



# basic education

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

## **NATIONAL SENIOR CERTIFICATE**

**GRADE/*GRAAD* 11**

**MATHEMATICS P2/*WISKUNDE V2***

**NOVEMBER 2014**

**MEMORANDUM**

**MARKS/*PUNTE*: 150**

**This memorandum consists of 16 pages.  
*Hierdie memorandum bestaan uit 16 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 memorandum.
- Assuming answers/values in order to solve a problem is NOT acceptable.

**LET WEL:**

- *Indien 'n kandidaat 'n vraag twee keer beantwoord, merk slegs die eerste poging.*
- *Indien 'n kandidaat 'n antwoord doodgetrek het, maar nie oorgedoen het nie, merk die doodgetrekte antwoord.*
- *Volgehoue akkuraatheid geld in ALLE aspekte van die memorandum.*
- *Aanname van antwoorde/waardes om 'n probleem op te los, is ONaanvaarbaar.*

**QUESTION/VRAAG 1**

1.1.1	$\text{IQR (A)} = 30 - 20$ $= 10$	✓ 30 – 20 ✓ 10 (2)
1.1.2	Data of Supermarket A is skewed to the left/ <i>Data van Supermark A is skeef na links.</i> <b>OR</b> Negatively skewed/ <i>negatief skeef</i>	✓ comment/ <i>kommentaar</i> (1)
1.1.3	Range/ <i>Omvang</i> (B) = 35 – 6 = 29	✓ 35 – 6 ✓ 29 (2)
1.1.4	Supermarket A <ul style="list-style-type: none"> <li>• Supermarket A received 25 or more deliveries on more than 7 days whilst Supermarket B received 25 or more deliveries on less than 7 days/ <i>Supermark A het op meer as 7 dae 25 of meer afleverings ontvang terwyl Supermark B op minder as 7 dae soveel afleverings ontvang het.</i></li> </ul>	✓ correct choice/ <i>regte keuse</i> ✓ reason/ <i>rede</i> (2)
1.2	$\bar{x} = 24,5$ $\frac{2x + 293}{14} = 24,5$ $2x + 293 = 343$ $2x = 50$ $x = 25$	✓ $\frac{2x + 293}{14}$ ✓ $2x + 293 = 343$ ✓ 25 (3) <b>[10]</b>

QUESTION/VRAAG 2

2.1	28 days/ <i>dae</i>	✓ answ/ <i>antw</i> (1)														
2.2	12 days $\therefore \frac{12}{28} \times 100$ $= 42,86\%$  Accept/ <i>Aanvaar</i> 12,5 days which is/ <i>dae, wat gelyk is aan</i> 44,64% OR Accept/ <i>Aanvaar</i> 13 days which is/ <i>dae, wat gelyk is aan</i> 46,43%	✓ No. of days/ <i>getal dae</i>  ✓ percentage/ <i>persentasie</i>  (2)														
2.3	<table border="1"><thead><tr><th>Temperature, T, in degrees Celsius</th><th>Frequency</th></tr></thead><tbody><tr><td><math>19 \leq T &lt; 21</math></td><td>2</td></tr><tr><td><math>21 \leq T &lt; 23</math></td><td>6</td></tr><tr><td><math>23 \leq T &lt; 25</math></td><td>9</td></tr><tr><td><math>25 \leq T &lt; 27</math></td><td>5</td></tr><tr><td><math>27 \leq T &lt; 29</math></td><td>4</td></tr><tr><td><math>29 \leq T &lt; 31</math></td><td>2</td></tr></tbody></table>	Temperature, T, in degrees Celsius	Frequency	$19 \leq T < 21$	2	$21 \leq T < 23$	6	$23 \leq T < 25$	9	$25 \leq T < 27$	5	$27 \leq T < 29$	4	$29 \leq T < 31$	2	✓ 2 and/ <i>en</i> 6 ✓ 9 and/ <i>en</i> 5  ✓ 4 and/ <i>en</i> 2  (3)
Temperature, T, in degrees Celsius	Frequency															
$19 \leq T < 21$	2															
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$23 \leq T < 25$	9															
$25 \leq T < 27$	5															
$27 \leq T < 29$	4															
$29 \leq T < 31$	2															
2.4	<p style="text-align: center;"><b>FREQUENCY POLYGON</b></p> <p>Detailed description: A frequency polygon is plotted on a grid. The horizontal axis (x-axis) is labeled 'Average daily temperature (in degrees Celsius)' and ranges from 17 to 35 with major grid lines every 2 units. The vertical axis (y-axis) is labeled 'Frequency' and ranges from 0 to 10 with major grid lines every 1 unit. The polygon is defined by the following vertices: (18, 0), (20, 2), (22, 6), (24, 9), (26, 5), (28, 4), (30, 2), and (32, 0). The points are connected by straight lines.</p>	✓ anchored at / <i>geanker by</i> (18 ; 0) and/ <i>en</i> (32 ; 0) ✓ points at midpoints/ <i>punte by</i> <i>middelpunte</i> ✓ straight lines joining pts/ <i>reguitlyne</i> <i>verbind punte</i> ✓ all points plotted/ <i>alle punte</i> <i>geplot</i>  (4) <b>[10]</b>														

**QUESTION/VRAAG 3**

3.1	$m_{AC} = \frac{12+9}{-9+3}$ $= \frac{21}{-6}$ $= -\frac{7}{2}$	✓ substitution into gradient formula/ <i>subst in gradiënt-formule</i> ✓ $-\frac{7}{2}$ (2)
3.2	$m_{RNS} = m_{AC} = -\frac{7}{2} \quad (\text{parallel lines/parallele lyne})$ $y = -\frac{7}{2}x$	✓ gradients equal/ <i>gradiënte gelyk</i> ✓ equation/vgl (2)
3.3	$NB^2 = (5\sqrt{5})^2$ $(a-9)^2 + (7-9)^2 = 125$ $a^2 - 18a + 81 + 4 - 125 = 0$ $a^2 - 18a - 40 = 0$ $(a-20)(a+2) = 0$ $a \neq 20 \quad \therefore a = -2$	✓ subst into distance formula/ <i>subst in afstandformule</i> ✓ st form/st vorm ✓ factors/faktore ✓ answ/antw (4)
3.4	$\tan \alpha = m_{AC} = -\frac{7}{2}$ $\alpha = 180^\circ - 74,05^\circ$ $= 105,95^\circ$ $\tan \beta = m_{BC} = \frac{3}{2}$ $\beta = 56,31^\circ$ $\therefore \theta = 105,95^\circ - 56,31^\circ$ $= 49,64^\circ$	✓ $\tan \alpha = -\frac{7}{2}$ ✓ $\alpha = 105,95^\circ$  ✓ $\tan \beta = \frac{3}{2}$ ✓ $\beta = 56,31^\circ$  ✓ $\theta = 49,64^\circ$ (5) <b>[13]</b>

**QUESTION/VRAAG 4**

4.1	Perimeter/Omtrek ABCD = $4 \times AD$ (sides of rhombus all equal/sye van ruit almal gelyk) $AD = \sqrt{(3+8)^2 + (9-6)^2}$ $= \sqrt{130}$ <b>OR/OF</b> 11,40 Perimeter/Omtrek = $4\sqrt{130}$ <b>OR/OF</b> 45,61	✓ subst into distance form/ <i>subst in afstandformule</i> ✓ $\sqrt{130}$ <b>OR/OF</b> 11,40 ✓ $4\sqrt{130}$ <b>OR/OF</b> 45,61 (3)
4.2	$m_{BD} = 3$ $m_{AC} \times m_{BD} = -1$ (diagonals of a rhombus/hoeklyne van ruit) $\therefore m_{AC} = -\frac{1}{3}$ $y - y_1 = m(x - x_1)$ $y = mx + c$ $y - 6 = -\frac{1}{3}(x + 8)$ $6 = -\frac{1}{3}(-8) + c$ $y = -\frac{1}{3}x - \frac{8}{3} + \frac{18}{3}$ <b>OR/OF</b> $\frac{10}{3} = c$ $y = -\frac{1}{3}x + \frac{10}{3}$ $y = -\frac{1}{3}x + \frac{10}{3}$	✓ $m_{BD} = 3$ ✓ $m_{AC} = -\frac{1}{3}$ ✓ subst into correct form/subst in korrekte formule ✓ answer/antw (4)
4.3	At/By K: $3x = -\frac{1}{3}x + \frac{10}{3}$ $9x = -x + 10$ $10x = 10$ $x = 1$ $y = 3(1) = 3$ K(1 ; 3) <b>OR/OF</b> $y = 3x$ $x + 3(3x) = 10$ $10x = 10$ $x = 1$ $y = 3(1) = 3$ K(1 ; 3) <b>OR/OF</b> $x = -3y + 10$ $3(-3y + 10) - y = 0$ $-9y + 30 - y = 0$ $-10y = -30$ $y = 3$ $x = -3(3) + 10$ $x = 1$ K(1 ; 3)	✓ equate equations/ <i>stel vgl's gelyk</i> ✓ $x = 1$ ✓ $y = 3$ (3) ✓ subst of/subst van $y = 3x$ into $x + 3y = 10$ ✓ $x = 1$ ✓ $y = 3$ (3) ✓ subst of/subst van $x = -3y + 10$ into $3x - y = 0$ ✓ $y = 3$ ✓ $x = 1$ (3)

4.4	$\frac{x_B + 3}{2} = 1 \qquad \frac{y_B + 9}{2} = 3$ $x_B + 3 = 2 \qquad y_B + 9 = 6$ $x_B = -1 \qquad y_B = -3$ <p>B(-1 ; -3)</p> <p><b>OR/OF</b></p> $x_B = -1 \qquad y_B = -3 \quad (\text{by translation/deur translasie})$ <p>B(-1 ; -3)</p>	<p>✓ x value/waarde ✓ y value/waarde</p> <p>(2)</p> <p>✓ x value/waarde ✓ y value/waarde</p> <p>(2)</p>
4.5	$m_{AB} = \frac{6+3}{-8+1} = -\frac{9}{7}$ $m_{AD} = \frac{9-6}{3+8} = \frac{3}{11}$ $m_{AB} \times m_{AD} \neq -1$ <p>ABCD is not a square/ is nie 'n vierkant ( <math>\hat{B}AD \neq 90^\circ</math> )</p> <p><b>OR/OF</b></p> <p>C(10 ; 0)</p> $BD^2 = (3 - (-1))^2 + (9 - (-3))^2$ $= 160$ $BD = 4\sqrt{10} \quad \text{OR/OF} \quad 12,65$ $AC^2 = (-8 - 10)^2 + (6 - 0)^2$ $= 360$ $AC = 6\sqrt{10} \quad \text{OR/OF} \quad 18,97$ <p>ABCD is not a square/is nie 'n vierkant (BD <math>\neq</math> AC)</p>	<p>✓ subst into gradient formula/subst in gradiëntformule ✓ gradient AB ✓ gradient AD ✓ <math>\neq -1</math> ✓ S/R</p> <p>(5)</p> <p>✓ C(10 ; 0) ✓ subst into distance formula/subst in afstandformule ✓ <math>4\sqrt{10}</math> OR 12,65</p> <p>✓ <math>6\sqrt{10}</math> OR 18,97 ✓ S/R</p> <p>(5)</p> <p>[17]</p>

**QUESTION/VRAAG 5**

5.1.1	$\cos 203^\circ = -\cos 23^\circ$ $= -p$	✓ reduction/herlei ✓ answer/antw (2)
5.1.2	$\sin 293^\circ = -\sin 67^\circ$ $= -\cos 23^\circ$ $= -p$	✓ reduction/herlei ✓ co-ratio/ko-verh ✓ answ/antw ito/v p (3)
5.2	$\frac{\sin(360^\circ - x) \cdot \tan(-x)}{\cos(180^\circ + x) \cdot (\sin^2 A + \cos^2 A)}$ $= \frac{(-\sin x)(-\tan x)}{(-\cos x)(1)}$ $= \frac{(-\sin x)\left(-\frac{\sin x}{\cos x}\right)}{-\cos x}$ $= -\frac{\sin^2 x}{\cos^2 x}$ $= -\tan^2 x$	✓ $-\sin x$ ✓ $-\tan x$ ✓ $-\cos x$ ✓ 1 ✓ $\left(-\frac{\sin x}{\cos x}\right)$ ✓ $-\tan^2 x$ (6)
5.3.1	$\text{LHS} = \frac{\cos^2 x + (1 + \sin x)^2}{(1 + \sin x) \cdot \cos x}$ $= \frac{\cos^2 x + 1 + 2\sin x + \sin^2 x}{(1 + \sin x) \cdot \cos x}$ $= \frac{1 + 1 + 2\sin x}{(1 + \sin x) \cdot \cos x}$ $= \frac{2(1 + \sin x)}{(1 + \sin x) \cdot \cos x}$ $= \frac{2}{\cos x}$ $= \text{RHS}$	✓ numerator/teller ✓ denominator/ <i>noemer</i> ✓ multiplication/ <i>vermenigvuldiging</i> ✓ identity/identiteit ✓ fact/faktor numerator/teller (5)
5.3.2	Undefined if/ongedefinieerd as: $\sin x = -1$ or $\cos x = 0$ $\therefore x = 90^\circ ; 270^\circ$	✓ $90^\circ$ ✓ $270^\circ$ (2)
5.4	$\sin 2x = 4 \cos 2x$ $\tan 2x = 4$ $2x = 75,96^\circ + k \cdot 180^\circ$ $x = 37,98^\circ + k \cdot 90^\circ ; k \in Z$	✓ $\tan 2x = 4$ ✓ $75,96^\circ$ ✓ $37,98^\circ$ ✓ $k \cdot 90^\circ$ ✓ $k \in Z$ (5)

5.5.1	$x^2 + y^2 = r^2$ $x^2 + (\sqrt{3})^2 = 2^2$ $x^2 = 1$ $x = \pm 1$ $x = 1 \quad (\text{since P lies in the 1}^{\text{st}} \text{ quadrant/aangesien P in die 1}^{\text{ste}} \text{ kwadrant lê})$	<p>✓ subst</p> <p>✓ <math>x = 1</math></p> <p>(2)</p>
5.5.2	$\sin \hat{PÔT} = \frac{\sqrt{3}}{2}$ $\hat{PÔT} = 60^\circ$ $\hat{PÔT} + \alpha = 90^\circ$ $\alpha = 90^\circ - 60^\circ$ $= 30^\circ$	<p>✓ correct ratio/ korrekte verh</p> <p>✓ <math>60^\circ</math></p> <p>✓ answer/antw</p> <p>(3)</p>
5.5.3	$\sin(-30^\circ) = \frac{b}{20}$ $b = 20 \sin(-30^\circ)$ $b = -10$ $\cos(-30^\circ) = \frac{a}{20}$ $a = 20 \cos(-30^\circ)$ $a = 10\sqrt{3} \quad \text{OR/OF} \quad 17,32$ $Q(10\sqrt{3}; -10) \quad \text{OR/OF} \quad Q(17,32; -10)$ <p><b>OR/OF</b></p> $OQ^2 = 400$ $a^2 + b^2 = 400$ $PQ^2 = 2^2 + 20^2$ $PQ^2 = 404$ $(a-1)^2 + (b-\sqrt{3})^2 = 404$ $a^2 - 2a + 1 + b^2 - 2\sqrt{3}b + 3 = 404$ $400 - 2a + 4 - 2\sqrt{3}b = 404$ $2a = -2\sqrt{3}b$ $a = -\sqrt{3}b$ $(-\sqrt{3}b)^2 + b^2 = 400$ $4b^2 = 400$ $b^2 = 100$ $b = -10 \quad (b < 0)$ $a = -\sqrt{3}(-10)$ $a = 10\sqrt{3}$ $\therefore Q(10\sqrt{3}; -10)$	<p>✓ correct ratio/ korrekte verh</p> <p>✓ <math>b = 20 \sin(-30^\circ)</math></p> <p>✓ <math>b = -10</math></p> <p>✓ correct ratio/ korrekte verh</p> <p>✓ <math>a = 10\sqrt{3} \quad \text{OR} 17,32</math></p> <p>(5)</p> <p>✓ subst into distance formula/subst in afstandformule</p> <p>✓ subst into distance formula/subst in afstandformule</p> <p>✓ <math>a = -\sqrt{3}b</math></p> <p>✓ <math>b = -10</math></p> <p>✓ <math>a = 10\sqrt{3} \quad \text{OR} 17,32</math></p> <p>(5)</p> <p><b>[33]</b></p>



**QUESTION/VRAAG 6**

6.1	$a = 1$ $b = 2$ $p = 45^\circ$	✓ $a = 1$ ✓ $b = 2$ ✓ $p = 45^\circ$ (3)
6.2	$x \in (-90^\circ; 0^\circ)$  <b>OR/OF</b>  $-90^\circ < x < 0^\circ$  <b>OR/OF</b>  between $-90^\circ$ and $0^\circ$ / <i>tussen <math>-90^\circ</math> en <math>0^\circ</math></i>	✓ extreme values/ <i>uiterste waardes</i> ✓ correct notation/ <i>korrekte notasie</i> (2) ✓ extreme values/ <i>uiterste waardes</i> ✓ correct notation/ <i>korrekte notasie</i> (2) ✓ extreme values/ <i>uiterste waardes</i> ✓ correct notation/ <i>korrekte notasie</i> (2)
6.3	$f(2x) = \cos 2(2x) = \cos 4x$ $\therefore$ period/periode = $90^\circ$	✓ $\cos 4x$ ✓ $90^\circ$ (2)
6.4	$h(x) = 3 \cos 2x - 1$ Minimum value/waarde = $-4$	✓ ✓ $-4$ (2)
6.5	move $45^\circ$ to the left and then reflect about the $x$ -axis/ <i>skui <math>45^\circ</math> na links en reflekteer dan om die <math>x</math>-as</i>  <b>OR/OF</b>  The graph of $g$ must be moved $135^\circ$ to the right/ <i>Die grafiek van <math>g</math> moet <math>135^\circ</math> na regs beweeg.</i>	✓ $45^\circ$ left/ <i>links</i> ✓ reflection $x$ -axis/ <i>refleksie om <math>x</math>-as</i>  ✓ ✓ $135^\circ$ right/ <i>regs</i> (2)

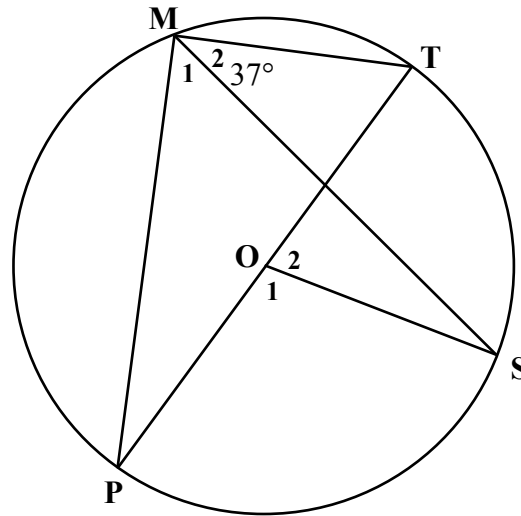
**[11]**

**QUESTION/VRAAG 7**

7.1.1	$\hat{A}CB = 180^\circ - 150^\circ = 30^\circ$ $\frac{AB}{\sin 30^\circ} = \frac{6}{\sin 110^\circ}$ $AB = 3,19m$	✓ $30^\circ$ ✓ subst into sine rule/ <i>subst in sin-reël</i> ✓ $AB = 3,19$ (3)
7.1.2	Area $\Delta ABC$ : $= \frac{1}{2} \cdot AB \cdot BC \cdot \sin B$ $= \frac{1}{2} \times 3,19 \times 6 \times \sin 40^\circ$ $= 6,15m^2$	✓ subst into correct form/ <i>subst in</i> <i>korrekte formule</i> ✓ 6,15 (2)
7.1.3	Volume of pyramid = $\frac{1}{3}$ area of base $\times$ $\perp$ height $= \frac{1}{3} \times 6,15 \times 8$ $= 16,4m^3$	✓ correct formula/ <i>korrekte formule</i> ✓ subst ✓ answer/ <i>antw</i> (3)
7.2	radius of base/ <i>radius van basis</i> : $\frac{r}{h} = \tan 36^\circ$ $r = 2 \tan 36^\circ = 1,45m$ slant height/ <i>skuinshoogte</i> : $\frac{S}{h} = \frac{1}{\cos 36^\circ}$ $S = \frac{2}{\cos 36^\circ} = 2,47m$ $SA = \pi(2 \tan 36^\circ)^2 + \pi(2 \tan 36^\circ) \left( \frac{2}{\cos 36^\circ} \right)$ $= 17,92 m^2$ <b>OR/OF</b> Surface area of cone = area of base + area of curved surface <i>buite-opp van keël = opp van basis + opp van geboë opp</i> $= \pi r^2 + \pi r S$ $= \pi(1,45)^2 + \pi(1,45)(2,47)$ $= 17,86m^2$	✓ $\frac{r}{h} = \tan 36^\circ$ ✓ $r = 2 \tan 36^\circ = 1,45$  ✓ $\frac{l}{h} = \frac{1}{\cos 36^\circ}$ ✓ $S = \frac{2}{\cos 36^\circ} = 2,47$ ✓ subst into correct form/ <i>subst in</i> <i>korrekte formule</i> ✓ answer/ <i>antw</i>  ✓ subst into correct form/ <i>subst in</i> <i>korrekte formule</i> ✓ answer/ <i>antw</i> (6) <b>[14]</b>

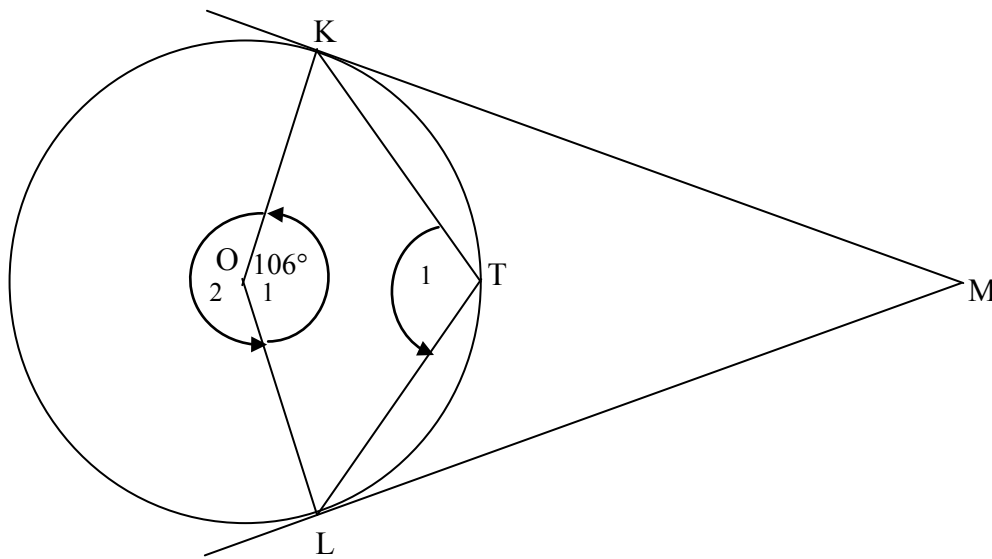
**QUESTION/VRAAG 8**

8.1



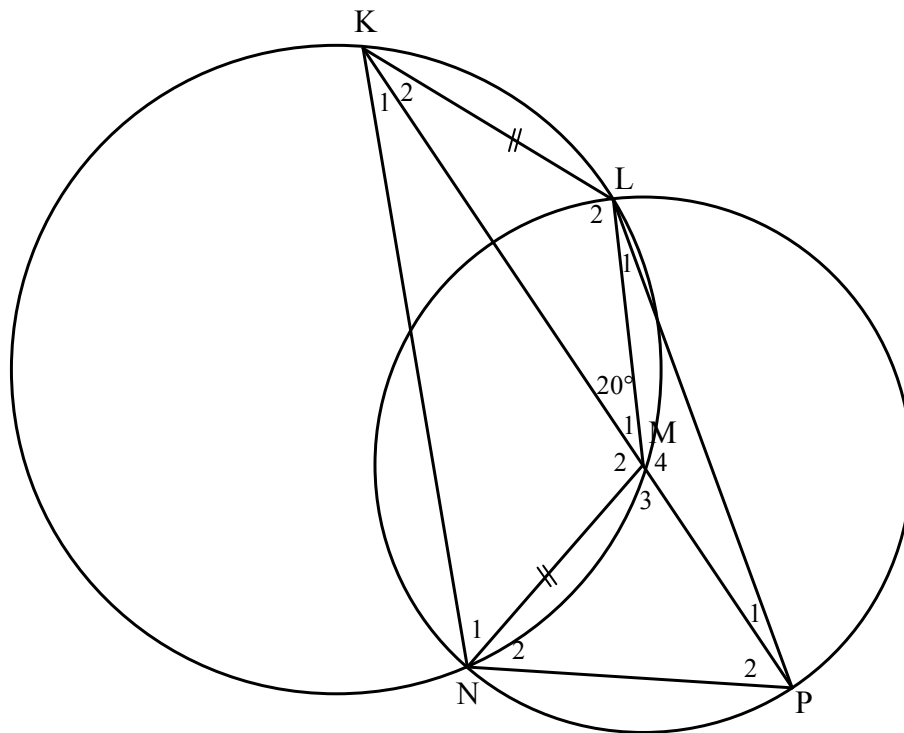
8.1.1	$\hat{M}_1 + \hat{M}_2 = 90^\circ$ ( $\angle$ in semi circle/ $\angle$ in halfsirkel <b>or/of</b> diameter subtends right $\angle$ /midlyn onderspan regte $\angle$ / <b>or/of</b> $\angle \frac{1}{2} \odot$ )  $\hat{M}_1 = 53^\circ$  <b>OR/OF</b>  $\hat{O}_2 = 74^\circ$ ( $\angle$ at centre/midpt = $2 \times \angle$ at circum/by omtrek) $\hat{O}_1 = 106^\circ$ ( $\angle$ s on a str line/ $\angle$ e op reguitlyn) $\hat{M}_1 = 53^\circ$ ( $\angle$ at centre/midpt = $2 \times \angle$ at circum/by omtrek)	✓ S/R  ✓ S  ✓ S/R  ✓ S  (2)
8.1.2	$\hat{O}_1 = 2 \times \hat{M}_1$ ( $\angle$ at centre/midpt = $2 \times \angle$ at circum/by omtrek) $\hat{O}_1 = 106^\circ$  <b>OR/OF</b>  $\hat{O}_2 = 74^\circ$ ( $\angle$ at centre/midpt = $2 \times \angle$ at circum/by omtrek) $\hat{O}_1 = 106^\circ$ ( $\angle$ s on a str line/ $\angle$ e op reguitlyn)	✓ S/R ✓ S  ✓ S/R ✓ S  (2)

8.2



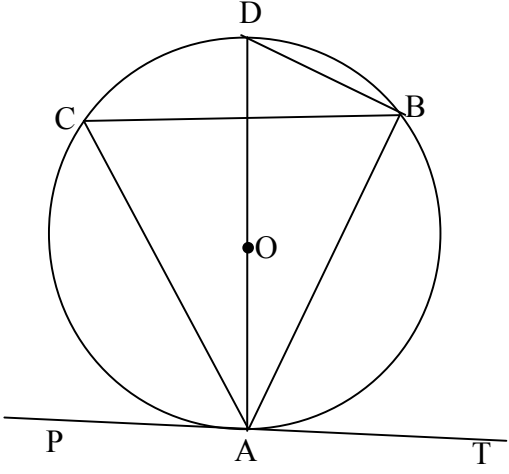
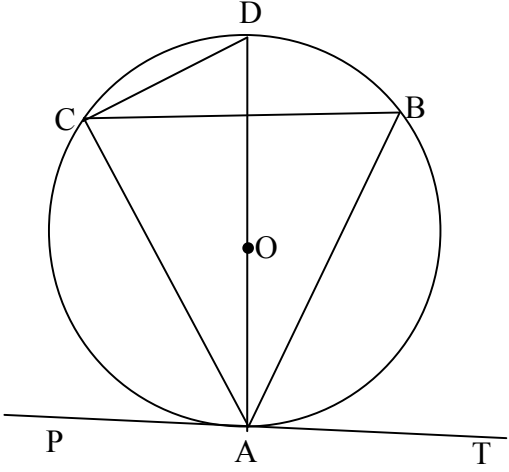
8.2.1	$\hat{O}_2 = 360^\circ - 106^\circ = 254^\circ$ ( $\angle$ s round a pt <b>or</b> $\angle$ s in a rev) ( $\angle$ e om 'n pt <b>of</b> $\angle$ e omw) $\hat{T}_1 = \frac{1}{2} \times \hat{O}_2$ ( $\angle$ at centre/midpt = $2 \times \angle$ at circum/by omtrek) $= 127^\circ$	✓ S ✓ S ✓ R (3)
8.2.2	$KO = OL$ (radii equal/radiusse gelyk) $KM = ML$ (Tans from common/same pt/rklyne van dies pt) $\therefore KOLM$ is a kite (adj sides of quad are =/aangr sye v vh =)	✓ S ✓ S/R ✓ S/R (3)
8.2.3	$\hat{O}\hat{K}M = 90^\circ$ (tan/rkl $\perp$ radius <b>or/of</b> tan/rkl $\perp$ diam/midlyn) $\hat{O}\hat{L}M = 90^\circ$ (tan/rkl $\perp$ radius <b>or/of</b> tan/rkl $\perp$ diam/midlyn) $\hat{O}\hat{K}M + \hat{O}\hat{L}M = 180^\circ$ $OKML = \text{cyc quad/kdvh}$ (opp $\angle$ s quad supp <b>or</b> converse opp $\angle$ s of cyclic quad)/ (tos $\angle$ e vierh supp <b>of</b> omgek tos $\angle$ e van kdvh)	✓ S/R ✓ S ✓ R (3)
8.2.4	$\hat{M} + \hat{O}_1 = 180^\circ$ (opp $\angle$ s of cyclic quad/tos $\angle$ e van kdvh) $\hat{M} = 74^\circ$	✓ R ✓ S (2) <b>[15]</b>

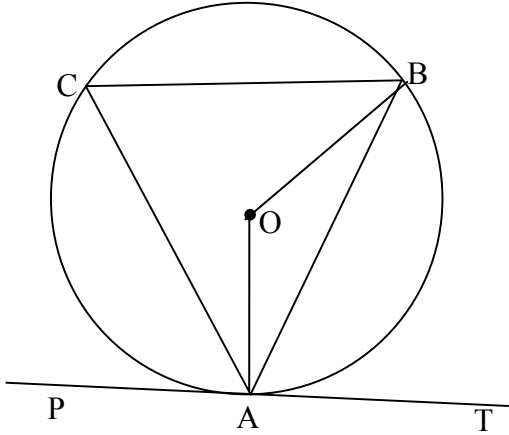
**QUESTION/VRAAG 9**



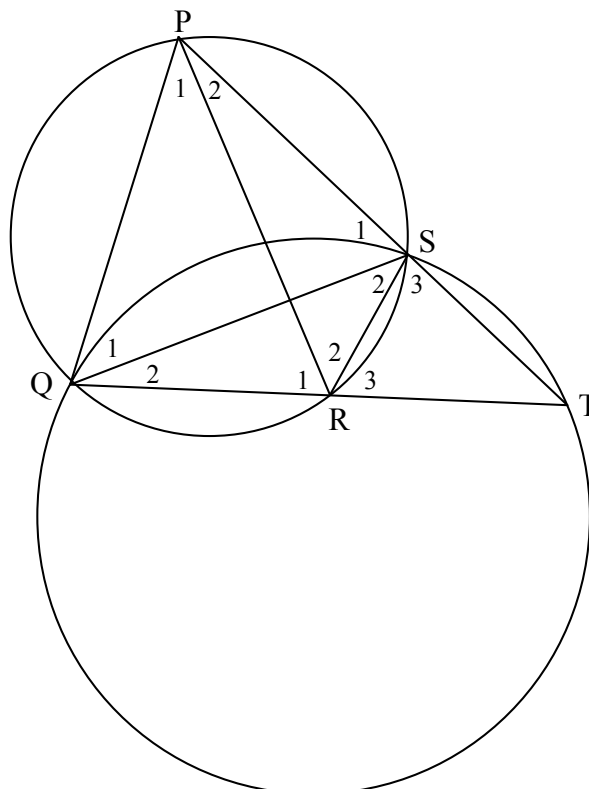
9.1	$\widehat{NKM} = \widehat{K}_1 = 20^\circ$ (equal chords; equal $\angle$ s) <i>(gelyke koorde; gelyke <math>\angle</math>e)</i>	✓ S ✓ R	(2)
9.2	Alternate $\angle$ s are equal/ <i>verwiss <math>\angle</math>e gelyk</i>	✓ R	(1)
9.3	$NM = LM$ (radii) $NM = KL$ (given/ <i>gegee</i> ) $\therefore KL = LM$	✓ S ✓ S	(2)
9.4.1	$\widehat{MKL} = \widehat{K}_2 = 20^\circ$ ( $\angle$ s/e opp equal sides/ <i>to gelyke sye</i> ) $\widehat{KLM} = \widehat{L}_2 = 140^\circ$ ( $\angle$ s sum in $\Delta$ / $\angle$ e som in $\Delta$ ) $\widehat{KNM} = \widehat{N}_1 = 180^\circ - 140^\circ = 40^\circ$ (opp $\angle$ s of cyclic quad/ <i>tos <math>\angle</math>e van kdvh</i> )	✓ S/R ✓ S ✓ S ✓ R	(4)
9.4.2	$\widehat{KMN} = \widehat{M}_2 = 180^\circ - (20^\circ + 40^\circ) = 120^\circ$ ( $\angle$ s sum in $\Delta$ / $\angle$ e som in $\Delta$ ) $\widehat{LMN} = \widehat{M}_1 + \widehat{M}_2 = 20^\circ + 120^\circ = 140^\circ$ $\widehat{LPN} = \widehat{P}_1 + \widehat{P}_2 = 70^\circ$ ( $\angle$ at centre = $2 \times \angle$ at circumference) <i>(<math>\angle</math> by midpt = <math>2 \times \angle</math> by omtrek)</i>	✓ S  ✓ S ✓ R	(3) <b>[12]</b>

**QUESTION/VRAAG 10**

<p>10.1</p>	<p>Construction: Draw diameter AD and join DB.  <i>Konstruksie: Trek middellyn AD en verbind DB</i></p>  <p>Proof/Bewys:</p> <p><math>\hat{B}A\hat{T} + \hat{D}A\hat{B} = 90^\circ</math> (tangent/rklyn <math>\perp</math> radius)  <math>\hat{D}\hat{B}C + \hat{C}\hat{B}A = 90^\circ</math> (<math>\angle</math> in semi circle/halfsirkel)  <math>\hat{D}\hat{A}\hat{B} + \hat{A}\hat{D}\hat{B} = 90^\circ</math> (<math>\angle</math>s/e of/van <math>\Delta</math>)  <math>\hat{B}A\hat{T} = \hat{A}\hat{D}\hat{B}</math>  <math>\hat{B}\hat{C}A = \hat{A}\hat{D}\hat{B}</math> (<math>\angle</math>s in same segment/<math>\angle</math>e in dies segment)  <math>\hat{B}A\hat{T} = \hat{B}\hat{C}A</math></p> <p><b>OR/OF</b></p> <p>Construct diameter AD and join DC.  <i>Konstrueer middellyn AD en verbind DC.</i></p>  <p>Proof/Bewys:</p> <p><math>\hat{B}A\hat{T} + \hat{D}A\hat{B} = 90^\circ</math> (tangent/rklyn <math>\perp</math> radius)  <math>\hat{D}\hat{C}B + \hat{B}\hat{C}A = 90^\circ</math> (<math>\angle</math> in semi circle/halfsirkel)  <math>\hat{B}\hat{C}A = 90^\circ - \hat{D}\hat{C}B</math>  <math>\hat{D}\hat{A}\hat{B} = 90^\circ - \hat{B}A\hat{T}</math>  <math>\hat{D}\hat{C}B = \hat{D}\hat{A}\hat{B}</math> (<math>\angle</math>s in same segment/<math>\angle</math>e in dies segment)  <math>\hat{B}A\hat{T} = \hat{B}\hat{C}A</math></p>	<p>✓ construction/  <i>konstruksie</i></p> <p>✓ S ✓ R          ✓ S ✓ R</p> <p>✓ S/R</p> <p>(6)</p> <p>✓ construction/  <i>konstruksie</i></p> <p>✓ S ✓ R          ✓ S ✓ R</p> <p>✓ S/R</p> <p>(6)</p>
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<p><b>OR/OF</b></p> <p>Construction: Draw radii OA and OB.  <i>Konstruksie:</i> Trek radiusse OA en OB.</p>  <p>Proof/Bewys:</p> <p><math>\widehat{OAB} + \widehat{BAT} = 90^\circ</math> (tangent/rklyn <math>\perp</math> radius) ✓ S ✓ R</p> <p><math>\widehat{OAB} = 90^\circ - \widehat{BAT}</math></p> <p><math>\widehat{OBA} = 90^\circ - \widehat{BAT}</math> (<math>\angle</math>s opp = sides/<math>\angle</math>e to = sye) ✓ S</p> <p><math>\widehat{AOB} = 180^\circ - 2(90^\circ - \widehat{BAT})</math> (<math>\angle</math>s/e of/van <math>\Delta</math>)</p> <p><math>\widehat{AOB} = 2\widehat{BAT}</math></p> <p><math>\widehat{AOB} = 2\widehat{C}</math> (<math>\angle</math> at centre = <math>2 \times \angle</math> at circumference/</p> <p><math>\widehat{BAT} = \widehat{BCA}</math> (<math>\angle</math> by midpt = <math>2 \times \angle</math> by omtrek)</p> <p>(6)</p>	<p>✓ construction/  <i>konstruksie</i></p>
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10.2



10.2.1(a)	Tan chord theorem/ <i>rklyn-koordstelling</i>	✓ R (1)
10.2.1(b)	$\angle s$ in same segment/ $\angle e$ in <i>dieselfde segment</i>	✓ R (1)
10.2.2	$\hat{R}_1 = \hat{P}_2 + \hat{T}$ (ext $\angle$ of $\Delta$ / <i>buite <math>\angle</math> v <math>\Delta</math>)  <math>\hat{P}_2 = \hat{Q}_2</math> (from/<i>vanaf</i> 10.2.1(b))  <math>\hat{Q}_1 = \hat{T}</math> (from/<i>vanaf</i> 10.2.1(a))  <math>\therefore \hat{Q}_1 + \hat{Q}_2 = \hat{P}_2 + \hat{T}</math>  <math>\therefore \hat{Q}_1 + \hat{Q}_2 = \hat{R}_1</math>  <math>\therefore PQ = PR</math> (sides opp = <math>\angle s</math>/sye to = <math>\angle e</math>)  <math>\therefore \Delta PQR =</math> isosceles triangle/<i>gelykbenige driehoek</i> </i>	✓ S  ✓ S ✓ S/R (4)
10.2.3	$\hat{R}_2 = \hat{Q}_1$ ( $\angle s$ in same segment/ $\angle e$ in <i>dies segment</i> ) $\hat{T} = \hat{Q}_1$ (from/ <i>vanaf</i> 10.2.1(a)) $\hat{R}_2 = \hat{T}$ PR is a tangent to circle RST at R (converse tan chord th) <i>PR is 'n rklyn aan sirkel RST by R (omgekeerde rkl-kdst)</i>  <b>OR/OF</b>  $\hat{P}_1 = 180^\circ - (\hat{Q}_1 + \hat{Q}_2 + \hat{R}_1)$ ( $\angle s/e$ of/ <i>van</i> $\Delta$ ) $\hat{R}_2 = \hat{Q}_1$ ( $\angle s$ in same segment/ $\angle e$ in <i>dies segment</i> ) $\hat{Q}_1 = \hat{T}$ (from/ <i>vanaf</i> 10.2.1(a)) $\therefore \hat{R}_2 = \hat{T}$	✓ S/R  ✓ S ✓ R (3)  ✓ S ✓ S/R ✓ R (3)

TOTAL/TOTAAL: 150