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**NATIONAL  
SENIOR CERTIFICATE/  
NASIONALE  
SENIOR SERTIFIKAAT**

**GRADE/GRAAD 12**

**MATHEMATICS P2/WISKUNDE V2**

**SEPTEMBER 2020**

**MARKING GUIDELINES/NASIENRIGLYNE**

**MARKS/PUNTE: 150**

**These marking guidelines consist of 20 pages./  
*Hierdie nasienriglyne bestaan uit 20 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 has not redone the question, mark the crossed out version.
- Consistent accuracy applies in ALL aspects of the marking memorandum. Stop marking at the second calculation error.
- Assuming answers/values in order to solve a problem is NOT acceptable.

**NOTA:**

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

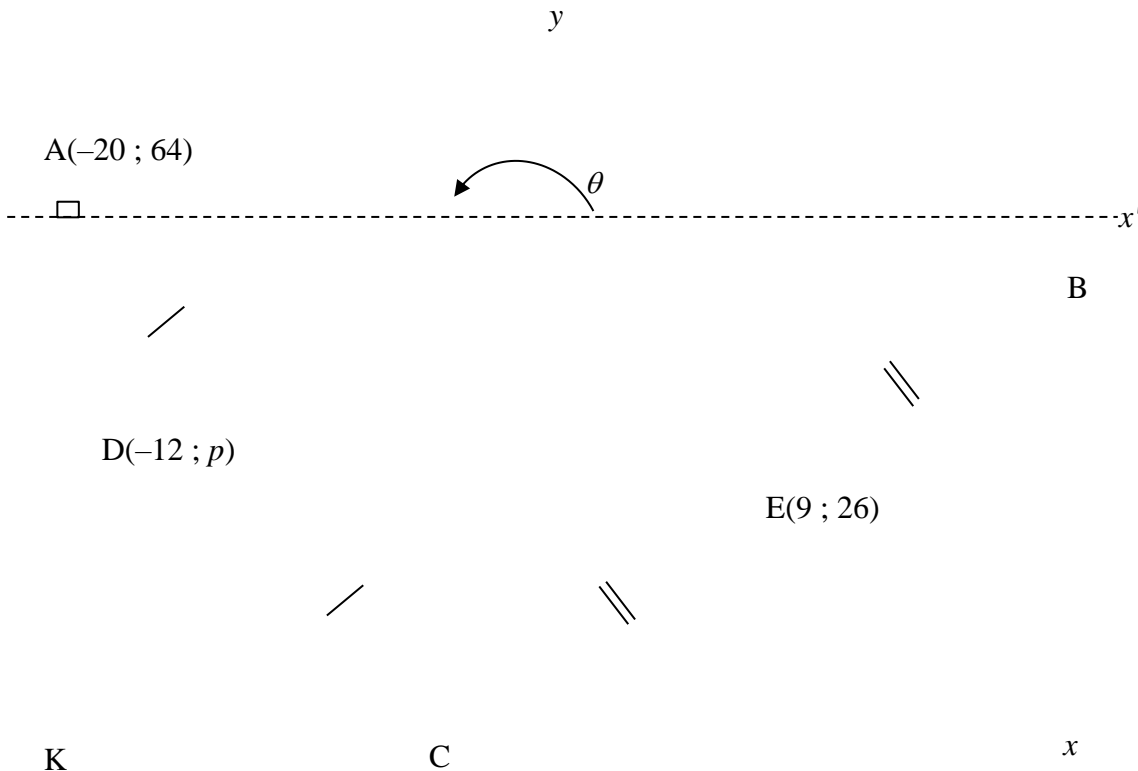
**QUESTION/VRAAG 1**

1.1	$\frac{k + 19 + 2k + 32 + 49 + 57 + 66}{7} = 37,43$ $\frac{3k + 223}{7} = 37,43$ $3k = 39,01$ $\therefore k = 13$	✓ method/metode  ✓ $3k = 39,01$ (2)
1.2	$\sigma_x = 18,63$ <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-left: 20px;">Answer only: Full Marks</div>	✓✓ 18,63 (2)
1.3	$\bar{x} + p\sigma_x = 57$ $37,43 + p(18,63) = 57$ $p = 1,05$	✓ method/metode ✓ subst./vervang 37,43 and/en 18,63 ✓ answer/antwoord (3)
1.4.1	38	✓ answer/antwoord (1)
1.4.2	$19 + y = 30$ $y = 11$	✓ answer/antwoord (1)
		<b>[9]</b>

**QUESTION/VRAAG 2**

2.1	$\hat{y} = a + bx$ $a = -106,95$ and / en $b = 14,76$ $\therefore \hat{y} = -106,95 + 14,76x$	✓ $a = -106,95$ ✓ $b = 14,76$ ✓ equation/ vergelyking (3)
2.2	$r = 0,94$	✓ $r = 0,94$ (1)
2.3	$\hat{y} = -106,95 + 14,76(32)$ $\hat{y} = 365,37$ visitors / besoe ker s <b>OR/OF</b> $32\hat{y} = 365,22$ $\therefore$ 365 people are predicted / mense word voorspel $\therefore$ Yes, accept the prediction / Ja, aanvaar die voorspelling.	✓ substitute 32 into eq. / vervang 32 in vgl. ✓ 365,37 / 365,22 ✓ Yes/Ja (3)
2.4	The <b>Madiba</b> swimming pool. The daily maximum temperatures (independent variable) remained the same. The slope of $\hat{y} = k + 12,85x$ is less steaper, which means the y-values for the Cronje swimming pool are smaller. This result in less visitors for the Cronje swimming pool/ <i>Die Madiba-swembad. Die daaglikse maksimum temperature (onafhanklike veranderlike) bly dieselfde. Die helling van <math>\hat{y} = k + 12,85x</math> is minder steiler, wat beteken dat die y-waardes vir die Cronje-swembad kleiner is. Dit het tot gevolg dat die Cronje-swembad minder besoekers het.</i>	✓ Madiba ✓ slope less steaper/ helling minder steiler ✓ y-values for Cronje swimming pool are smaller/y-waardes vir Cronje-swembad is kleiner (3) <b>[10]</b>

**QUESTION/VRAAG 3**

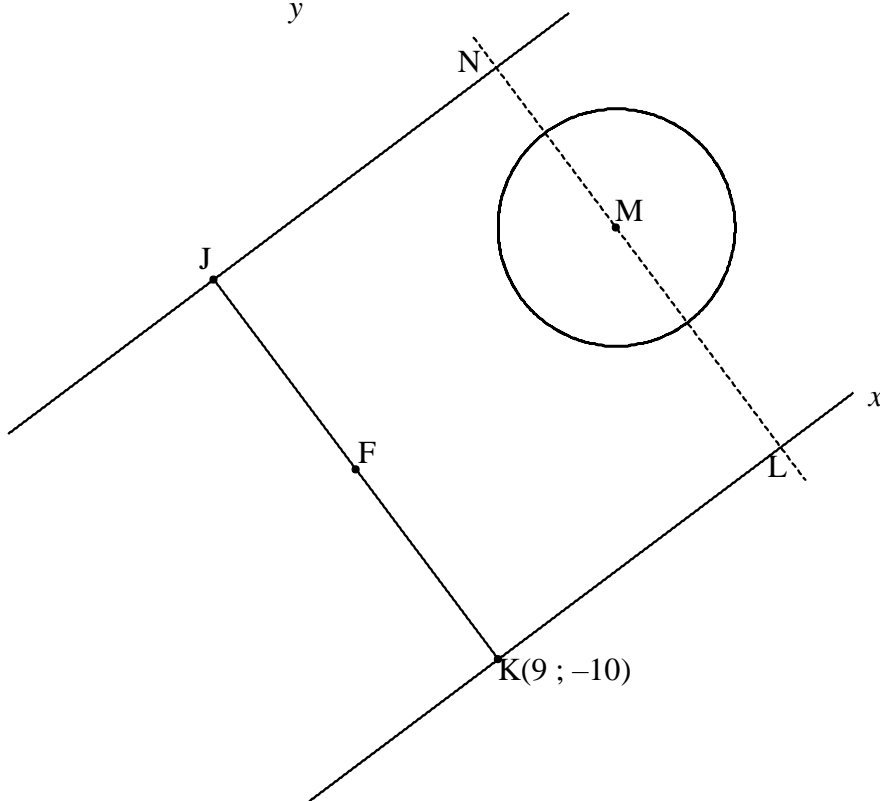


3.1	$x = -20$	✓ $x = -20$ (1)
3.2	$-20 + 16 = -4$ $\therefore C(-4; 0)$	✓ $C(-4; 0)$ (1)
3.3	$AC^2 = (64)^2 + (16)^2$ <b>OR / OF</b> $d_{AC} = \sqrt{(-20 + 4)^2 + (64 - 0)^2}$ $= 4352$ $= 65,97$ units / eenhede	✓ method/metode ✓ 65,97 (2)
3.4	$\frac{64+0}{2} = p$ $\therefore p = 32$	✓ $\frac{64+0}{2}$ (1)

<p>3.5</p>	$m_{DE} = \frac{26 - 32}{9 + 12}$ $= -\frac{2}{7}$ $m_{AB} = m_{DE} = -\frac{2}{7} \text{ [DE    AB midpt.th / middelpuntstelling]}$ <p>Through the point / Deur die punt <math>(-20; 64)</math></p> $y - 64 = -\frac{2}{7}(x + 20)$ $y - 64 = -\frac{2}{7}x - \frac{40}{7}$ $\therefore y = -\frac{2}{7}x + \frac{408}{7}$	<p>✓ method gradient/metode gradiënt</p> <p>✓ <math>m_{DE} = -\frac{2}{7}</math></p> <p>✓ <math>m_{AB} = -\frac{2}{7}</math></p> <p>✓ Subst./Vervang <math>(-20; 64)</math></p> <p>✓ <math>y = -\frac{2}{7}x + \frac{408}{7}</math></p> <p>(5)</p>
<p>3.6</p>	$m_{AB} = \tan \theta \text{ see / sien diagram}$ $\tan \theta = -\frac{2}{7}$ $\tan^{-1}\left(-\frac{2}{7}\right) = \theta$ $\therefore \theta = -15,95^\circ + 180^\circ$ $\theta = 164,05^\circ$ $164,05^\circ = \hat{K}AB + 90^\circ$ $\therefore \hat{K}AB = 74,05^\circ$	<p>✓ <math>\tan \theta = -\frac{2}{7}</math></p> <p>✓ <math>-15,95^\circ</math></p> <p>✓ <math>164,05^\circ</math></p> <p>✓ method/metode</p> <p>✓ answer/antwoord</p> <p>(5)</p>
<p>3.7</p>	$\hat{C}AB = 74,05^\circ - 38,67^\circ$ $= 35,38^\circ$ <p>coordinates of / koördinate van B <math>(22; 52)</math></p> $d_{AB} = \sqrt{(22 + 20)^2 + (52 - 64)^2}$ $= 6\sqrt{53}$ $\text{Area } \triangle ABC = \frac{1}{2} AC \cdot AB \sin \hat{C}AB$ $= \frac{1}{2} (65,97) \cdot (6\sqrt{53}) \sin 35,38^\circ$ $= 834,22 \text{ units}^2 / \text{eenhede}^2$	<p>✓ <math>\hat{C}AB = 35,38^\circ</math></p> <p>✓ <math>x = 22</math></p> <p>✓ <math>y = 52</math></p> <p>✓ <math>6\sqrt{53}</math></p> <p>✓ correct use of area rule/korrekte gebruik van oppv.reël</p> <p>✓ answer/antwoord</p> <p>(6)</p> <p>[21]</p>

**QUESTION/VRAAG 4**

y

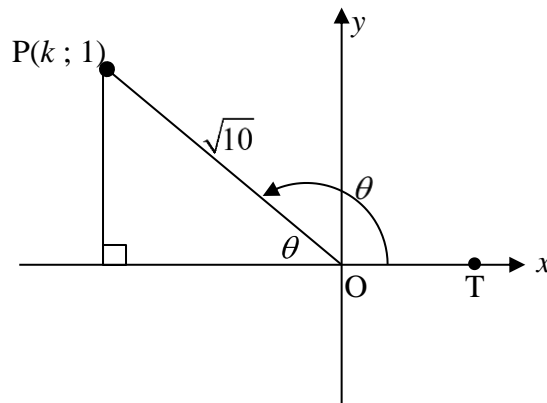


4.1	$r = 5$	✓ $r = 5$ <span style="float: right;">(1)</span>
4.2	$x^2 - 6x + (-3)^2 + y^2 + 4y + (2)^2 = 87 + 9 + 4$ $(x - 3)^2 + (y + 2)^2 = 100$ $\therefore F(3; -2)$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;">Answer only: Full Marks</div>	✓ method/metode  ✓ $x = 3$ ✓ $y = -2$  <span style="float: right;">(3)</span>
4.3	$r^2 = 87 + (-3)^2 + (2)^2 = 100$ $\therefore r = 10$	✓ $r^2 = 100$ (can also be shown in 4.2/ kan ook in 4.2 gewys word) ✓ $r = 10$  <span style="float: right;">(2)</span>
4.4	$FM = 15 \text{ units/eenhede}$ $d_{FM} = \sqrt{(14 - 3)^2 + (h + 2)^2} = 15$ $11^2 + (h + 2)^2 = 225$ $(h + 2)^2 = 104$ $h = \pm \sqrt{104} - 2$ $\therefore h = \sqrt{104} - 2$ (see / sien diagram)	✓ $FM = 15$ ✓ subst. into distance formulae / vervang in afstandsvormule ✓ square both sides / kwadreer beide kante ✓ $(h + 2)^2 = 104$  <span style="float: right;">(4)</span>

<p>4.5</p>	$m_{JK} = \frac{6+10}{-3-9}$ $= -\frac{4}{3}$ <p><math>\therefore m_{JN} = \frac{3}{4}</math> [rad <math>\perp</math> tangent / rad <math>\perp</math> raaklyn]</p> $y - 6 = \frac{3}{4}(x + 3)$ $y - 6 = \frac{3}{4}x + \frac{9}{4}$ $\therefore y = \frac{3}{4}x + \frac{33}{4}$	<p><math>\checkmark m_{JK} = -\frac{4}{3}</math></p> <p><math>\checkmark m_{JN} = \frac{3}{4}</math></p> <p><math>\checkmark</math> correct subst. into eq. / korrekte vervanging in vgl.</p> <p>(3)</p>
<p>4.6</p>	<p>Eq. of / vgl. van NL</p> $y - (\sqrt{104} - 2) = -\frac{4}{3}(x - 14)$ $y - \sqrt{104} + 2 = -\frac{4}{3}x + \frac{56}{3}$ $\therefore y = -\frac{4}{3}x + \frac{50}{3} + \sqrt{104}$ <p>Min. <math>x</math> - value of intersection will be at N / Min. <math>x</math> - waarde van snyding is by N</p> $-\frac{4}{3}x + \frac{50}{3} + \sqrt{104} = \frac{3}{4}x + \frac{33}{4}$ $-\frac{4}{3}x - \frac{3}{4}x = \frac{33}{4} - \frac{50}{3} - \sqrt{104}$ $-\frac{25x}{12} = -18,614705\dots$ $x = 8,94$ <p>min. <math>x</math> -value of point of contact is p / min. <math>x</math> - waarde vir raakpunt is p</p> $\therefore p = 8,94$	<p><math>\checkmark</math> Correct subst into eq. / korrekte vervanging in vgl.</p> <p><math>\checkmark</math> eq. of / vgl. van NL</p> <p><math>\checkmark</math> equate eqs. / stel vgl. gelyk</p> <p><math>\checkmark</math> simplify / vereenvoudig</p> <p><math>\checkmark</math> 8,94</p> <p><math>\checkmark</math> conclude / lei af <math>p = 8,94</math></p> <p>(6) [19]</p>



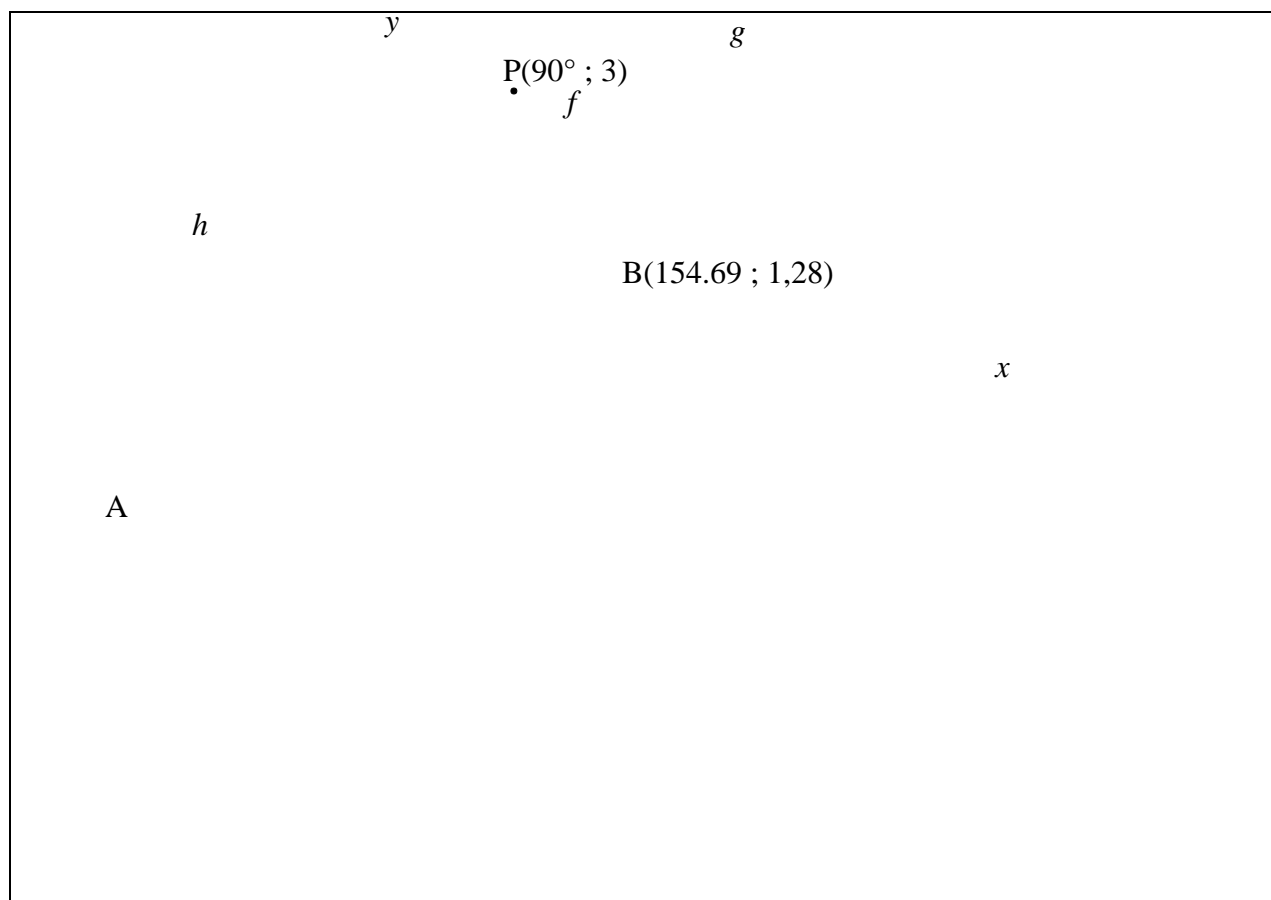
**QUESTION/VRAAG 5**



<p>5.1.1</p>	$k^2 + 1^2 = (\sqrt{10})^2$ $k^2 = 9$ $k = \pm 3$ $k = -3 \text{ (according to/volgens diagram)}$	<p>✓Pythagoras</p> <p>✓<math>k = -3</math></p> <p style="text-align: right;">(2)</p>
<p>5.1.2 (a)</p>	$-\cos \theta$ $= -\left(\frac{-3}{\sqrt{10}}\right)$ $= \frac{3}{\sqrt{10}}$	<p>✓ <math>\frac{3}{\sqrt{10}}</math> or / of <math>\frac{3\sqrt{10}}{10}</math></p> <p style="text-align: right;">(1)</p>
<p>5.1.2 (b)</p>	$\sqrt{1 - \sin(180^\circ + \theta) \cdot \sin(360^\circ - \theta)}$ $= \sqrt{1 - (-\sin \theta) \cdot (-\sin \theta)} \quad \text{OR/OF}$ $= \sqrt{1 - \sin^2 \theta}$ $= \sqrt{\cos^2 \theta}$ $= \cos \theta$ $= \frac{-3}{\sqrt{10}} \text{ or / of } \frac{-3\sqrt{10}}{10}$ $\sqrt{1 - \left(-\frac{1}{\sqrt{10}}\right) \left(-\frac{1}{\sqrt{10}}\right)}$ $= \sqrt{1 - \frac{1}{10}}$ $= \sqrt{\frac{9}{10}}$ $= \frac{-3}{\sqrt{10}} \text{ or / of } \frac{-3\sqrt{10}}{10}$	<p>✓ <math>\sin(180^\circ + \theta) = -\sin \theta</math></p> <p>✓ <math>\sin(360^\circ - \theta) = -\sin \theta</math></p> <p>✓ <math>1 - \sin^2 \theta = \cos^2 \theta</math></p> <p><b>OR/OF</b></p> $\sin \theta = \frac{1}{\sqrt{10}}$ <p>✓ <math>\frac{-3}{\sqrt{10}}</math> or / of <math>\frac{-3\sqrt{10}}{10}</math></p> <p style="text-align: right;">(4)</p>

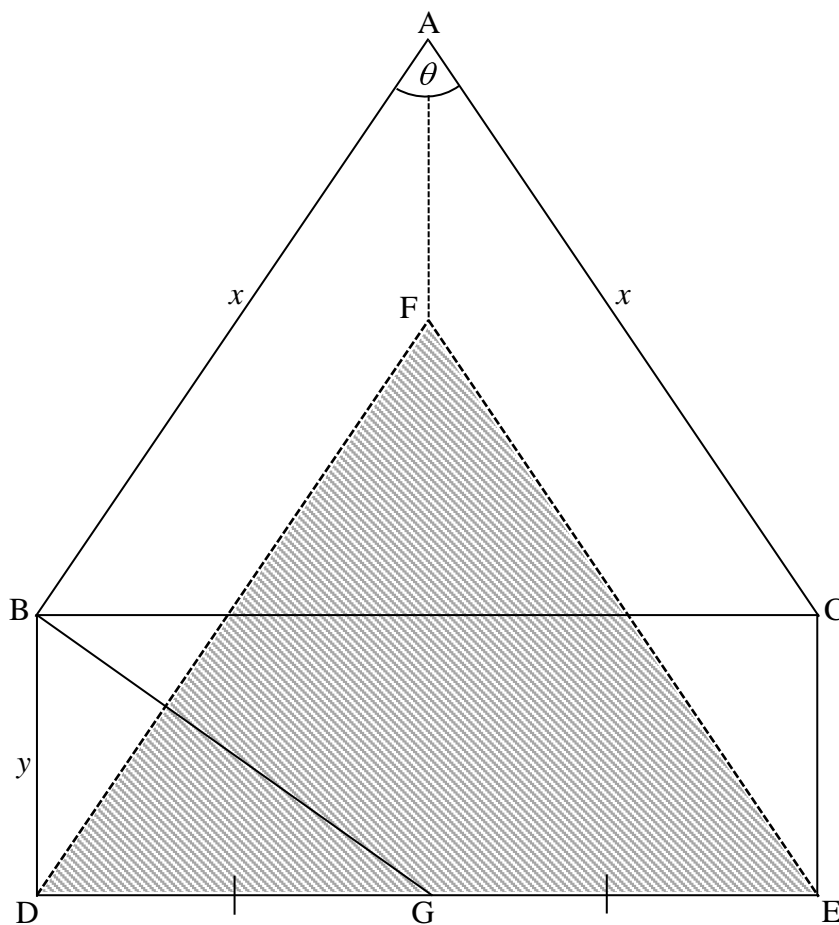
<p>5.1.3</p>	$\frac{1}{2} \times \left[ 2 \sin \left( \frac{\theta}{2} - 15^\circ \right) \cdot \cos \left( \frac{\theta}{2} - 15^\circ \right) \right]$ $= \frac{1}{2} \sin(\theta - 30^\circ)$ $= \frac{1}{2} [\sin \theta \cdot \cos 30^\circ - \sin 30^\circ \cdot \cos \theta]$ $= \frac{1}{2} \left[ \frac{1}{\sqrt{10}} \cdot \frac{\sqrt{3}}{2} - \frac{1}{2} \cdot \frac{-3}{\sqrt{10}} \right]$ $= \frac{1}{2} \left[ \frac{\sqrt{3}}{2\sqrt{10}} + \frac{3}{2\sqrt{10}} \right]$ $= \frac{1}{2} \left[ \frac{\sqrt{3} + 3}{2\sqrt{10}} \right]$ $= \frac{\sqrt{3} + 3}{4\sqrt{10}}$	<p>✓ manipulation / manipulasie</p> <p>✓ <math>\sin(\theta - 30^\circ)</math></p> <p>✓ expansion of identity/ uitbreiding van identiteit</p> <p>✓ <math>\sin \theta \cdot \cos 30^\circ = \frac{1}{\sqrt{10}} \cdot \frac{\sqrt{3}}{2}</math></p> <p>✓ <math>\sin 30^\circ \cdot \cos \theta = \frac{1}{2} \cdot \frac{-3}{\sqrt{10}}</math></p> <p>(5)</p>
<p>5.2.1</p>	<p><math>d \in [-1;1]</math> or / of <math>-1 \leq d \leq 1</math></p>	<p>✓ critical values/kritiese waardes</p> <p>✓ notation/notasie</p> <p>(2)</p>
<p>5.2.2</p>	$\sin(\theta + 60^\circ) = \sin \theta \cdot \cos 60^\circ + \sqrt{\frac{3}{8}}$ $\sin \theta \cdot \cos 60^\circ + \sin 60^\circ \cdot \cos \theta = \sin \theta \cdot \cos 60^\circ + \sqrt{\frac{3}{8}}$ $\sin 60^\circ \cdot \cos \theta = \sqrt{\frac{3}{8}}$ $\frac{\sqrt{3}}{2} \cdot \cos \theta = \frac{\sqrt{3}}{2\sqrt{2}}$ $\cos \theta = \frac{1}{\sqrt{2}}$ $\theta = \pm 45^\circ + n \cdot 360^\circ$	<p>✓ LHS expansion / LK uitbreiding</p> <p>✓ <math>\sin 60^\circ \cdot \cos \theta = \sqrt{\frac{3}{8}}</math></p> <p>✓ <math>\sin 60^\circ = \frac{\sqrt{3}}{2}</math></p> <p>✓ <math>\cos \theta = \frac{1}{\sqrt{2}}</math></p> <p>✓ <math>m = 45^\circ</math></p> <p>(5)</p>
<p>5.3</p>	$\sin(m - m) = \sin 0 = 0$ $\therefore A = 2^0$ $= 1$	<p>✓ <math>\sin 0</math></p> <p>✓ <math>2^0</math></p> <p>✓ 1</p> <p>(3)</p> <p><b>[22]</b></p>

**QUESTION/VRAAG 6**



6.1	$a = 3$ and/en $b = \frac{1}{3}$	$\checkmark a = 3$ $\checkmark b = \frac{1}{3}$ (2)
6.2	540°	$\checkmark 540^\circ$ (1)
6.3	A(-154,69° ; -1,28)	$\checkmark -154,69^\circ$ $\checkmark -1,28$ (2)
6.4	$\tan \frac{1}{3} x = \frac{3}{2}$ $\frac{1}{3} x = 56,3099^\circ \dots$ $x = 168,93^\circ$ vertical dist./vertikale afst. = $\tan 56,31^\circ - 3 \sin 168,93^\circ$ vertical distance / vertikale afs $\tan d = \frac{t+5}{2}$	$\checkmark g(x) = h(x)$ $\checkmark 56,3099^\circ$ $\checkmark 168,93^\circ$ $\checkmark \frac{t+5}{2}$ (4) <b>[9]</b>

**QUESTION/VRAAG 7**

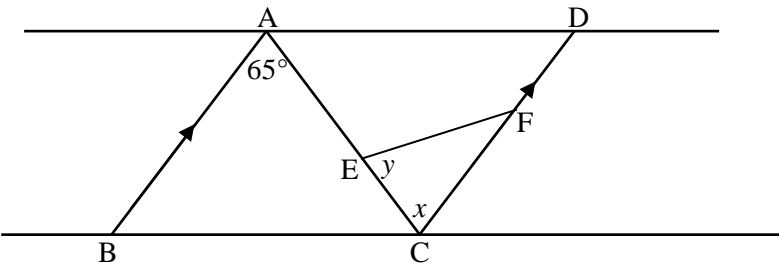


7.1	$BC^2 = AB^2 + AC^2 - 2AB \cdot AC \cdot \cos \theta$ $BC^2 = x^2 + x^2 - 2x \cdot x \cdot \cos \theta$ $BC^2 = 2x^2 - 2x^2 \cos \theta$ $BC^2 = 2x^2(1 - \cos \theta)$ $BC = x\sqrt{2(1 - \cos \theta)}$	✓ correct use of cosine-rule/korrekte gebruik van cos-reël ✓ subst/vervanging ✓ factorisation/faktoriserings (3)
7.2	$\hat{B}DG = 90^\circ$	✓ answer/antwoord (1)

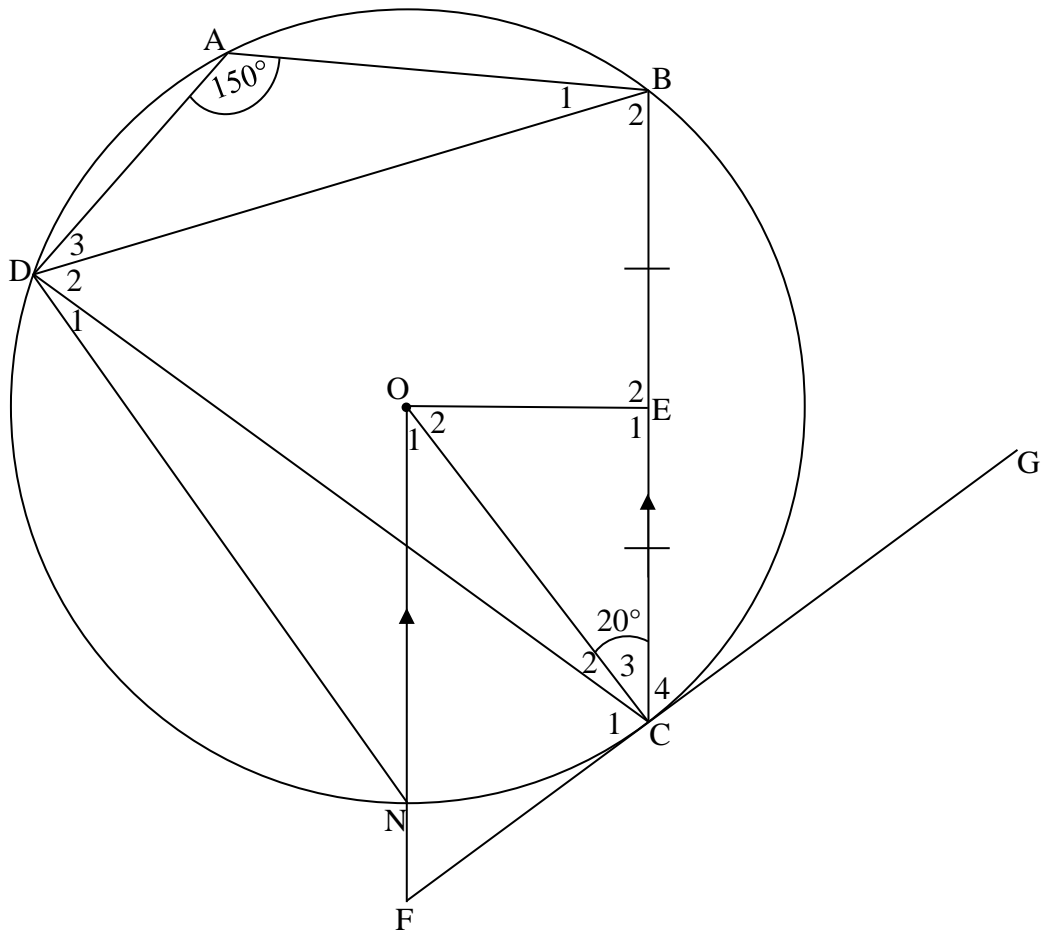
<p>7.3</p>	$DG = \frac{1}{2}DE = \frac{1}{2}BC$ $BG^2 = BD^2 + DG^2$ $= y^2 + \left(\frac{x\sqrt{2(1-\cos\theta)}}{2}\right)^2$ $= y^2 + \frac{x^2 \cdot 2 \cdot (1-\cos\theta)}{4}$ $= y^2 + \frac{x^2(1-\cos\theta)}{2}$ $= \frac{2y^2 + x^2(1-\cos\theta)}{2}$ $\therefore BG = \sqrt{\frac{2y^2 + x^2(1-\cos\theta)}{2}}$	<p>✓ <math>DG = \frac{1}{2}BC</math></p> <p>✓ subst./vervanging</p> <p>✓ <math>y^2 + \frac{x^2(1-\cos\theta)}{2}</math></p> <p>(3)</p>
<p>7.4</p>	<p>Max. length of BG is where <math>1 - \cos\theta</math> is a max /  <i>Maks. lengte van BG is waar <math>1 - \cos\theta</math> 'n maks is</i></p> <p>max value of / maks.waarde van <math>1 - \cos\theta = 2</math></p> $BG_{\text{max/maks}} = \sqrt{\frac{2y^2 + x^2(1-\cos\theta)}{2}}$ $= \sqrt{\frac{2\left(\frac{8}{3}\right)^2 + \left(\frac{15}{2}\right)^2}{2}} \quad (2)$ $= \sqrt{\frac{2281}{36}}$ $= 7,96 \text{ units / eenhede}$	<p>✓ <math>1 - \cos\theta = 2</math></p> <p>✓ subst./vervanging</p> <p>✓ answer/antwoord</p> <p>(3)  <b>[10]</b></p>

**GEOMETRY/MEETKUNDE**

Please read carefully through the following table before marking **QUESTION 8 – 10** /  
 Lees asseblief sorgvuldig deur die volgende tabel alvorens **VRAAG 8 –10** nagesien word.

	<p>The order in which the candidate answer a geometry question must follow logically/ <i>Die volgorde waarin 'n kandidaat 'n meetkundevraag beantwoord moet logies volg.</i></p> <p><b>Example/Voorbeeld</b></p> <p>Given/Gegee <math>AB \parallel CD</math> and/en <math>\hat{EFD} = 115^\circ</math></p>  <p>The candidate first need to calculate <math>x</math> BEFORE he/she can calculate <math>y</math>/Die kandidaat moet eerste vir <math>x</math> bereken <b>VOORDAT</b> hy/sy vir <math>y</math> kan bereken.</p>
S	<p>A mark for a correct statement                  (A statement mark is independent of a reason)                  'n Punt vir 'n korrekte bewering                  ('n Punt vir 'n bewering is onafhanklik van die rede)</p>
R	<p>A mark for the correct reason                  (A reason mark may only be awarded if the statement is correct)                  'n Punt vir 'n korrekte rede                  ('n Punt word slegs vir die rede toegeken as die bewering korrek is)</p>
S/R	<p>Award a mark if the statement AND reason are both correct                  (Both <b>MUST</b> be correct to get one mark)                  Ken 'n punt toe as die bewering <b>EN</b> rede beide korrek is                  (Beide <b>MOET</b> korrek wees om een punt te kry)</p>

**QUESTION/VRAAG 8**

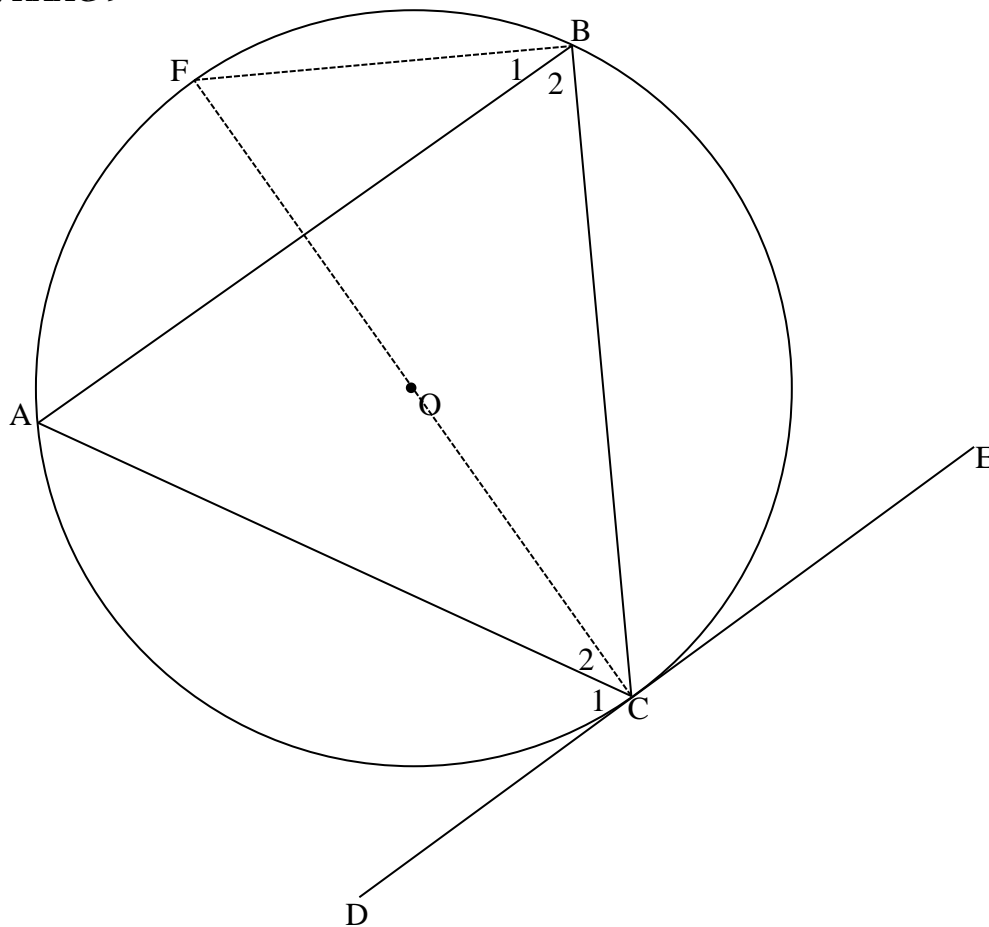


8.1.1	$\hat{O}_1 = 20^\circ$ [alt $\angle$ s / verwiss $\angle$ e; $OF \parallel BC$ ]	✓S/R (1)
8.1.2	$\hat{D}_1 = 10^\circ$ [ $\angle$ at centre = $2 \times \angle$ circumference / <i>midtpt</i> $\angle = 2 \times$ <i>omtrek</i> $\angle$ ]	✓S✓R (2)
8.1.3	$\hat{C}_2 = 10^\circ$ [opp $\angle$ s of cyclic quad / <i>teenoorst. <math>\angle</math>e van kvh</i> ]	✓S✓R (2)
8.1.4	$\hat{C}_4 = 70^\circ$ [rad $\perp$ tangent / <i>rad <math>\perp</math> raaklyn</i> ] $\hat{D}_2 = \hat{C}_4 = 70^\circ$ [tan-chord.th / <i>raaklyn – koordst.</i> ]	✓S✓R ✓S✓R (4)

8.2	<p><math>OE \perp BC</math> [midpt. □ , midpt. chord / <i>midpt. □ , midpt. koord</i>]</p> <p><math>\therefore OE</math> is the perpendicular height of trapezium <math>OECF</math> /  <i>OE is die loodregte hoogte van trapesium <math>OECF</math></i></p> $\frac{1}{2}(OF + EC) \times OE = \frac{3}{4}y^2 - x^2$ $\frac{1}{2}(\sqrt{3}y + 2x) \times OE = \frac{3}{4}y^2 - x^2$ $\left(\frac{\sqrt{3}}{2}y + x\right) \times OE = \frac{3}{4}y^2 - x^2$ $OE = \frac{\left(\frac{\sqrt{3}}{2}y - x\right)\left(\frac{\sqrt{3}}{2}y + x\right)}{\left(\frac{\sqrt{3}}{2}y + x\right)}$ <p><math>\therefore OE = \frac{\sqrt{3}}{2}y - x</math></p>	<p>✓S✓R</p> <p>✓ area          formulae          trapezium/  <i>oppv.</i>  <i>formule</i>  <i>trapesium</i></p> <p>✓ factors          RHS /  <i>faktore RK</i></p> <p>✓ answer/  <i>antwoord</i>          (5)  <b>[14]</b></p>
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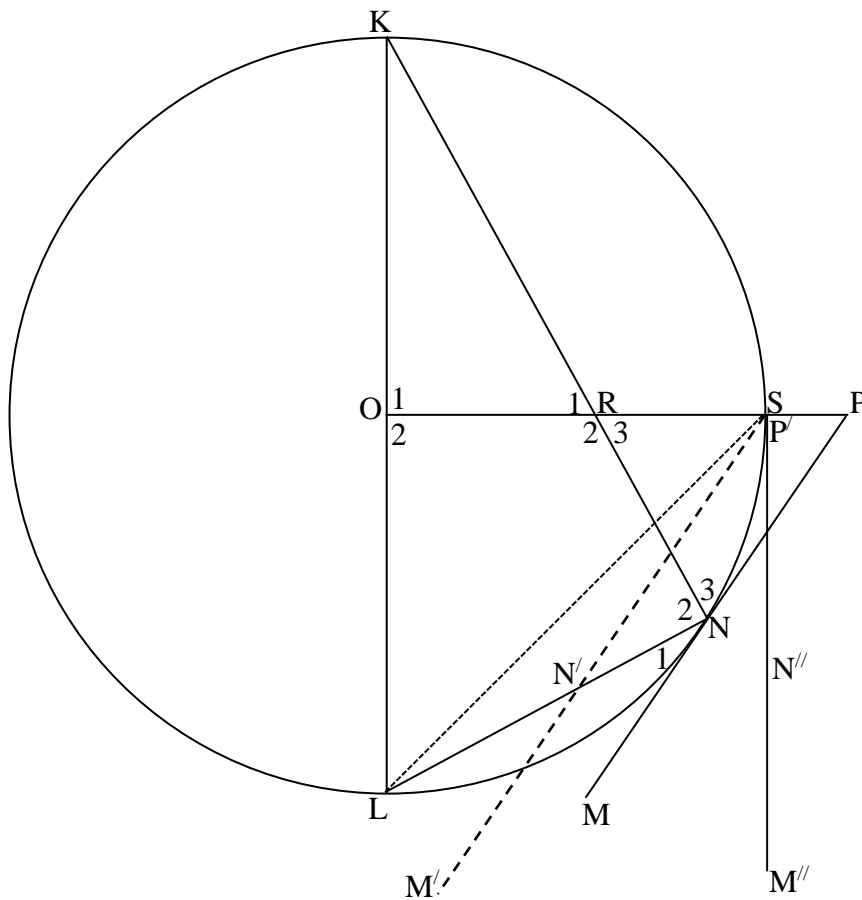


**QUESTION/VRAAG 9**



<p>9.1</p>	<p>Construction: Draw diameter CF and connect F with B/  <i>Konstruksie: Trek middellyn CF en verbind F met B</i></p> <p><math>\hat{C}_1 + \hat{C}_2 = 90^\circ</math> [rad <math>\perp</math> tangent / rad <math>\perp</math> raaklyn]</p> <p><math>\hat{B}_1 + \hat{B}_2 = 90^\circ</math> [<math>\angle</math> in <math>\frac{1}{2}</math> <math>\square</math> ]</p> <p><math>\therefore \hat{C}_1 + \hat{C}_2 = \hat{B}_1 + \hat{B}_2 = 90^\circ</math></p> <p>but / maar <math>\hat{B}_1 = \hat{C}_2</math> [<math>\angle</math>s in the same seg./ <math>\angle</math>e in dies. seg.]</p> <p><math>\therefore \hat{C}_1 = \hat{B}_2</math></p> <p><math>\therefore \hat{ACD} = \hat{ABC}</math></p>	<p>✓ constr/ konstr</p> <p>✓ S/R</p> <p>✓ S/R</p> <p>✓ S/R</p> <p>✓ S/R</p> <p>(5)</p>
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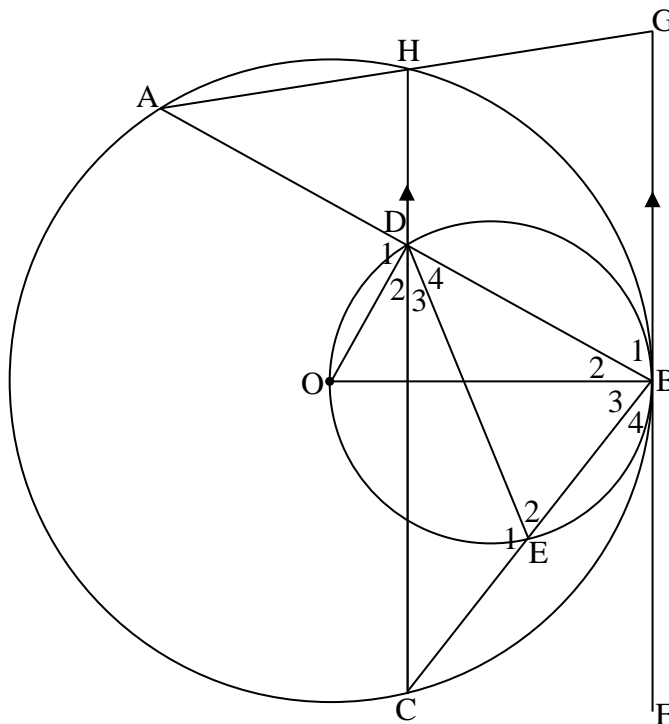
9.2



9.2.1	OR = 6	✓ 6 (1)
9.2.2	$OR^2 = 36$ $\therefore KR^2 - KO^2 = OR^2$ $\therefore OR \perp KL$ [converse Pythagoras / omgekeerde Pythagoras]	✓S ✓R (2)
9.2.3	$\hat{N}_2 = 90^\circ$ [ $\angle$ in $\frac{1}{2}$ ] $\therefore ORNL$ is a cyclic quad / is 'n kvh [converse opp. $\angle$ s of cyclic quad / omgekeerde teenoorst. $\angle$ e kvh] <b>OR/OF</b> [converse ext. $\angle$ cyclic quad / omgekeerde buite $\angle$ kvh]	✓S ✓R ✓R (3)
9.2.4	If / As $M'N'P'$ touches the circle / die sirkel raak : $M'N'P' \perp OP'$ [rad $\perp$ tangent / rad $\perp$ raaklyn] If $M'N'P' \parallel MNP$ and $P'$ coincide with S, then $L\hat{S}M' < 90^\circ$ / As $M'N'P' \parallel MNP$ en $P'$ val saam met S, dan is $L\hat{S}M' < 90^\circ$	✓S/R ✓S

	<p><math>\hat{L}\hat{O}\hat{S} = 90^\circ</math> [from / uit 9.2.2 ]  <math>\therefore \hat{L}\hat{O}\hat{S} \neq \hat{L}\hat{S}\hat{M}</math>  <math>\therefore M'N'P'</math> is not a tangent to circle through L,O and S                  [converse tan-chord th. not true]  <math>\therefore M'N'P'</math> is nie 'n raaklyn aan sirkel deur L,O en S nie                  [omgekeerde raaklyn – koordst. nie waar nie]</p>	<p>✓S                  ✓S/R                  (4)  <b>[15]</b></p>
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**QUESTION/VRAAG 10**



10.1.1	alt $\angle$ s / <i>verwiss</i> $\angle$ e; $HC \parallel GF$	✓ R (1)
10.1.2	tan-chord.th/raaklyn-koordst.	✓ R (1)
10.2.1	<p>In <math>\triangle DBE</math> and / en <math>\triangle DBC</math>  <math>\hat{B} = \hat{B}</math> [common / <i>gemeenskaplik</i>]  <math>\hat{D}_4 = \hat{C}</math> [both / <i>beide</i> = <math>\hat{B}_4</math>]  <math>\hat{E}_2 = \hat{C}\hat{D}\hat{B}</math> [sum of <math>\angle</math>s of <math>\triangle</math> / <i>som van</i> <math>\angle</math>e van <math>\triangle</math>]  <math>\therefore \triangle BDE \parallel \triangle BCD</math> [<math>\angle \angle \angle</math>]</p> <p><b>OR/OF</b></p>	<p>✓S/R                  ✓S/R                  ✓S/R</p>

	<p>In <math>\triangle DBE</math> and / en <math>\triangle DBC</math></p> <p><math>\hat{B} = \hat{B}</math> [common / <i>gemeenskaplik</i>]</p> <p><math>\hat{D}_4 = \hat{C}</math> [both / <i>beide = <math>\hat{B}_4</math></i>]</p> <p><math>\therefore \triangle BDE \parallel \triangle BCD</math> [<math>\angle \angle \angle</math>]</p>	<p>✓S/R</p> <p>✓S/R</p> <p>✓R</p> <p>(3)</p>
10.2.2	<p><math>\frac{AH}{AG} = \frac{AD}{AB} = \frac{1}{2}</math> [prop.th/<i>eweredigheidst. HC  GF</i>]</p> <p><math>\therefore AD = DB</math></p> <p><b>OR/OF</b></p> <p><math>OB \perp FG</math> [rad <math>\perp</math> tangent / <i>rad <math>\perp</math> raaklyn</i>]</p> <p><math>\therefore OB</math> is the diameter of the smaller circle / <i>OB is die middellyn van die kleiner sirkel</i></p> <p>[converse tan <math>\perp</math> rad / <i>omgekeerde rad <math>\perp</math> raaklyn</i>]</p> <p><math>\angle ODB = 90^\circ</math> [<math>\angle</math> in <math>\frac{1}{2}</math> <math>\square</math>]</p> <p><math>\therefore AD = DB</math> [midpt.<math>\square</math> , midpt.chord / <i>midpt.<math>\square</math> , midpt.koord</i>]</p>	<p>✓S ✓R</p> <p>✓S</p> <p>✓S/R</p> <p>✓S/R</p> <p>✓S/R</p> <p>(3)</p>
10.2.3	<p><math>\frac{BD}{BC} = \frac{DE}{CD} = \frac{BE}{BD}</math> [from / <i>vanuit <math>\parallel \triangle</math></i>]</p> <p><math>\therefore BD^2 = BC \cdot BE</math></p> <p>but / <i>maar</i> <math>BD = \frac{AB}{2}</math> [from / <i>vanuit</i> 10.2.2]</p> <p><math>\left(\frac{AB}{2}\right)^2 = BD^2</math></p> <p><math>\therefore \frac{AB^2}{4} = BD^2 = BC \cdot BE</math></p>	<p>✓S/R</p> <p>✓S</p> <p>✓S</p> <p>✓squaring/ <i>kwadrering</i></p> <p>(4)</p>
10.2.4	<p><math>AB = 2DB = 2(3) = 6</math> units / <i>eenhede</i></p> <p><math>\frac{6^2}{4} = BC \times 2</math> [from / <i>vanuit</i> 10.2.3]</p> <p><math>BC = 4,5</math> units / <i>eenhede</i></p> <p>but / <i>maar</i> <math>CE = BC - BE</math></p> <p style="padding-left: 40px;"><math>= 4,5 - 2</math></p> <p style="padding-left: 40px;"><math>= 2,5</math> units / <i>eenhede</i></p> <p><math>\therefore CE : BC = 2,5 : 4,5 = 5 : 9</math></p>	<p>✓subst. / <i>vervanging</i></p> <p>✓4,5</p> <p>✓2,5</p> <p>(3)</p>

10.3	$\frac{\text{area } \triangle AHD}{\text{area } \triangle HGB} = \frac{\frac{1}{2} \cdot AH \cdot HD \cdot \sin \hat{AHD}}{\frac{1}{2} \cdot HG \cdot GB \cdot \sin G} \quad [\text{given/gegee } AH = HG]$ $= \frac{HD \cdot \sin \hat{AHD}}{GB \cdot \sin G}$ <p><math>\hat{AHD} = \hat{G}</math> [corresp. <math>\angle</math>s / ooreenk. <math>\angle</math>e <math>HC \parallel GF</math>]</p> $\therefore \frac{\text{area } \triangle AHD}{\text{area } \triangle HGB} = \frac{HD}{GB}$ <p>but / maar <math>HD = \frac{1}{2} GB</math> [midpt.th <math>\Delta</math>s / midpt.st <math>\Delta</math>e]</p> $\therefore \frac{\text{area } \triangle AHD}{\text{area } \triangle HGB} = \frac{1}{2}$	<p>✓ area rule / oppv.-reël</p> <p>✓ S/R</p> <p>✓ S</p> <p>✓ S ✓ R</p> <p>✓ S</p> <p>(6)</p>
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**TOTAL/TOTAAL: 150**

GRID-Analysis (According to BLOOMS TAXONOMY)													
Question	Description	KNOWLEDGE			ROUTINE PROCEDURES			COMPLEXED PROCEDURES			PROBLEM SOLVING		
		Low	Mod	High	Low	Mod	High	Low	Mod	High	Low	Mod	High
	<b>Statistics(Gr.11) [9]</b>												
1.1	Mean average						2						
1.2	Standard deviation						2						
1.3	Within standard deviation							3					
1.4.1	Adjusted range		1										
1.4.2	Adjusted lower quartile		1										
	<b>Regression(Gr.12) [10]</b>												
2.1	Regression line				3								
2.2	Correlation Coefficient			1									
2.3	Application reg. line					3							
2.4	Application slope										3		
	<b>Analytical (Gr.11) [21]</b>												
3.1	Equation vertical line		1										
3.2	Translation	1											
3.3	Distance			2									
3.4	Midpoint			1									
3.5	Equation of str line						5						
3.6	Angle + integr. geometry								5				
3.7	Area								6				
	<b>Analytical(Gr.12) [19]</b>												
4.1	Length of radius	1											
4.2.	Centre of circle				3								
4.3	Radius from equation				2								
4.4	Integrating concepts							4					
4.5	Eq. of tangent							3					
4.6	Min.value of intersection										6		

Question	Description	KNOWLEDGE			ROUTINE PROCEDURES			COMPLEX PROCEDURES			PROBLEM SOLVING		
		Low	Mod	High	Low	Mod	High	Low	Mod	High	Low	Mod	High
5	<b>Trigonometry [22]</b>												
5.1.1	Pythagoras			2									
5.1.2 (a)	Ratio		1										
5.1.2 (b)	Reduction + ratio						4						
5.1.3	Double angle							5					
5.2.1	Range			2									
5.2.2	General solution							5					
5.3	Problem										3		
6	<b>Trig Graphs [9]</b>												
6.1	Parameters		2										
6.2	Period	1											
6.3	Symmetry			2									
6.4	Vertical distance							4					
7	<b>2D/3D Trig [10]</b>												
7.1	cos-rule					3							
7.2.	Basic geometry	1											
7.3	Pythagoras					3							
7.4	Maxima										3		
8	<b>Geometry [14]</b>												
8.1.1	Alternating angles	1											
8.1.2	Angle at centre		2										
8.1.3	Opp. Angle Cyclic quads		2										
8.1.4	Tangents				4								
8.2	Integrating concepts							5					

Question	Description	KNOWLEDGE			ROUTINE PROCEDURES			COMPLEX PROCEDURES			PROBLEM SOLVING		
		Low	Mod	High	Low	Mod	High	Low	Mod	High	Low	Mod	High
9	<b>Geometry [15]</b>												
9.1	Tan-chord theorem					5							
9.2.1	Ratios	1											
9.2.2	Converse Pythagoras			2									
9.2.3	Prove cyclic quad						3						
9.2.4	Problem										4		
10	<b>Geometry</b>												
10.1.1	Theory	1											
10.1.2.	Theory			1									
10.2.1	Similarity				3								
10.2.2	Proportionality						3						
10.2.3	Ratios						4						
10.2.4	Ratios				3								
10.3	Area ratio							6					
		7	10	13	18	14	23	26	20	0	19	0	0
% Breakdown of cognitive levels		<b>30</b>	<b>20%</b>		<b>55</b>	<b>36,7%</b>		<b>46</b>	<b>30,7%</b>		<b>19</b>	<b>12,7%</b>	
Expected %			<b>20%</b>			<b>35%</b>			<b>30%</b>			<b>15%</b>	