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GAUTENG PROVINCE

EDUCATION
REPUBLIC OF SOUTH AFRICA

**JUNE EXAMINATION/
JUNIE EKSAMEN
GRADE/*GRAAD* 12**

2026

**MARKING GUIDELINES/
*NASIENRIGLYNE***

**MATHEMATICS/
WISKUNDE
(*PAPER/VRAESTEL 2*)**

27 pages/bladsye



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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 to solve a problem is NOT acceptable.

LET WEL:

- *As 'n kandidaat 'n vraag TWEE KEER beantwoord het, sien slegs die EERSTE poging na.*
- *As 'n kandidaat 'n antwoord van 'n vraag doodtrek en dit 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.*
- *Aannames van antwoorde/waardes om 'n probleem op te los, word NIE toegelaat NIE.*

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



NASIENRIGLYNE

WISKUNDE
(PAPER/VRAESTEL 2)

GR12 0626

AMENDMENT TO MARKING GUIDELINES
JUNE 2026 PROVINCIAL COMMON EXAMINATION

FOR ATTENTION: THE CHIEF INVIGILATOR

SUBJECT / VAK	MATHEMATICS/WISKUNDE
PAPER / VRAESTEL	2
DATE OF EXAMINATION	8 JUNE/JUNIE 2026

The errata for the Marking Guidelines of **MATHEMATICS P2/WISKUNDE V2** has reference.

There was an error in **QUESTION 2.4** which affected the possible candidate responses on BOTH the English AND Afrikaans versions of the question paper. This matter was addressed at the Marking Standardisation Meeting.

To ensure that candidates are not disadvantaged nor prejudiced in any way, you are advised to ask your Mathematics Educator to please **ignore QUESTION 2.4** when marking. This question carries 5 marks.

In other words, the paper must be marked out of a total of 145 instead of 150 and then the learners' marks must be converted to a mark out of 150. E.g. Should a learner attain $\frac{29}{145}$ then

that mark is recalculated as $\frac{30}{150}$.

Use the formula: $\frac{a}{145} \times 100 = b$. Then, $\frac{b}{100} \times 150 = c$

C is the mark that is entered into SASAMS out of 150.

MR JONATHAN WILLIAMS

DIRECTOR: EXAMINATIONS MANAGEMENT

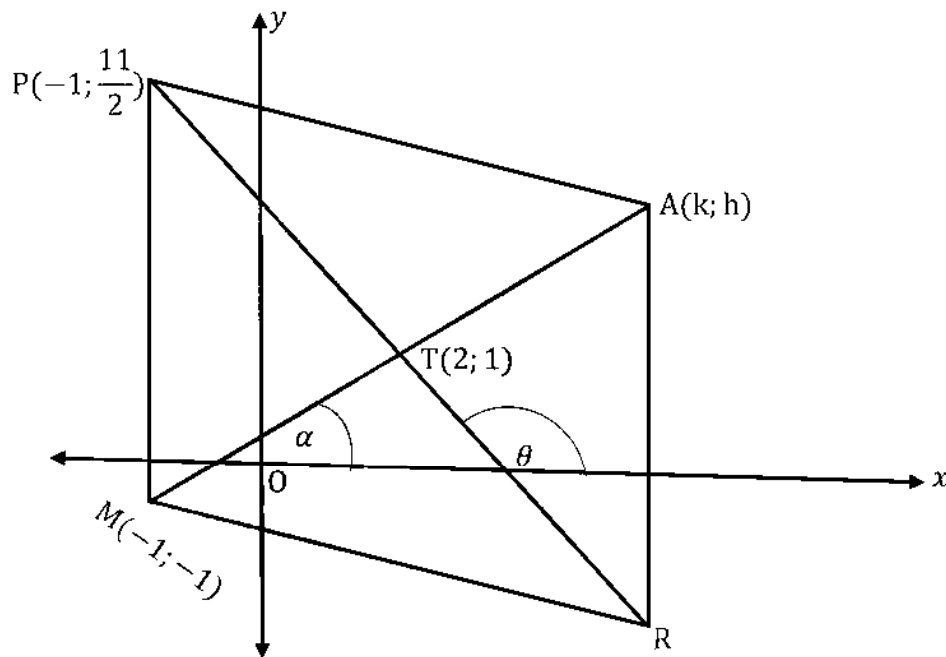
9 JUNE 2026



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QUESTION/VRAAG 1



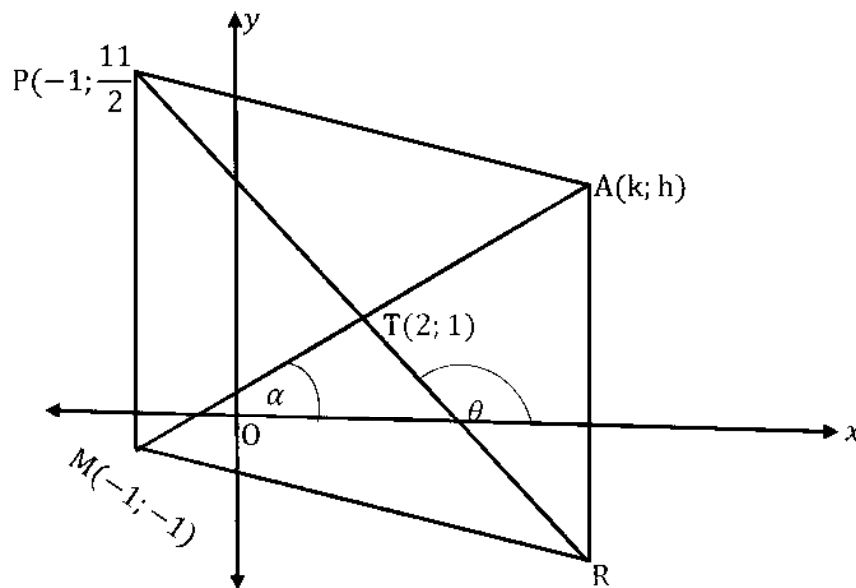
1.1	$m_{MT} = \frac{-1-1}{-1-2}$ $= \frac{2}{3}$	✓ substitution into gradient formula/ <i>substitusie in die gradiënt formule</i> ✓ answer/antwoord (2)
1.2	$y = \frac{2}{3}x + c$ $\frac{11}{2} = \frac{2}{3}(-1) + c$ $c = \frac{37}{6}$ $\therefore y = \frac{2}{3}x + \frac{37}{6}$ <p style="text-align: center;">OR/OF</p> $y - \frac{11}{2} = \frac{2}{3}(x - (-1))$ $\therefore y = \frac{2}{3}x + \frac{37}{6}$	✓ $m_{\text{line/lyn}} = \frac{2}{3}$ ✓ substitution into equation formula/ <i>substitusie in die vergelykings- formule</i> ✓ answer/antwoord (3)
1.3	$\frac{-1+k}{2} = 2$ $\therefore k = 5$ $\frac{-1+h}{2} = 1$ $\therefore h = 3$	✓ substitution into midpoint formula/ <i>substitusie in die middelpuntsformule</i> ✓ $k = 5$ ✓ $h = 3$ (3)

Answer only: Full marks
Slegs antwoord: Volpunte



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1.4	$AM = \sqrt{(-1 - 5)^2 + (-1 - 3)^2}$ $= 2\sqrt{13} \text{ units/eenhede (Accept } \sqrt{52})$ <p style="text-align: center;">OR/OF</p> $MT = \sqrt{(-1 - 2)^2 + (-1 - 1)^2} = \sqrt{13}$ $\therefore AM = 2MT = 2\sqrt{13} \text{ units/eenhede}$	<ul style="list-style-type: none"> ✓ substitution into distance formula/ substitusie in afstandformule ✓ answer in surd form/ antwoord in wortelvorm (2) <ul style="list-style-type: none"> ✓ substitution into distance formula/ substitusie in afstandformule ✓ answer in surd form/ antwoord in wortelvorm (2)
1.5	<p>ARMP is a parallelogram/is 'n parallelogram (2 pairs of opp sides /2 pare oorst sye)</p> $\frac{x_R + (-1)}{2} = 2$ $x_R = 5$ $\frac{y_R + \frac{11}{2}}{2} = 1$ $y_R = -\frac{7}{2}$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>Answer only: Full marks Slegs antwoord: Volpunte Translation implied Translasie geïmpliseer</p> </div> $\therefore R(5; -\frac{7}{2})$	<ul style="list-style-type: none"> ✓ method/metode ✓ $x_R = 5$ ✓ $y_R = -\frac{7}{2}$ <p style="text-align: right;">(3)</p>



1.6

$$m_{AM} = \frac{2}{3}$$

$$\alpha = \tan^{-1}\left(\frac{2}{3}\right)$$

$$\alpha = 33,69^\circ$$

$$m_{PR} = \frac{\frac{11}{2} - 1}{-1 - 2} = -\frac{3}{2}$$

$$\theta = \tan^{-1}\left(-\frac{3}{2}\right) + 180$$

$$\theta = 123,69^\circ$$

$$M\hat{T}R = 123,69^\circ - 33,69^\circ = 90^\circ$$

$$\therefore P\hat{T}A = 90^\circ \text{ (vert opp } \sphericalangle \text{)/(regoorst } \sphericalangle \text{e)}$$

If one \sphericalangle is rounded off and the other one not, then penalize 1 mark/ as een \sphericalangle afgerond is, penaliëer een punt

OR/OF

$$m_{AM} = \frac{2}{3}$$

$$m_{PR} = \frac{\frac{11}{2} - 1}{-1 - 2} = -\frac{3}{2}$$

$$m_{AM} \times m_{PR} = \frac{2}{3} \times -\frac{3}{2} = -1$$

$$\therefore AM \perp PR$$

$$\therefore P\hat{T}A = 90^\circ$$

OR/OF

$$PT = \sqrt{(1-2)^2 + \left(\frac{11}{2}-1\right)^2} = \frac{3\sqrt{13}}{2} = 5,41$$

$$AT = \sqrt{(5-2)^2 + (3-1)^2} = \sqrt{13} = 3,61$$

$$AP = \sqrt{(5-(-1))^2 + \left(3-\frac{11}{2}\right)^2} = 6,5$$

$$P\hat{T}A = \cos^{-1}\left(\frac{\left(\frac{3\sqrt{13}}{2}\right)^2 + (\sqrt{13})^2 - \left(\frac{13}{2}\right)^2}{2\left(\frac{3\sqrt{13}}{2}\right)(\sqrt{13})}\right)$$

$$\therefore P\hat{T}A = 90^\circ$$

$$\checkmark m_{AM} = \frac{2}{3}$$

$$\checkmark \alpha = 33,69^\circ$$

$$\checkmark m_{PR} = -\frac{3}{2}$$

$$\checkmark \theta = 123,69^\circ$$

$$\checkmark \text{answer/antwoord} \quad (5)$$

OR/OF

$$\checkmark m_{AM} = \frac{2}{3}$$

$$\checkmark m_{PR} = -\frac{3}{2}$$

$$\checkmark m_{AM} \times m_{PR} = -1$$

$$\checkmark AM \perp PR$$

$$\checkmark \text{answer/antwoord} \quad (5)$$

OR/OF

$$\checkmark PT = \frac{3\sqrt{13}}{2}$$

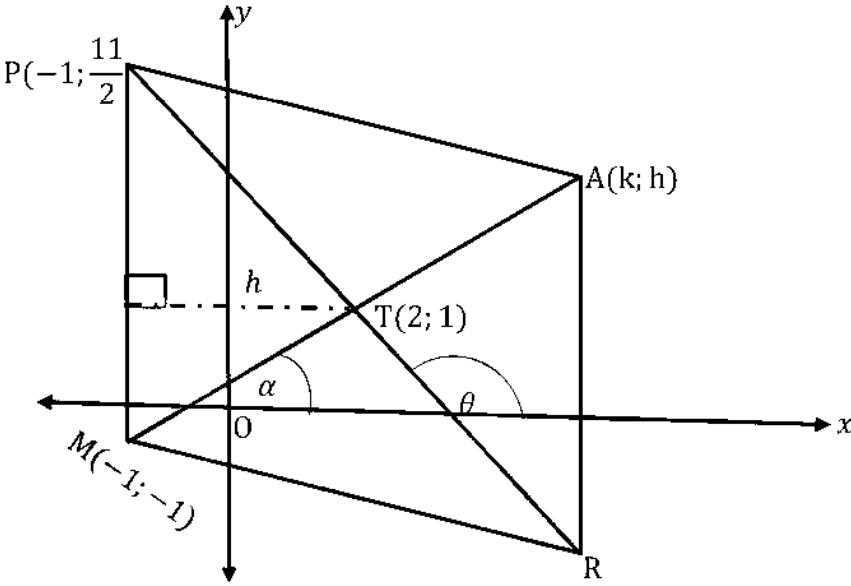
$$\checkmark AT = \sqrt{13}$$

$$\checkmark AP = \frac{13}{2}$$

$$\checkmark \text{substitution into cosine formula/ substitution in cos-formule}$$

$$\checkmark \text{answer/antwoord} \quad (5)$$



1.7	$m_{AP} = \frac{\frac{11}{2} - 3}{-1 - 5} = -\frac{5}{12}$ $m_{AM} = \frac{2}{3}$ $m_{AP} \times m_{AM} = -\frac{5}{12} \times \frac{2}{3} \neq -1$ $\therefore \widehat{PAM} \neq 90^\circ$	$\checkmark m_{AP} = -\frac{5}{12}$ $\checkmark m_{AM} = \frac{2}{3}$ $\checkmark m_{AP} \times m_{AM} \neq -1$
1.8		
	$h = 3 \text{ units/eenhede}$ $MP = \frac{11}{2} - (-1) = \frac{13}{2}$ $= 6,5 \text{ units/eenhede}$ $\text{Area of /opp } \Delta MPT = \frac{1}{2} \times \frac{13}{2} \times 3 \text{ units}^2/\text{eenhede}^2$ $= \frac{39}{4} \text{ units}^2/\text{eenhede}^2$ $= 9,75 \text{ units}^2/\text{eenhede}^2$	$\checkmark h = 3 \text{ units/h} = 3 \text{ eenhede}$ $\checkmark \text{length of MP/}$ lengte van MP $\checkmark \text{substitution into area formula}$ $\text{/substitusie in oppervlakformule}$ $\checkmark \text{answer/antwoord}$



OR/OF $\widehat{P}TM = 90^\circ$ (<s on a str line) / (< e op 'n reghoutlyn)

$$PT = \sqrt{(-1-2)^2 + \left(\frac{11}{2}-1\right)^2} = \frac{3\sqrt{13}}{2} = 5,41$$

$$MT = \sqrt{(-1-2)^2 + (-1-1)^2} = \sqrt{13} = 3,61$$

Area of / (opp van) ΔMPT

$$= \frac{1}{2} \times \frac{3\sqrt{13}}{2} \times \sqrt{13} \text{ units}^2/\text{eenhede}^2$$

$$= \frac{39}{4} \text{ units}^2/\text{eenhede}^2$$

$$= 9,75 \text{ units}^2/\text{eenhede}^2$$

OR/OF $\widehat{P}TM = 90^\circ$ (<s on a str line) / (< e op 'n reghoutlyn)

$$PT = \sqrt{(1-2)^2 + \left(\frac{11}{2}-1\right)^2} = \frac{3\sqrt{13}}{2} = 5,41$$

$$MT = \sqrt{(-1-2)^2 + (-1-1)^2} = \sqrt{13} = 3,61$$

Area of/Opp van ΔMPT

$$= \frac{1}{2} \times \frac{3\sqrt{13}}{2} \times \sqrt{13} \sin(90^\circ) \text{ units}^2/\text{eenhede}^2$$

$$= \frac{39}{4} \text{ units}^2/\text{eenhede}^2$$

$$= 9,75 \text{ units}^2/\text{eenhede}^2$$

OR/OF

$$\checkmark PT = \frac{3\sqrt{13}}{2}$$

$$\checkmark MT = \sqrt{13}$$

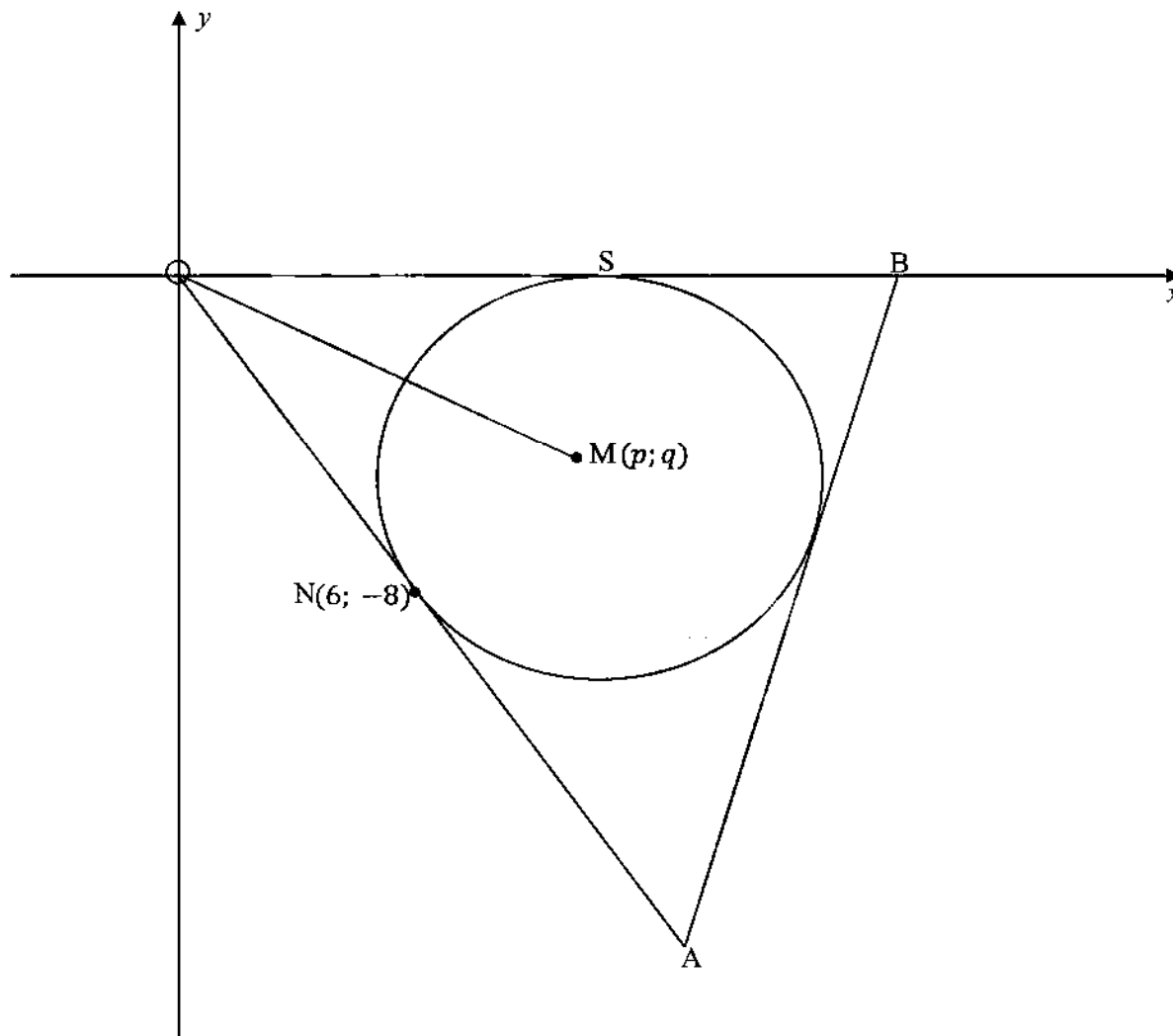
 \checkmark substitution into area formula*substitusie in opp. formule* \checkmark answer/antwoord (4)**OR/OF**

$$\checkmark PT = \frac{3\sqrt{13}}{2}$$

$$\checkmark MT = \sqrt{13}$$

 \checkmark substitution into area formula*substitusie in opp. formule* \checkmark answer/antwoord (4)**[25]**

QUESTION/VRAAG 2



2.1.1	$ON = \sqrt{(6-0)^2 + (-8-0)^2}$ $ON = \sqrt{100}$ $\therefore ON = 10 \text{ units/eenhede}$	✓ substitution/substitusie ✓ answer/antwoord (2)
2.1.2	$ON = OS$ tangents from the same point/ <i>raaklyne vanuit dieselfde punt</i> $\therefore p = 10$	✓ S ✓ answer/antwoord (2)
2.1.3	$ON \perp NM$ tangent \perp radius/ <i>raaklyn \perp radius</i> $m_{ON} = \frac{-8-0}{6-0}$ $\therefore m_{ON} = -\frac{4}{3}$ $\therefore m_{NM} = \frac{3}{4}$	✓ $-\frac{4}{3}$ ✓ $\frac{3}{4}$ (2)



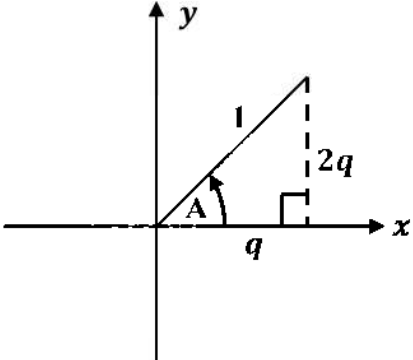
2.1.4	$m_{NM} = \frac{3}{4}$ $\frac{q - (-8)}{10 - 6} = \frac{3}{4}$ $\frac{q + 8}{4} = \frac{3}{4}$ $q = -5$	$y = \frac{3}{4}x + c$ $-8 = \frac{3}{4}(6) + c$ $c = -\frac{25}{2}$ $y = \frac{3}{4}x - \frac{25}{2}$ $q = \frac{3}{4}(10) - \frac{25}{2}$ $q = -5$	<p>✓ equating and simplifying/ gelykstelling en vereenvoudiging</p> <p>✓ answer/antwoord</p> <p>OR/OF</p> <p>✓ substitution/vervanging</p> <p>✓ answer/antwoord</p> <p>(2)</p>
2.2	$MS = r = 5 \text{ units/eenhede}$ $(x - 10)^2 + (y + 5)^2 = 25$		<p>✓ radius</p> <p>✓ subs centre coordinates/ subst middelpuntkoördinate</p> <p>✓ equation/vergelyking</p> <p>(3)</p>
2.3	$(x - 10)^2 + (-5 + 5)^2 = 25$ $(x - 10)^2 = 25$ $\therefore k = 5 \text{ or/of } k = 15$ $k = 5 \text{ or/of } k = 15$		<p>✓ substitution/vervanging</p> <p>✓ both answer/beide antwoord</p> <p>(2)</p>
2.4	<p>Coordinates of the point directly opposite N is C. / Koördinate van die punt direk teenoor N is C.</p> $\frac{x+6}{2} = 10$ $x + 6 = 10 \times 2$ $\therefore x = 14$ $\therefore C(14; -2)$ <p>equation of the tangent at C/ vergelyking van raaklyn by C</p> $y + 2 = -\frac{4}{3}(x - 14)$ $\therefore y = -\frac{4}{3}x + \frac{50}{3}$ $\therefore 0 < t < \frac{50}{3}$	$\frac{y-8}{2} = -5$ $y - 8 = -5 \times 2$ $\therefore y = -2$	<p>✓ substitution into correct midpoint formula/subst in korrekte middelpuntsformule</p> <p>✓ x - value/waarde</p> <p>✓ y - value/waarde</p> <p>✓ equation of tangent at C/ vergelyking van raaklyn by C</p> <p>✓ value of t/waarde van t</p> <p>(5)</p>



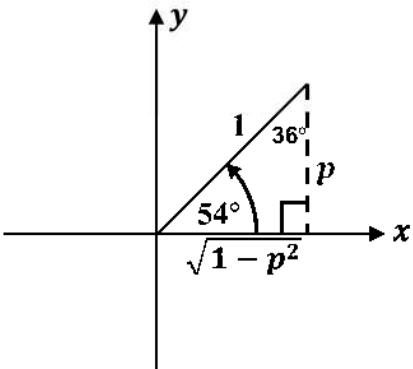
2.5	<p>They will not touch./Hulle sal nie raak nie</p> <p>The new circle is the old circle shifted up by 11 units/ <i>Die nuwe sirkel is die ou sirkel wat met 11 eenhede opwaarts gekuif het.</i></p> <p>OR/OF</p> <p>sum of radii/som van radiusse = 10</p> <p>distance between centres/afstand tussen middelpunte</p> $= \sqrt{(10-10)^2 + (6+5)^2}$ $= 11$ <p>∴ the circles do not touch or cut/die sirkels raak of sny nie</p>	<p>✓ answer/antwoord</p> <p>✓ any valid reason/ <i>enige geldige rede</i> (2)</p> <p>✓ distance between centres > sum of radii /afstand tussen middelpunte > som van radiusse</p> <p>✓ the circles do not touch or cut/die sirkels raak of sny nie. (2)</p>
[15]		



QUESTION/VRAAG 3

3.1		
3.1.1	$\tan A = \frac{2q}{q}$ $\therefore \tan A = 2$ <p style="text-align: center;">OR/OF</p> $\frac{\sin A}{\cos A} = \frac{2q}{q} = 2 = \tan A$	✓ correct diagram/ <i>korrekte diagram</i> ✓ answer/antwoord (2) OR/OF ✓ quotient identity/ <i>kwosiënt identiteit</i> ✓ answer/antwoord (2)
3.1.2	$(2q)^2 + q^2 = 1$ $5q^2 = 1$ $q^2 = \frac{1}{5}$ $q = \frac{1}{\sqrt{5}}$ $q = \frac{\sqrt{5}}{5}$	✓ Pythagoras ✓ simplification/ <i>vereenvoudiging</i> ✓ answer in any form/ <i>antwoord in enige vorm</i> (3)



3.2			$x^2 + y^2 = r^2$ $\therefore x = \sqrt{1 - (p)^2}$
3.2.1	$\sin 594^\circ$ $= \sin 234^\circ$ $= -\sin 54^\circ$ $= -p$	$\checkmark -\sin 54^\circ$ $\checkmark -p$ <p style="text-align: right;">(2)</p>	
3.2.2	$\cos 36^\circ = p$ <p style="text-align: center;">or/of</p> $\cos 36^\circ$ $= \cos (90^\circ - 54^\circ)$ $= \sin 54^\circ$ $= p$	$\checkmark \checkmark \text{ answer/antwoord}$ <p style="text-align: right;">(2)</p>	
3.2.3	$\cos 18^\circ \sin 2(36^\circ)$ $= \sin 72^\circ$ $= \sin 2(36^\circ)$ $= 2 \sin 36^\circ \cdot \cos 36^\circ$ $= 2 \left(\frac{\sqrt{1-(p)^2}}{1} \right) \left(\frac{p}{1} \right)$ $= 2p\sqrt{1 - (p)^2}$ <p style="text-align: center;">OR/OF</p> $\cos 18^\circ = \cos (54^\circ - 36^\circ)$ $= \cos 54^\circ \cos 36^\circ + \sin 54^\circ \sin 36^\circ$ $= \sqrt{1 - p^2} \times p + p \times \sqrt{1 - p^2}$ $= 2p\sqrt{1 - (p)^2}$	$\checkmark \sin 72^\circ$ $\checkmark \sin 2(36^\circ)$ $\checkmark 2 \sin 36^\circ \cdot \cos 36^\circ$ $\checkmark 2p\sqrt{1 - (p)^2}$ <p style="text-align: right;">(4)</p> <p style="text-align: center;">OR/OF</p> $\checkmark \cos 18^\circ = \cos (54^\circ - 36^\circ)$ $\checkmark \cos 54^\circ \cos 36^\circ + \sin 54^\circ \sin 36^\circ$ $\checkmark \sqrt{1 - p^2} \times p + p \times \sqrt{1 - p^2}$ $\checkmark 2p\sqrt{1 - (p)^2}$ <p style="text-align: right;">(4)</p>	



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(PAPER/VRAESTEL 2)

/WISKUNDE

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3.3	$= \frac{\cos(90^\circ+50^\circ)-\cos \theta}{\sin 50^\circ+\cos \theta}$ $= \frac{-\sin 50^\circ-\cos \theta}{\sin 50^\circ+\cos \theta}$ $= \frac{-(\sin 50^\circ+\cos \theta)}{\sin 50^\circ+\cos \theta}$ $= -1$	<p>✓ $-\sin 50^\circ$ ✓ $\cos \theta$</p> <p>✓ $\sin 50^\circ$ ✓ $\cos \theta$</p> <p>✓ common factor/ gemeenskaplike faktor</p> <p>✓ answer/antwoord</p>	(6)
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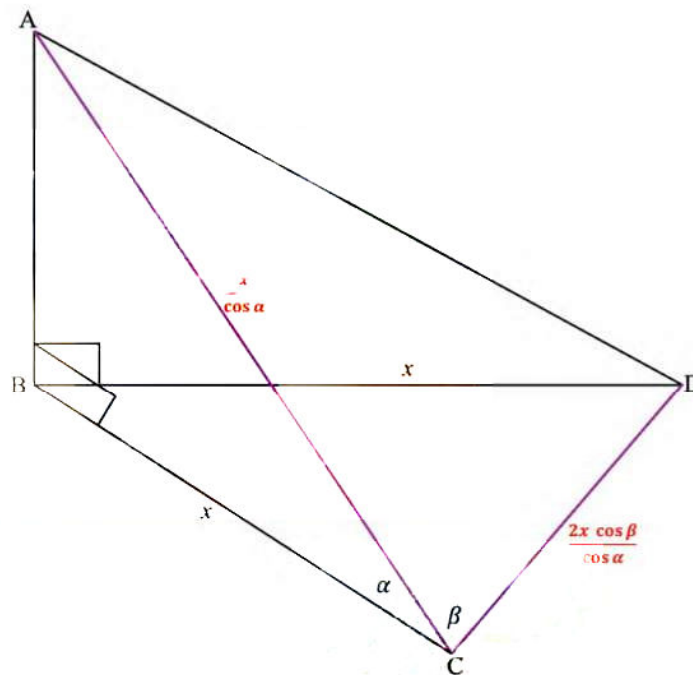
3.4	$\cos(x + 65^\circ) \cdot \cos(x + 20^\circ) - \sin(x + 245^\circ) \cdot \sin(x + 20^\circ)$ $= \cos(x + 65^\circ) \cdot \cos(x + 20^\circ) + \sin(x + 65^\circ) \cdot \sin(x + 20^\circ)$ $= \cos[(x + 65^\circ) - (x + 20^\circ)]$ $= \cos 45^\circ$ $= \frac{1}{\sqrt{2}} \text{ or/of } \frac{\sqrt{2}}{2}$	<ul style="list-style-type: none"> ✓ reduction/reduksie of herleiding ✓ compound angles/ saamgestelde hoeke ✓ $\cos 45^\circ$ ✓ answer/antwoord <p style="text-align: right;">(4)</p>
3.5	$\cos^2 x - \sin^2 x = \frac{1}{2}$ $\cos 2x = \frac{1}{2}$ <p>ref angle/verwysingshoek: $2x = \cos^{-1}\left(\frac{1}{2}\right)$</p> $\therefore 2x = 60^\circ + k \cdot 360^\circ$ <p>1st Quad/1^{ste} Kwad: 4th Quad/4^{de} Kwad:</p> $2x = 60^\circ + k \cdot 360^\circ \qquad 2x = 360^\circ - 60^\circ + k \cdot 360^\circ$ $\therefore x = 30^\circ + k \cdot 180^\circ, k \in \mathbb{Z} \qquad 2x = 300^\circ + k \cdot 360^\circ$ $\qquad \qquad \qquad \therefore x = 150^\circ + k \cdot 180^\circ, k \in \mathbb{Z}$ <p>OR/OF</p> $\cos^2 x - \sin^2 x = \frac{1}{2}$ $2 \cos^2 x - 2 \sin^2 x = 1$ $2 \cos^2 x - 2 \sin^2 x = \sin^2 x + \cos^2 x$ $2 \sin^2 x + \sin^2 x = 2 \cos^2 x - \cos^2 x$ $3 \sin^2 x = \cos^2 x$ $\therefore \tan^2 x = \frac{1}{3}$ $\therefore \tan x = \frac{1}{\sqrt{3}}$ <p>$\therefore x = 30^\circ$ #ref angle/ #verw hoek</p> $\therefore x = 30^\circ + k \cdot 180^\circ; k \in \mathbb{Z}$ $x = 180^\circ + 30^\circ + k \cdot 180^\circ k \in \mathbb{Z}$ $x = 210^\circ + k \cdot 180^\circ k \in \mathbb{Z}$	<ul style="list-style-type: none"> ✓ $\cos 2x = \frac{1}{2}$ ✓ $2x = 60^\circ + k \cdot 360^\circ$ ✓ $x = 30^\circ + k \cdot 180^\circ, k \in \mathbb{Z}$ (4) ✓ $x = 150^\circ + k \cdot 180^\circ, k \in \mathbb{Z}$ <p>OR/OF</p> <ul style="list-style-type: none"> ✓ multiplying by 2 and using identity/ vermenigvuldig met 2 en gebruik identiteit ✓ $3 \sin^2 x = \cos^2 x$ ✓ $\tan x = \frac{1}{\sqrt{3}}$ ✓ answer/antwoord <p style="text-align: right;">(4)</p>



3.6	$\frac{\sin 2\theta \cdot \tan \theta}{\cos 2\theta + 1} = \tan^2 \theta$			
3.6.1	$\text{LHS} = \frac{\sin 2\theta \cdot \tan \theta}{\cos 2\theta + 1}$ $= \frac{2 \sin \theta \cos \theta \cdot \frac{\sin \theta}{\cos \theta}}{2 \cos^2 \theta - 1 + 1}$ $= \frac{2 \sin^2 \theta}{2 \cos^2 \theta}$ $= \tan^2 \theta$ $\therefore \text{LHS} = \text{RHS/LK} = \text{RK}$	$\checkmark 2 \sin \theta \cos \theta$ $\checkmark \frac{\sin \theta}{\cos \theta}$ $\checkmark 2 \cos^2 \theta - 1$ $\checkmark \frac{2 \sin^2 \theta}{2 \cos^2 \theta}$	(4)	
3.6.2	$\cos 2\theta + 1 = 0$ $\cos 2\theta = -1$ $2\theta = 180^\circ$ $\theta = 90^\circ$	<div style="border: 2px solid black; padding: 5px;"> If only $\theta = 90^\circ$ for $\tan \theta$ undefined ($\frac{1}{4}$) <i>/as slegs $\theta = 90^\circ$ vir</i> $\tan \theta$ ongedefinieerd $\tan \theta$ ($\frac{1}{4}$) </div>	\checkmark denominator/noemer = 0 $\checkmark \cos 2\theta = -1$ $\checkmark 2\theta = 180^\circ$ $\checkmark \theta = 90^\circ$	(4)
[35]				



QUESTION/VRAAG 4



4.1	$\Delta ABC \equiv \Delta ABD$ (S.A.S)/(S \angle S)	✓ R (1)
4.2	$\cos \alpha = \frac{x}{AC}$ $\therefore AC = \frac{x}{\cos \alpha}$	✓ correct ratio/korrekte verhouding ✓ AC simplified as subject/AC vereenvoudig as onderwerp (2)
4.3	$CD^2 = \left(\frac{x}{\cos \alpha}\right)^2 + \left(\frac{x}{\cos \alpha}\right)^2 - 2\left(\frac{x}{\cos \alpha}\right)\left(\frac{x}{\cos \alpha}\right)\cos(180^\circ - 2\beta)$ $CD^2 = \frac{2x^2}{\cos^2 \alpha} - 2\left(\frac{x^2}{\cos^2 \alpha}\right)\cos 2\beta$ $CD^2 = \frac{2x^2}{\cos^2 \alpha}(1 + \cos 2\beta)$ $CD^2 = \frac{2x^2}{\cos^2 \alpha}(1 + (1 - 2\sin^2 \beta))$ $CD^2 = \frac{2x^2}{\cos^2 \alpha}(1 + (1 - 2(1 - \cos^2 \beta)))$ $CD^2 = \frac{2x^2}{\cos^2 \alpha}(2\cos^2 \beta)$ $CD^2 = \frac{4x^2 \cos^2 \beta}{\cos^2 \alpha}$ $\therefore CD = \frac{2x \cos \beta}{\cos \alpha}$	✓ correct use of cos rule/korrekte gebruik van cos-reël ✓ simplification/vereenvoudig ✓ applying double angles/gebruik dubbelhoeke ✓ identity/identiteit (4)



	<p>OR/OF</p> $\widehat{ADC} = \beta$ $\widehat{CAD} = 180^\circ - 2\beta$ $\frac{CD}{\sin(180^\circ - 2\beta)} = \frac{AC}{\sin \beta}$ $CD = \frac{AC \cdot \sin 2\beta}{\sin \beta}$ <p>but $AC = \frac{x}{\cos \alpha}$</p> $CD = \frac{\left(\frac{x}{\cos \alpha}\right) \cdot \sin 2\beta}{\sin \beta}$ $CD = \frac{x \cdot 2 \sin \beta \cdot \cos \beta}{\cos \alpha \cdot \sin \beta}$ $\therefore CD = \frac{2x \cdot \cos \beta}{\cos \alpha}$	<p>OR/OF</p> <p>✓ $\widehat{ADC} = \beta$ and/en</p> $\widehat{CAD} = 180^\circ - 2\beta$ <p>✓ correct use of sin rule/ <i>korrekte gebruik van sin-reël</i></p> <p>✓ substituting AC/ <i>substitusie van AC</i></p> <p>✓ double angle/dubbelhoek</p> <p style="text-align: right;">(4)</p>
4.4	$CD = \frac{2(25) \cos 65,62^\circ}{\cos 30^\circ}$ $CD = 23,83 \text{ cm}$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>penalize 1 mark for incorrect rounding /penaliseer 1 punt vir foutiewe afronding</p> </div>	<p>✓ substitution/substitusie</p> <p>✓ answer/antwoord</p> <p style="text-align: right;">(2)</p>
[9]		

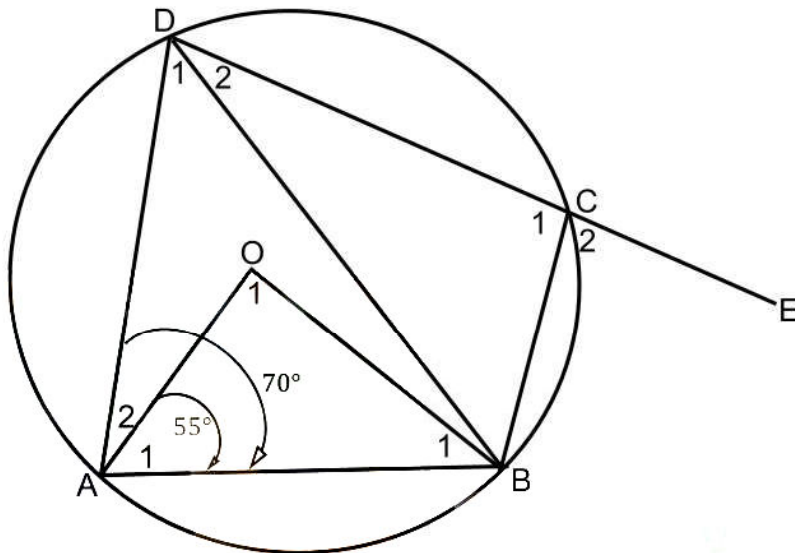


QUESTION/VRAAG 5

5.1	$f(180^\circ) = \cos(180^\circ - 45^\circ)$ $= -0,71$ $\therefore -0,71 \leq y \leq 1$ OR/OF $\therefore y \in [-0,71; 1]$ OR/OF $-\frac{\sqrt{2}}{2} \leq y \leq 1$	$\checkmark f(180^\circ)$ \checkmark answer/antwoord (2)
5.2	SEE THE GRAPH BELOW AND ALLOCATE MARKS ACCORDINGLY: SIEN DIE GRAFIEK HIERONDER EN KEN PUNTE TOE DAARVOLGENS: \checkmark intercepts/afsnitte \checkmark shape/vorm \checkmark turning points/draaipunte	(3)
5.3	Period/periode = 180°	\checkmark answer/antwoord (1)
5.4	$-45^\circ < x < 45^\circ$ OR/OF $x \in (-45^\circ; 45^\circ)$ ACCEPT/ AANVAAR: $-45^\circ \leq x \leq 45^\circ$	$\checkmark\checkmark$ answer/antwoord (2)
5.5	$x = -45^\circ$ or/of $x = 135^\circ$	$\checkmark -45^\circ$ $\checkmark 135^\circ$ (2)
5.6	$g(x) = \cos(x + 15^\circ)$	\checkmark answer/antwoord (1)

QUESTION/VRAAG 6

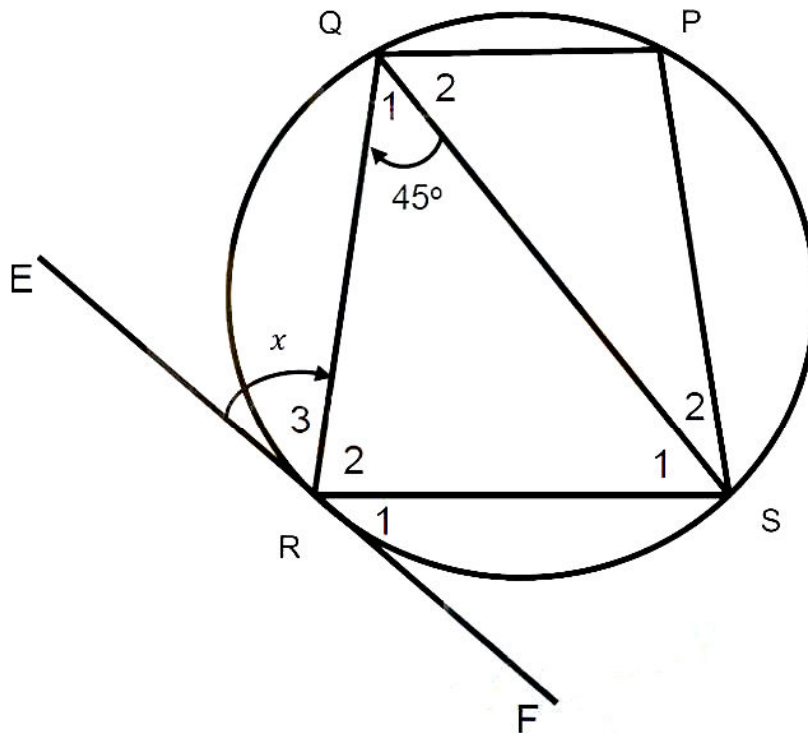
6.1



6.1.1	$\hat{B}_1 = 55^\circ$ (\s opp equal radii)/(\s teenoor gelyke radiusse) OR/OF $OA = OB$ (radii)(radiusse) $\hat{B}_1 = 55^\circ$ (\s opp equal sides)/(\s teenoor gelyke radiusse)	\checkmark S \checkmark R (2) \checkmark $OA = OB$ (radii) (radiusse) \checkmark S (2)
6.1.2	$\hat{O}_1 = 70^\circ$ (sum of/som van \s in Δ)/(\s van Δ)	\checkmark S \checkmark R (2)
6.1.3	$\hat{D}_1 = 35^\circ$ (\s at centre = $2 \times \s$ at circumference) (midpts $\s = 2 \times$ omtreks \s)	\checkmark S \checkmark R (2)
6.1.4	$\hat{C}_2 = 70^\circ$ (ext \s of a cyclic quad)/(buite \s van kvh) OR $\hat{C}_1 = 110^\circ$ (opp \s of a cyclic quad)/(teenoorst \s kvh) $\hat{C}_2 = 70^\circ$ (\s on a st line)/(\s op reguitlyn)	\checkmark S \checkmark R (2) \checkmark S/R \checkmark S (2)



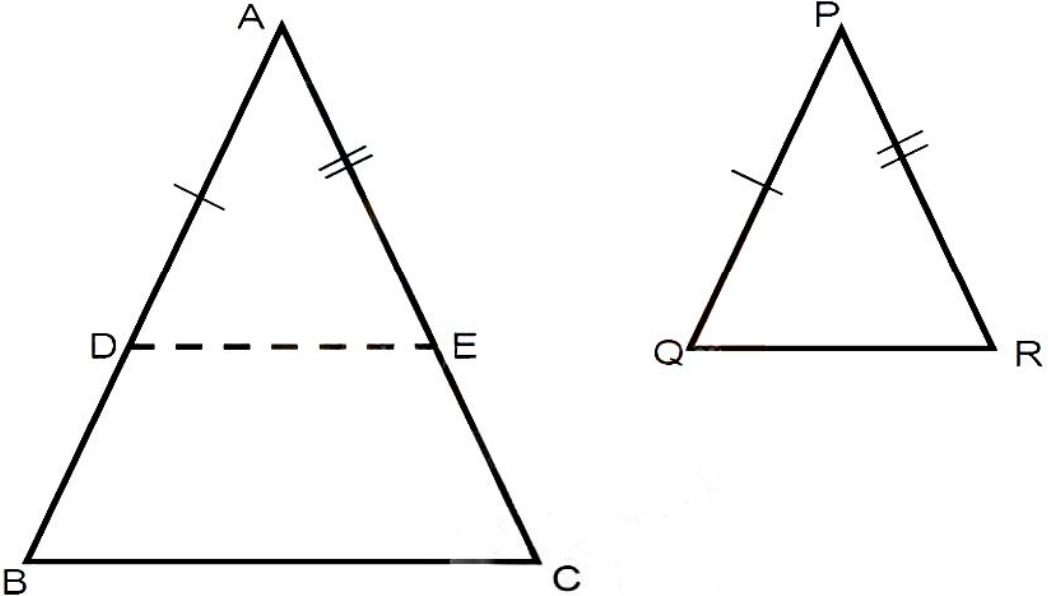
6.2



6.2.1	$\hat{S}_1 = x$ (tan chord theorem)/(\angle tussen raaklyn en koord)	✓ S	✓ R	(2)
6.2.2	$\hat{R}_2 = 180^\circ - (\hat{S}_1 + 45^\circ)$ (sum of \angle s in Δ)/(\angle e van Δ) $= 180^\circ - (x + 45^\circ)$ $\hat{R}_2 + \hat{P} = 180^\circ$ (opp \angle s of cyclic quad)/(teenoorst \angle e kvh) $\therefore 180^\circ - (x + 45^\circ) + \hat{P} = 180^\circ$ $\hat{P} = x + 45^\circ$ <p style="text-align: center;">OR/OF</p> $\hat{R}_1 = 45^\circ$ (tan chord theorem)(\angle tussen rlyn en koord) $\hat{R}_2 = 180^\circ - (x + 45^\circ)$ (\angle s on st line)/(\angle e op reguitlyn) $\hat{R}_2 + \hat{P} = 180^\circ$ (opp \angle s of cyclic quad)/teenoorst \angle e kvh $\therefore 180^\circ - (x + 45^\circ) + \hat{P} = 180^\circ$ $\hat{P} = x + 45^\circ$	✓ S	✓ R	(4)
		✓ S	✓ R	(4)
[14]				

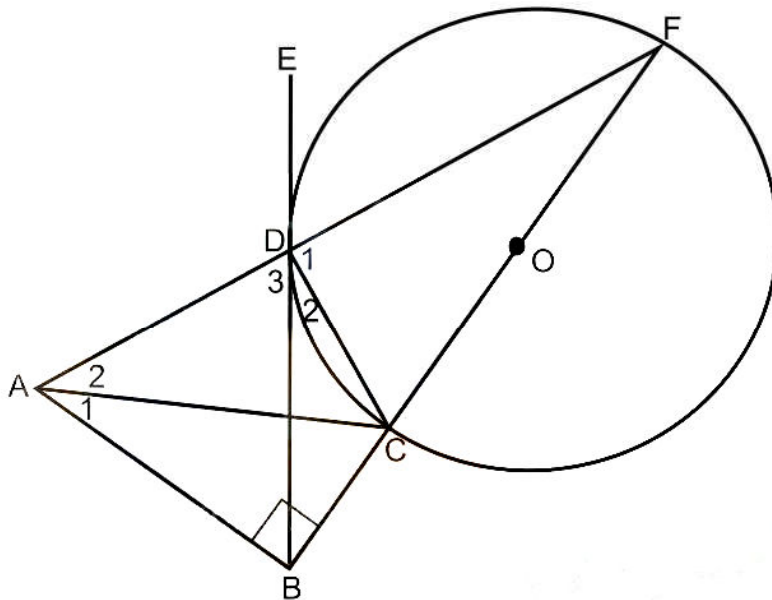


QUESTION/VRAAG 7

7.1.1	SAS/(S<S)	✓ R	(1)
7.1.2			
$\widehat{ADE} = \widehat{Q}$ ($\equiv \Delta s$)/($\equiv \Delta e$) $\widehat{ADE} = \widehat{B}$ (both = \widehat{Q})/(beide = \widehat{Q}) $\therefore DE \parallel BC$ (corrresp $\angle s =$)/(ooreenk $\angle e =$) $\frac{AB}{AD} = \frac{AC}{AE}$ (prop theorem; $DE \parallel BC$)/(lyn \parallel een sy van Δ ; $DE \parallel BC$) But/Maar $AD = PQ$ and/en $AE = PR$ (given)/(gegee) $\therefore \frac{AB}{PQ} = \frac{AC}{PR}$		✓ S ✓ S ✓ R ✓ S ✓ R	(5)
OR/OF In ΔABC and ΔPQR : $\hat{A} = \hat{P}$ (given/gegee) $\hat{B} = \hat{Q}$ (given/gegee) $\hat{C} = \hat{R}$ (given/gegee) $\Delta ABC \equiv \Delta PQR$ (\lll) $\frac{AB}{PQ} = \frac{AC}{PR}$		✓ S ✓ S ✓ R ✓ S ✓ R	(5)



7.2



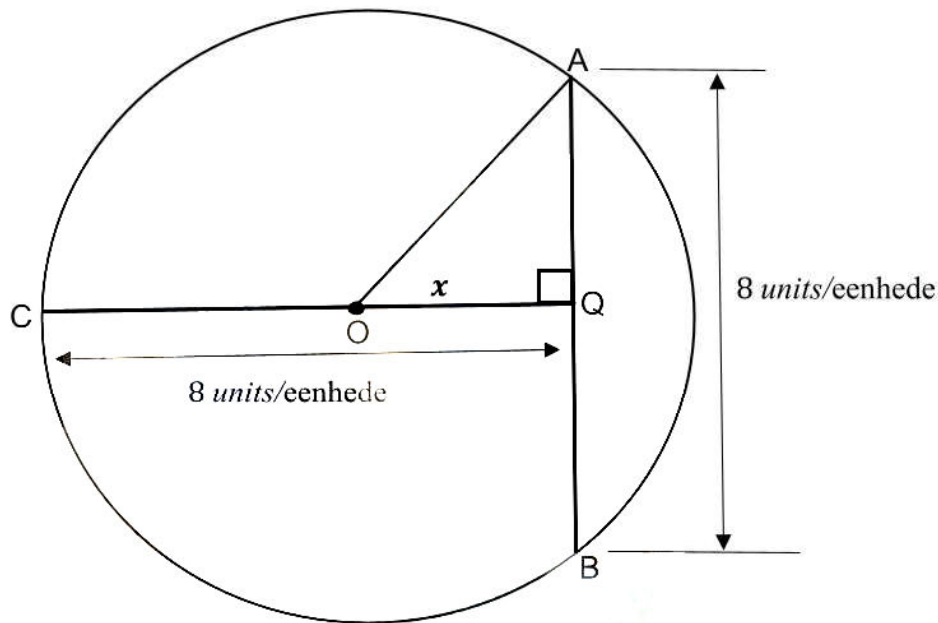
7.2.1	<p>$\widehat{B} = 90^\circ$ (given)/(gegee)</p> <p>$\widehat{D}_1 = 90^\circ$ (\sphericalangle in a semi – circle)/(\sphericalangle in halwe sirkel)</p> <p>$\therefore ABCD$ is a cyclic quadrilateral (converse: ext \sphericalangle of a cyclic quad) / $ABCD$ is 'n kvh (buite \sphericalangle van vierhoek = teenoorst binne \sphericalangle)</p> <p style="text-align: center;">OR/OF</p> <p>$\widehat{B} = 90^\circ$ (given)/(gegee)</p> <p>$\widehat{D}_1 = 90^\circ$ (\sphericalangle in a semicircle)/(\sphericalangle in 'n halwe sirkel)</p> <p>$\widehat{D}_2 + \widehat{D}_3 = 90^\circ$ (\sphericalangle s on a st line)/(\sphericalangle e op reguitlyn)</p> <p>$\therefore ABCD$ is a cyclic quadrilateral (converse: opp \sphericalangle s of a cyclic quad) / $ABCD$ is 'n kvh (buite \sphericalangle van vierhoek = teenoorst binne \sphericalangle)</p>	<p>✓S ✓R</p> <p>✓R (3)</p> <p style="text-align: center;">OR/OF</p> <p>✓S ✓R</p> <p>✓R (3)</p>
7.2.2	<p>$\widehat{A}_1 = \widehat{D}_2$ (\sphericalangle s in the same seg)/(\sphericalangle e in dies sirkel segm)</p> <p>$\widehat{D}_2 = \widehat{F}$ (tan chord theorem)/(\sphericalangle tussen raaklyn en koord)</p> <p>$\therefore \widehat{A}_1 = \widehat{F}$ (both = \widehat{D}_2) / (beide = \widehat{D}_2)</p> <p>$\therefore AB$ is a tangent/is 'n raaklyn (converse: tan – chord thrm OR \sphericalangle between line and chord)</p> <p>(omg \sphericalangle e in dies sirkel segm OF \sphericalangle tussen lyn en koord = \sphericalangle in teenoorst sirkel segm)</p>	<p>✓S ✓R</p> <p>✓ S/R</p> <p>✓ R (4)</p>

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[13]

QUESTION/VRAAG 8

8.1



$AQ = 4$ units/eenhede (line from centre \perp chord) /
(loodlyn uit midpt O na koord)

$OC = OA = 8 - x$ (radii)/(radiusse)

$OA^2 = x^2 + AQ^2$ (Pythagoras)

$(8 - x)^2 = x^2 + 4^2$

$64 - 16x + x^2 = x^2 + 16$

$16x = 48$

$\therefore x = 3$

$\therefore OC = 5$ units/eenhede

OR/OF

$OC = OA$ (radii)/(radiusse)

$OQ = 8 - OC$

$AQ = 4$ units/eenhede (line from centre \perp chord) /
(loodlyn uit midpt O na koord)

$OA^2 = OQ^2 + 4^2$ (Pythagoras)

$OC^2 = (8 - OC)^2 + 4^2$

$OC^2 = 64 - 16OC + OC^2 + 16$

$16OC = 80$

$\therefore OC = 5$ units/eenhede

✓ S ✓ R

✓ $OA = 8 - x$

✓ S

(5)

✓ $OC = 5$ units/
eenhede

OR/OF

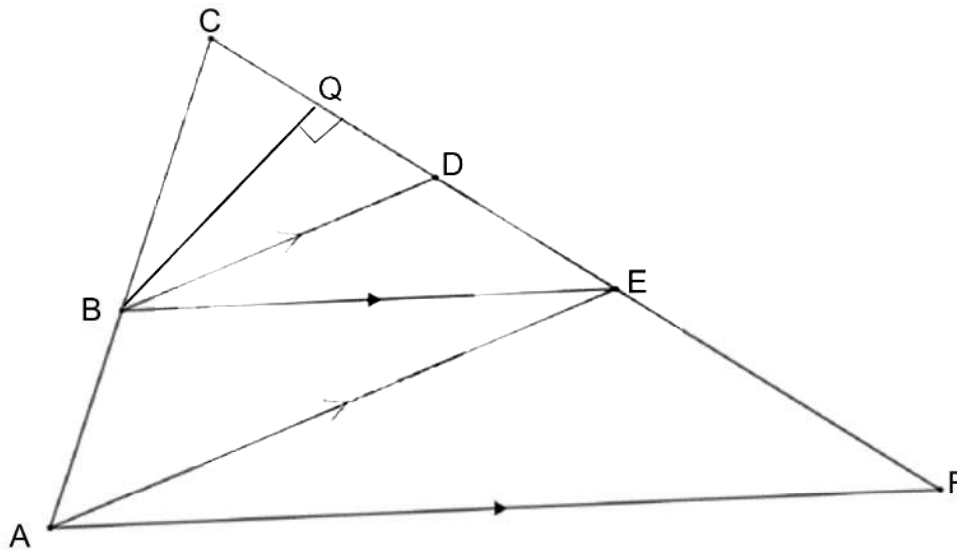
✓ $OQ = 8 - OC$

✓ S ✓ R

✓ S

(5)

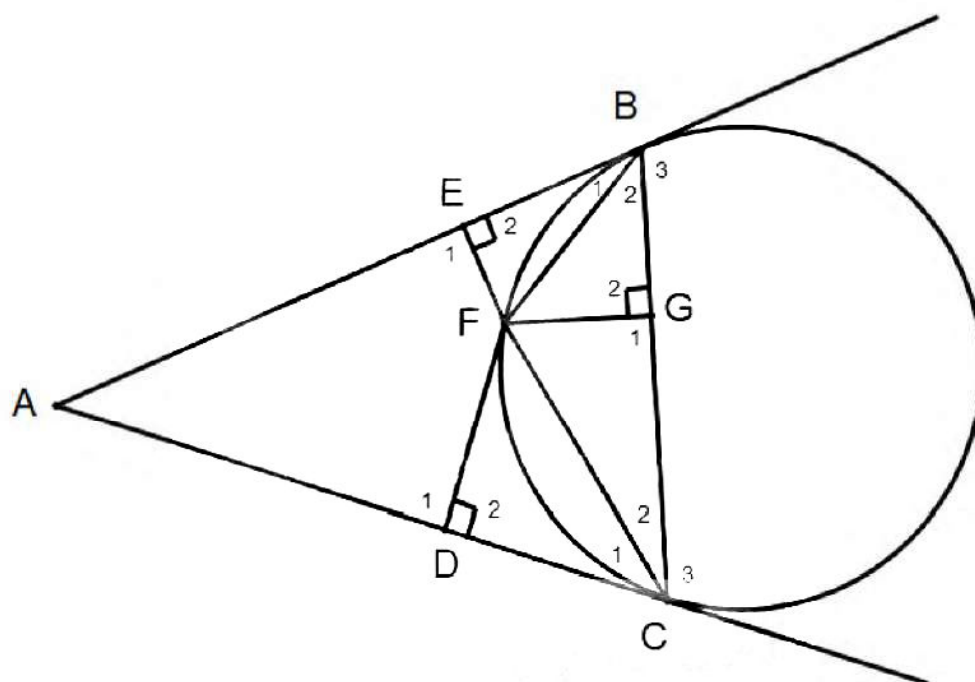
8.2



8.2.1	4 : 5	✓ S (1)
8.2.2	$\frac{AC}{AB} = \frac{9}{4}$ (given/gegee) $AC = \frac{9}{4} \times 6$ units/eenhede $AC = \frac{27}{2}$ units/eenhede $= 13,5$ units/eenhede	✓ substitution /substitusie ✓ answer/antwoord (2)
8.2.3	$\frac{\text{Area of } \Delta BDC}{\text{Area of } \Delta BED} = \frac{\frac{1}{2} \times CD \times BQ}{\frac{1}{2} \times DE \times BQ}$ $= \frac{CD}{DE}$ $= \frac{5}{4}$ (prop theorem; $BD \parallel AE$) / line one side of Δ (lyn een sy van Δ)	$\frac{\text{Area of } \Delta BDC}{\text{Area of } \Delta BED} = \frac{CD}{DE}$ $\frac{\text{Opp } \Delta BDC}{\text{Opp } \Delta BED} = \frac{CD}{DE}$ ✓ S/R (2)
8.2.4	$\frac{EC}{FC} = \frac{BC}{AC} = \frac{5}{9}$ (prop theorem; $BE \parallel AF$) / line one side of Δ (lyn een sy van Δ) $\frac{EC}{15} = \frac{5}{9}$ $EC = \frac{25}{3} = 8,33$ $\frac{DE}{EC} = \frac{4}{9}$ (prop theorem; $BD \parallel AE$) / line one side of Δ (lyn een sy van Δ) $DE = \frac{4}{9} \times EC$ $= \frac{4}{9} \times \frac{25}{3}$ $\therefore DE = \frac{100}{27}$ units/eenhede = 3,70 units/eenhede	$\frac{EC}{FC} = \frac{5}{9}$ $EC = \frac{25}{3} = 8,33$ $\frac{DE}{EC} = \frac{4}{9}$ ✓ answer/antwoord (4)

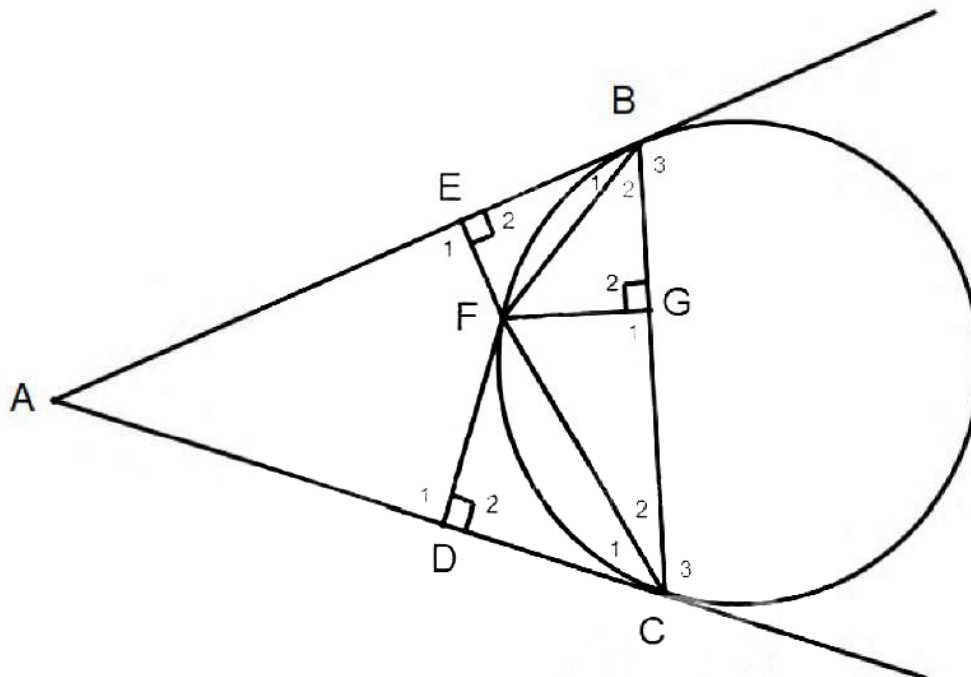


QUESTION/VRAAG 9



9.1	<p>In $\triangle BEF$ and/en $\triangle CGF$,</p> <p>$\hat{E}_2 = \hat{G}_1$ (both = 90°, given)/(beide = 90°, gegee)</p> <p>$\hat{B}_1 = \hat{C}_2$ (tan chord theorem)/(<i>< tussen raaklyn en koord</i>)</p> <p>$\hat{E}\hat{F}B = \hat{C}\hat{F}G$ (sum of/som van \angles in Δ)/(<i>< e van Δ</i>)</p> <p>$\therefore \triangle BEF \parallel \triangle CGF$ ($\lll \lll$)</p>	<p>✓ $\hat{E}_2 = \hat{G}_1$</p> <p>✓ S/R</p> <p>✓ $\lll \lll$ OR/OF</p> <p>Sum of/som van \angles in Δ/ (<i>< e van Δ</i>) (3)</p>
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9.2	<p>In $\triangle CDF$ and/en $\triangle BGF$,</p> <p>$\widehat{D}_2 = \widehat{G}_2$ (both = 90°, given)/(beide = 90°, gegee)</p> <p>$\widehat{C}_1 = \widehat{B}_2$ (tan chord theorem)/(<i>< tussen raaklyn en koord</i>)</p> <p>$\widehat{C}\widehat{F}\widehat{D} = \widehat{B}\widehat{F}\widehat{G}$ (sum of \angle s in \triangle)/(<i>< e van \triangle</i>)</p> <p>$\therefore \triangle CDF \parallel \triangle BGF$ (\lll)</p> <p>$\triangle BEF \parallel \triangle CGF$ (proven)</p> <p>$\frac{FD}{FG} = \frac{FC}{FB}$ ($\triangle CDF \parallel \triangle BGF$)</p> <p>$\frac{FG}{FE} = \frac{FC}{FB}$ ($\triangle BEF \parallel \triangle CGF$)</p> <p>$\frac{FD}{FG} = \frac{FG}{FE}$ (both /beide = $\frac{FC}{FB}$)</p> <p>$\therefore FG^2 = FE \times FD$</p>	<p>✓ S ✓ R</p> <p>✓ $\triangle CDF \parallel \triangle BGF$</p> <p>✓ S/R</p> <p>✓ S</p> <p>✓ $\frac{FD}{FG} = \frac{FG}{FE}$</p> <p>(6)</p>
		[9]

TOTAL/TOTAAL: 145



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