</p>	<p><math>\frac{OV}{VT} = \frac{RS}{ST} = \frac{1}{3}</math> [prop theorem; <math>RO \parallel SW</math>/                  lyn ∥ een sy van Δ]  <math>\frac{RS}{15} = \frac{1}{3}</math>  <math>RS = 5</math> units  <math>PR = RS = 5</math> units [line from centre ⊥ to chord /                  lyn vanuit midpt. sirkel ⊥ op koord]  <math>\therefore PT = 25</math> units</p>	<p>✓ S /R                  ✓ S                  ✓ S                  ✓ answer</p> <p>(4)</p>
<p><b>[15]</b></p>		

10.2







<p>11.2</p>	<p><math>\hat{D}_1 = \hat{A}FG = x</math>  <math>\therefore DC \parallel FG</math> [corresp <math>\angle s = /</math> ooreenk <math>\angle e =</math> ]  <math>\frac{AG}{AC} = \frac{AF}{AD}</math> [prop theorem; <math>DC \parallel FG /</math>  <i>lyn // een sy van <math>\Delta</math></i> ]  <math>\therefore AG \cdot AD = AC \cdot AF</math></p> <p><b>OR/OF</b></p> <p>In <math>\Delta ACD</math> and <math>\Delta AGF</math>  <math>\hat{A}_3</math> is common  <math>\hat{A}FG = \hat{D}_1 = x</math> [proved in 11.1 / <i>reeds bewys</i>]  <math>\hat{C}_2 = \hat{A}GF = x</math> [sum <math>\angle \Delta s</math>/binne <math>\angle e \Delta</math>]  <math>\Delta ACD \parallel \Delta AGF</math> [<math>\angle \angle \angle</math> ]  <math>\frac{AC}{AG} = \frac{AD}{AF}</math> [   <math>\Delta s \therefore</math> sides in proportion /     <math>\Delta e \therefore</math> sye in dieselfde verhouding]  <math>\therefore AG \cdot AD = AC \cdot AF</math></p>	<p>✓ S  ✓ S/R  ✓ S ✓ R</p> <p>(4)</p> <p>✓ S  ✓ S  ✓ S/R  ✓ S</p> <p>(4)</p>
<p>11.3</p>	<p>In <math>\Delta AGF</math> and <math>\Delta ABC</math>  <math>\hat{G} = \hat{B}_2</math> [<math>\angle s</math> in the same seg /  <math>\angle e</math> in dies. segment]  <math>\hat{A}FG = \hat{C}_1 = x</math> [proved in 11.1 / <i>reeds bewys</i>]  <math>\hat{A}_3 = \hat{A}_2</math> [sum of <math>\angle s</math> in <math>\Delta</math>/binne <math>\angle e</math> van <math>\Delta</math>]  <math>\Delta AGF \parallel \Delta ABC</math> [<math>\angle \angle \angle</math> ]</p>	<p>✓ S ✓ R  ✓ S  ✓ S  <b>OR/OF</b> R</p> <p>(4)</p>

<p>11.4</p>	$\frac{GF}{BC} = \frac{AF}{AC} \quad [ \Delta AGF \parallel \Delta ABC ]$ $\therefore GF = \frac{BC \cdot AF}{AC}$ $\Delta ACD \parallel \Delta FGC \quad [ \angle \angle \angle ]$ $\therefore \frac{AC}{GF} = \frac{AD}{FC}$ $\therefore AC = \frac{AD \cdot FG}{FC}$ $\therefore GF = BC \cdot AF \div \frac{AD \cdot FG}{FC}$ $GF = BC \cdot AF \times \frac{FC}{AD \cdot FG}$ $\therefore GF^2 = \frac{BC \cdot FC \cdot AF}{AD}$ <p><b>OR/OF</b></p> $\Delta AGF \parallel \Delta ABC \quad [ \angle \angle \angle ]$ $\frac{GF}{BC} = \frac{AF}{AC}$ $GF = \frac{AF \cdot BC}{AC}$ $\Delta ACD \parallel \Delta AGF \quad [ \angle \angle \angle ]$ $\frac{AD}{AF} = \frac{CD}{GF}$ $GF = \frac{AF \cdot CD}{AD}$ $GF \times GF = \frac{AF \cdot BC}{AC} \cdot \frac{AF \cdot CD}{AD}$ $\Delta FCD \parallel \Delta FAC \quad [ \angle \angle \angle ]$ $\frac{FC}{FA} = \frac{CD}{AC} \quad \text{from } \parallel \Delta \text{'s}$ $FC = \frac{CD \cdot AF}{AC}$ $GF^2 = \frac{AF \cdot FC \cdot BC}{AD}$	<p>✓ S / R</p> <p>✓ S</p> <p>✓ S</p> <p>✓ S</p> <p>✓ S</p> <p>✓ S</p> <p>✓ S</p> <p>(6)</p> <p><b>OR/OF</b></p> <p>✓ S</p> <p>✓ S</p> <p>✓ S</p> <p>✓ S</p> <p>✓ S</p> <p>✓ S</p> <p>✓ S</p> <p>(6)</p>
		[20]

**TOTAL/TOTAAL: 150**