LIMPOPO

PROVINCIAL GOVERNMENT

REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF

# EDUCATION

NATIONAL SENIOR CERTIFICATE/

*NASIONALE SENIOR SERTIFIKAAT*

GRADE 12/*GRAAD 12*

MATHEMATICS P2/*WISKUNDE V2*

SEPTEMBER 2026/*SEPTEMBER 2026*

MARKING GUIDELINES/*NASIENRIGLYNE*

**MARKS/*PUNTE*: 150**

**This marking guidelines consists of 18 pages/*Hierdie nasienriglyne bestaan uit 18 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 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.*

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

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**QUESTION/*VRAAG* 1**

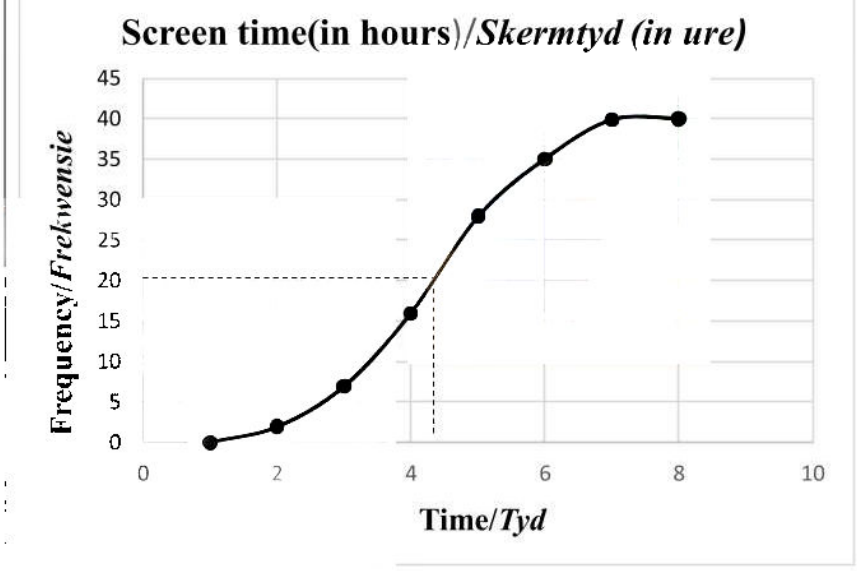
**1.1**

| Screen time (hours) | Frequency | Cumulative Frequency |
|---|---|---|
| $0 < x \leq 1$ | 0 | 0 |
| $1 < x \leq 2$ | 2 | 2 |
| $2 < x \leq 3$ | 5 | 7 |
| $3 < x \leq 4$ | 9 | 16 |
| $4 < x \leq 5$ | 12 | 28 |
| $5 < x \leq 6$ | 7 | 35 |
| $6 < x \leq 7$ | 5 | 40 |
| $7 < x \leq 8$ | 0 | 40 |

✓16

✓40 (2)

**1.2**




✓grounding/*anker*

✓using cumulative values/*gebruik van kumulatiewe waardes* (2)

**1.3**

$Q_2 = 4,3$

Accept/*aanvaar* 4,2 to 4,4

✓ answer/*antwoord* (1)

**1.4**

$\bar{x} < Q_2$

Data skew to left/*Data is skeef na links*

✓ $\bar{x} < Q_2$

✓conclusion/ *gevolgtrekking* (2)

**1.5**

$$\text{new/}nuwe\ \bar{x} = \frac{(1,5\times 2)+(2,5\times 5)+(3,5\times 33)}{40}$$

$$= \frac{131}{40}$$

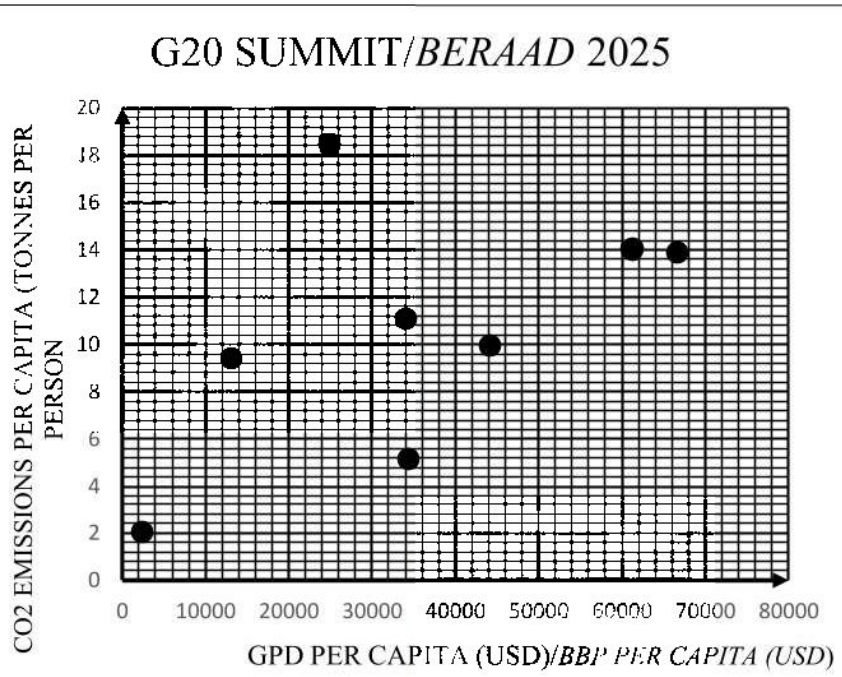
$$= 3,275$$

✓131

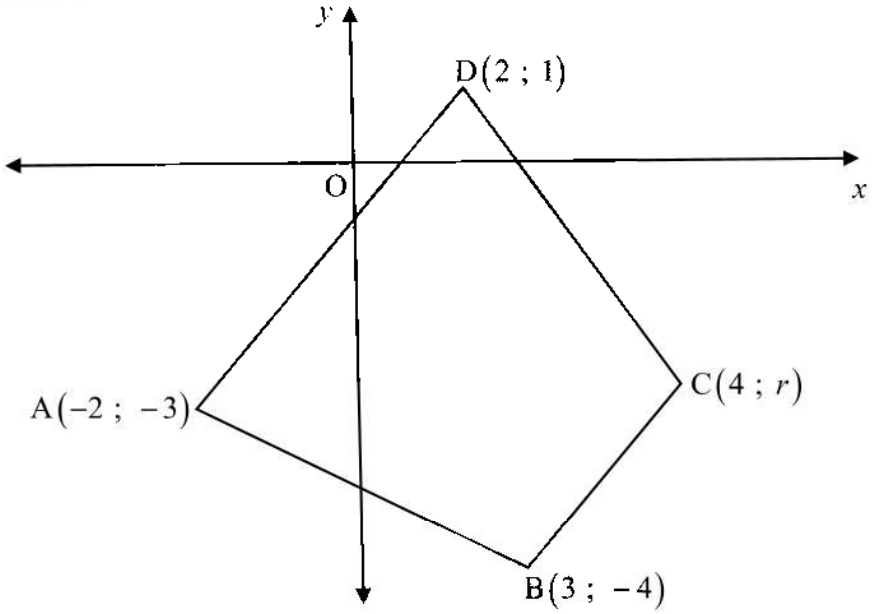
✓answer/*antwoord* (2)

**[9]**

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| **QUESTION/*VRAAG* 2** | | |
|---|---|---|
| 2.1 |  | ✓4 points correct/*4 punte korrek*<br>✓all points correct/*alle punte korrek*<br>(2) |
| 2.2 | $a = 6,1289$<br>$b = 0,0001$<br>$y = 6,1289 + 0,0001x$ | ✓value/*waarde a*<br>✓value/*waarde b*<br>✓equation/*vergelyking*<br>(3) |
| 2.3 | $r = 0,47$ | ✓answer/*antwoord*<br>(1) |
| 2.4 | Moderate correlation/*Matige korrelasie* | ✓answer/*antwoord*<br>(1) |
| 2.5 | $y = 6,1289 + 0,0001(40000)$<br>$y = 10,1289$ | ✓subst/*vervang*<br>✓answer/*antwoord*<br>(2) |
| 2.6 | No, some countries are more developed than others and that can influence the Gross Domestic Product (GDP) per capita<br>Or some countries are more densely populated than others.<br>*Nee, sommige lande is meer ontwikkel as ander en dit kan die Bruto Binnelandse Produk (BBP) per capita beïnvloed*<br>*Of sommige lande is digter bevolk as ander.* | ✓answer/*antwoord*<br>(1) |
| | | **[10]** |

**QUESTION/*VRAAG* 3**




| | | |
|---|---|---|
| 3.1 | $x_M = \frac{-2+2}{2}$ $\quad y_M = \frac{-3+1}{2}$<br>$x_M = 0$ $\quad y_M = -1$ | ✓value $x$ /*waarde* $x$<br>✓value $y$ /*waarde* $y$<br>(2) |
| 3.2 | $y - y_1 = m(x - x_1)$ $\quad m(BP) = \frac{-4-(-1)}{3-0} = -1$<br>$y-(-4) = -1(x-3)$ or/*of* $y-(-1) = -1(x-0)$<br>$y+4 = -x+3$ $\quad y+1 = -x$<br>$y = -x-1$ $\quad y = -x-1$ | ✓$m(AP)$<br>✓subst in formula/*vervang in formule*<br>✓answer/*antwoord*<br>(3) |
| 3.3 | $m(AD) = \frac{-3-1}{-2-2} = 1$<br>$m(AD) \times m(BP)$<br>$= 1 \times -1$<br>$= -1$<br>$\therefore BP \perp AD$ | ✓$m(AD)$<br>✓subst in formula/*vervang in formule*<br>(2) |
| 3.4 | $m(AD) = m(BC)$<br>$1 = \frac{-4-r}{3-4}$<br>$-1 = -4-r$<br>$r = -3$ | ✓$m(BC)$<br>✓equate gradients/*gelykstel*<br>✓ answer/*antwoord*<br>(3) |

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| | | |
|---|---|---|
| 3.5 | $\tan\theta = m(\text{BD})$<br>$\tan\theta = \frac{-4-1}{3-2}$<br>$\tan\theta = -5$<br>$\theta = 180° - 78,69°$<br>$\theta = 101,31°$ | ✓subst in formula/ *vervang in formule*<br>✓ $-5$<br>✓ $180° - 78,69°$<br>✓answer/*antwoord*<br>(4) |
| 3.6 | AC: $y = -3$ .....①<br>BD: $y - y_1 = m(x - x_1)$ $m(\text{BD}) = -5$<br>$y-(-4) = -5(x-3)$ or/*of* $y-1 = -5(x-2)$<br>$y+4 = -5x+15$ $y-1 = -5x+10$<br>$y = -5x+11$ $y = -5x+11$ .....②<br>Subst ① into ②: $-3 = -5x+11$<br>$5x = 14$<br>$x = \frac{14}{5}$<br>$\text{S}\left(\frac{14}{5}\ ;\ -3\right)$ | ✓equation AC/*vergelyking AC*<br>✓ $m(\text{BD})$<br>✓ equation BD/*vergelyking BD*<br>✓equating/*gelykstel*<br>✓ value $x$/*waarde* $x$<br>(5) |
| 3.7 | $\text{AB} = \sqrt{(-2-3)^2+(-3-(-4))^2}$<br>$= \sqrt{26}$<br>$\text{BD} = \sqrt{(3-2)^2+(-4-1)^2} = \sqrt{26}$<br>AB = BD<br>$\therefore \Delta$ABD is isosceles/*gelykbenig* | ✓subst in distance formula/ *vervang in afstand formule*<br>✓length AB/*lengte AB*<br>✓length BD/*lengte BD*<br>✓conclusion/*gevolgtrekking*<br>(4) |
| 3.8 | Trapezium one pair of sides parallel<br>*Trapesium een paar sye ewewydig* | ✓answer/*antwoord*<br>✓reason/*rede*<br>(2) |
| | | **[25]** |

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| **QUESTION/*VRAAG* 4** | | |
|---|---|---|
| 4.1 | $\tan \hat{P} = \frac{1}{3}$<br>$\hat{P} = 18,43°$<br>$Q\hat{P}V = 18,43° - 4,4°$<br>$Q\hat{P}V = 14,03°$ | ✓subst in tan def/*vervang in tan def*<br>✓size $\hat{P}$ /*grootte* $\hat{P}$<br>✓$18,43° - 4,4°$<br>✓$14,03°$<br>(4) |
| 4.2 | $\hat{Q} = 90°$ rad $\perp$ tan<br>In $\Delta PQV$: $\tan 14,03° = \frac{QV}{8\sqrt{10}}$<br>$QV = 6,32$<br>$\therefore$ rad $= 6,32$ | ✓state $90°$ /*stel* $90°$<br>✓tan def/*vervang in tan def*<br>✓radius<br>(3) |
| 4.3 | $(x-a)^2 + (y-b)^2 = r^2$ through/*deur* $(0\ ;\ 0)$<br>$(0-6)^2 + (0-b)^2 = (6,32)^2$<br>$36 + b^2 = 39,9424$<br>$b^2 = 3,9424$<br>$b = 2$<br>Centre/*midpunt* $(6\ ;\ 2)$ | ✓ $a$ – value/ $a$ – waarde<br>✓substitution (0, 0) /*vervang*<br>✓subst radius/*vervang rad*<br>✓ $b$ – value/ $b$ – waarde<br>(4) |
| 4.4 | $S(-16\ ;\ -2)$ | ✓ value $x$ /*waarde* $x$<br>✓ value $y$ /*waarde* $y$<br>(2) |
| | | **[13]** |

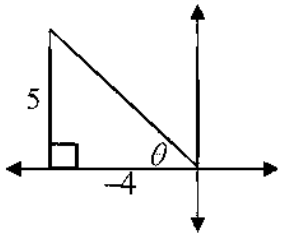
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**QUESTION/*VRAAG* 5**

**5.1.1**

$\tan\theta = -\frac{5}{4}$

$r = \sqrt{41}$




$\sin(180° + \theta)$

$= -\sin\theta$

$= \frac{5}{\sqrt{41}}$

✓value r/*waarde r*

✓reduction/*reduksie*

✓answer/*antwoord*

(3)

**5.1.2**

$\sqrt{41}\cos\theta - 4\sin(-150°).\cos 180°$

$= \sqrt{41}\cos\theta + 4\sin 150°(-1)$

$= \sqrt{41}\cos\theta + 4(\sin 30°)(-1)$

$= \sqrt{41}\left(-\frac{4}{\sqrt{41}}\right) + 4\left(\frac{1}{2}\right)(-1)$

$= -4 - 2$

$= -6$

✓ $\sin 30°$

✓ $\frac{1}{2}$ and/*en* $-1$ ✓ $-\frac{4}{\sqrt{41}}$

✓answer/*antwoord*

(4)

**5.2**

$a \in [-1\ ;\ 1]$

✓answer/*antwoord*

(1)

**5.3.1**

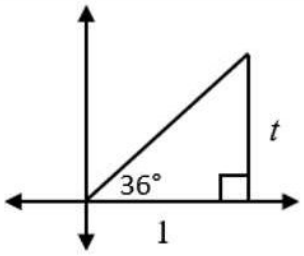
$r = \sqrt{t^2 + 1}$

$\frac{1}{\sin 306°}$

$= \frac{1}{-\sin 54°}$

$= 1 \div -\left(\frac{1}{\sqrt{t^2+1}}\right)$

$= -\sqrt{t^2 + 1}$




✓ $-\sin 54°$

✓substitution/*vervanging*

✓answer/*antwoord*

(3)

**OR/*OF***

$= \frac{1}{-\sin 54°}$

$= \frac{1}{-\cos 36°}$

$= 1 \div -\left(\frac{1}{\sqrt{t^2+1}}\right)$

$= -\sqrt{t^2 + 1}$

✓ $-\sin 54°$

✓substitution/*vervanging*

✓answer/*antwoord*

(3)

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| | | |
|---|---|---|
| 5.3.2 | $\tan 81°$<br>$= \dfrac{\sin 81°}{\cos 81°}$<br>$= \dfrac{\sin(45° + 36°)}{\cos(45° + 36°)}$<br>$= \dfrac{\sin 45°\cos 36° + \cos 45°\sin 36°}{\cos 45°\cos 36° - \sin 45°\sin 36°}$<br>$= \dfrac{\left(\frac{\sqrt{2}}{2}\right)\left(\frac{1}{\sqrt{t^2+1}}\right) + \left(\frac{\sqrt{2}}{2}\right)\left(\frac{t}{\sqrt{t^2+1}}\right)}{\left(\frac{\sqrt{2}}{2}\right)\left(\frac{1}{\sqrt{t^2+1}}\right) - \left(\frac{\sqrt{2}}{2}\right)\left(\frac{t}{\sqrt{t^2+1}}\right)}$<br>$= \dfrac{\left(\frac{\sqrt{2}}{2}\right)\left(\frac{1}{\sqrt{t^2+1}}\right)(1+t)}{\left(\frac{\sqrt{2}}{2}\right)\left(\frac{1}{\sqrt{t^2+1}}\right)(1-t)}$ | ✓quotient identity/*kwosiënt identiteit*<br>✓ $45° + 36°$<br>✓expansion/*uitbreiding*<br>✓substitution numerator/ *vervanging teller*<br>✓substitution denominator/ *vervanging noemer*<br>(5) |
| | | **[15]** |

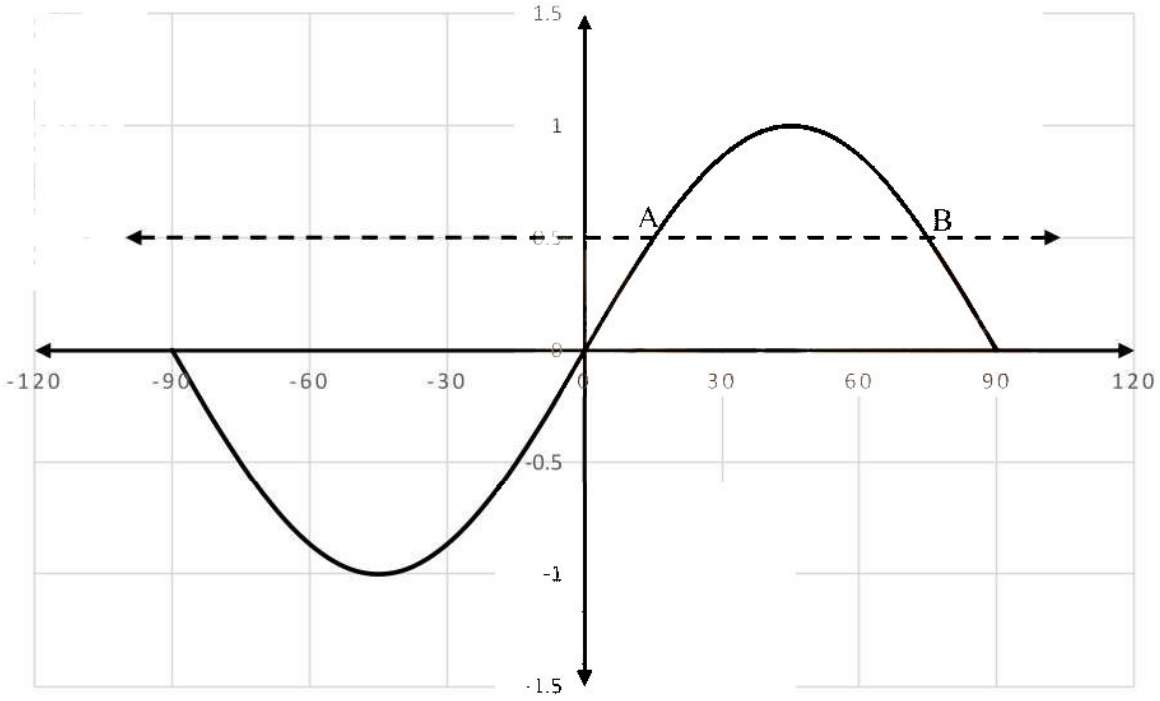
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| **QUESTION/*VRAAG* 6** | | |
|---|---|---|
| 6.1.1 | $\text{LHS} = 2\cos\theta.\cos 2\theta + \dfrac{\sin^2 2\theta}{\cos\theta}$<br>$\text{LHS} = 2\cos\theta\left(2\cos^2\theta - 1\right) + \dfrac{\left(2\sin\theta\cos\theta\right)^2}{\cos\theta}$<br>$\text{LHS} = 4\cos^3\theta - 2\cos\theta + \dfrac{4\sin^2\theta\cos^2\theta}{\cos\theta}$<br>$\text{LHS} = 4\cos^3\theta - 2\cos\theta + 4\sin^2\theta\cos\theta$<br>$\text{LHS} = 2\cos\theta\left(2\cos^2\theta - 1 + 2\sin^2\theta\right)$<br>$\text{LHS} = 2\cos\theta\left(2-1\right)$<br>$\text{LHS} = 2\cos\theta$ | ✓cos double angle/*cos dubbelhoek*<br>✓sin double angle/*sin dubbelhoek*<br>✓simplification/*vereenv*<br>✓ simplification/*vereenv*<br>✓common factor/*gemeensk faktor*<br>✓2<br>(6) |
| 6.1.2 | $x = \{90°\}$ | ✓ 90°<br>(1) |
| 6.2 | $\cos\theta = \dfrac{1}{\cos\theta} + \dfrac{5}{6}$<br>$6\cos^2\theta = 6 + 5\cos\theta$<br>$6\cos^2\theta - 5\cos\theta - 6 = 0$<br>$\left(3\cos\theta + 2\right)\left(2\cos\theta - 3\right) = 0$<br>$3\cos\theta + 2 = 0$ or/*of* $2\cos\theta - 3 = 0$<br>$\cos\theta = -\dfrac{2}{3}$ or/*of* $\cos\theta = \dfrac{3}{2}$<br>NA<br>$\theta = 180° - 48{,}19° + k.360°$ or/*of* $\theta = 180° + 48{,}19° + k.360°$<br>$\theta = 131{,}81° + k.360°, k \in \text{Z}$ or/*of* $\theta = 228{,}19° + k.360°, k \in \text{Z}$ | ✓LCM/*KGV*<br>✓standard form/*std vorm*<br>✓factors/*faktore*<br>✓both equations/*albei vgls*<br>✓131,81° and/*en* 228,19°<br>✓ $k.360°, k \in \text{Z}$<br>(6) |
| 6.3 | area/*opv* $\Delta$ PQR $= \dfrac{1}{2}pq\sin\text{R}$ ……①<br>$\dfrac{p}{\sin P} = \dfrac{q}{\sin Q}$<br>$p = \dfrac{q\sin P}{\sin Q}$ ……②<br>Subs ② into ①: area/*opv* $\Delta$ PQR $= \dfrac{1}{2}\left(\dfrac{q\sin P}{\sin Q}\right)q\sin\text{R}$<br>area/*opv* $\Delta$ PQR $= \dfrac{q^2\sin P\sin\text{R}}{2\sin Q}$ | ✓ $p = \dfrac{q\sin P}{\sin Q}$<br>✓substitution/*vervanging*<br>(2) |
| | | **[15]** |

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| **QUESTION/*VRAAG* 7** | | |
|---|---|---|
| 7.1.1 | $\cos(\alpha-\beta)=\cos\alpha\cos\beta+\sin\alpha\sin\beta$ | ✓answer/*antwoord* (1) |
| 7.1.2 | $\sin 2\alpha$<br>$=\cos(90°-(\alpha+\alpha))$<br>$=\cos(90°-\alpha-\alpha)$<br>$=\cos((90°-\alpha)-\alpha)$<br>$=\cos(90°-\alpha)\cos\alpha+\sin(90°-\alpha)\sin\alpha$<br>$=\sin\alpha\cos\alpha+\cos\alpha\sin\alpha$<br>$=2\sin\alpha\cos\alpha$ | ✓ $90°-(\alpha+\alpha)$<br>✓expansion/*uitbreiding*<br>✓co-functions/ *ko-funksies* (3) |
| 7.2.1 | In $\Delta$PNR : $\sin\theta=\frac{r}{b}$<br>$r=b\sin\theta$ ……① | ✓sin def<br>✓r subject/*r onderwerp* (2) |
| 7.2.2 | $r=b\sin\theta$ ……①<br>$r=a\sin 2\theta$ ……②<br>From ① and ②: $b\sin\theta=a\sin 2\theta$<br>$b=\frac{a\sin 2\theta}{\sin\theta}$<br>$b=\frac{a(2\sin\theta\cos\theta)}{\sin\theta}$<br>$b=2a\cos\theta$ | ✓equating/*gelykstel*<br>✓b subject/*b onderwerp*<br>✓sin double angle/*sin dubbelhoek* (3) |
| 7.2.3 | $\cos\theta=\frac{PR}{b}$<br>PR=$b\cos\theta$<br>$\cos 2\theta=\frac{PQ}{a}$<br>PQ=$a\cos 2\theta$<br>$\therefore QR=PR-PQ$<br>$QR=b\cos\theta-a\cos 2\theta$<br>$QR=(2a\cos\theta)\cos\theta-a(2\cos^2\theta-1)$<br>$QR=2a\cos^2\theta-2a\cos^2\theta+a$<br>$QR=a$ | ✓ PR=$b\cos\theta$<br>✓ PQ=$a\cos 2\theta$<br>✓ $QR=b\cos\theta-a\cos 2\theta$<br>✓ substitution/*vervanging* (4) |
| | | **[13]** |

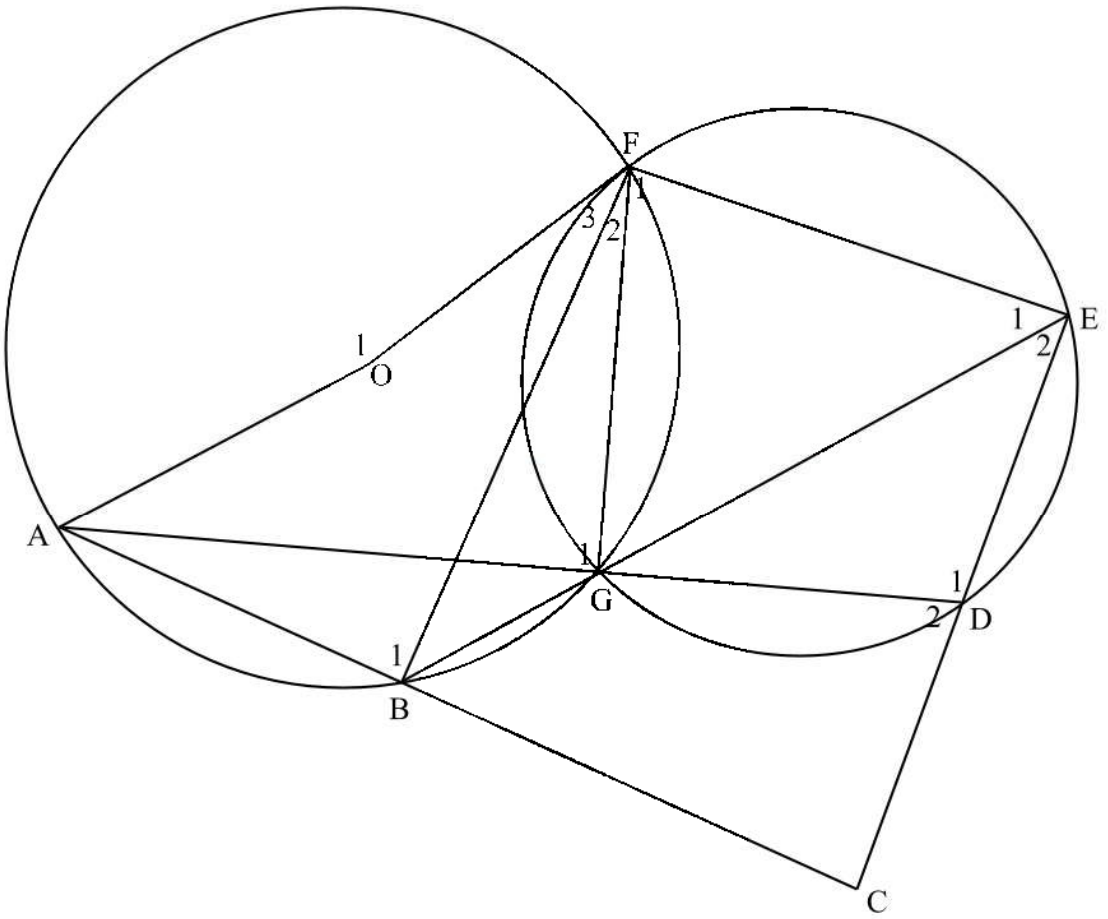
**QUESTION/*VRAAG* 8**




| | | |
|---|---|---|
| 8.1 | $a = 2$ | ✓ $a = 2$ (1) |
| 8.2 | $f(x) = \sin 2x$<br>$f\left(\frac{3x}{2}\right) = \sin 2\left(\frac{3x}{2}\right) = \sin 3x$<br>Period/*Periode*: 120° | ✓ $\sin 3x$<br>✓ answer/*antwoord* (2) |
| 8.3 | $\sqrt{\sin 2x - 1}$<br>Max/*maks* = 0 | ✓ answer/*antwoord* (1) |
| 8.4 | $f(x) = \sin 2x$ shifted down/*afgeskuif* $\frac{1}{2}$ units/*eenhede*<br>$h(x) = \sin 2x - \frac{1}{2}$ | ✓ answer/*antwoord* (1) |
| 8.5 | $x = 15°$ and/*en* $x = 75°$ | ✓ $x = 15°$ ✓ $x = 75°$ (2) |
| | | **[7]** |

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**QUESTION/*VRAAG* 9**

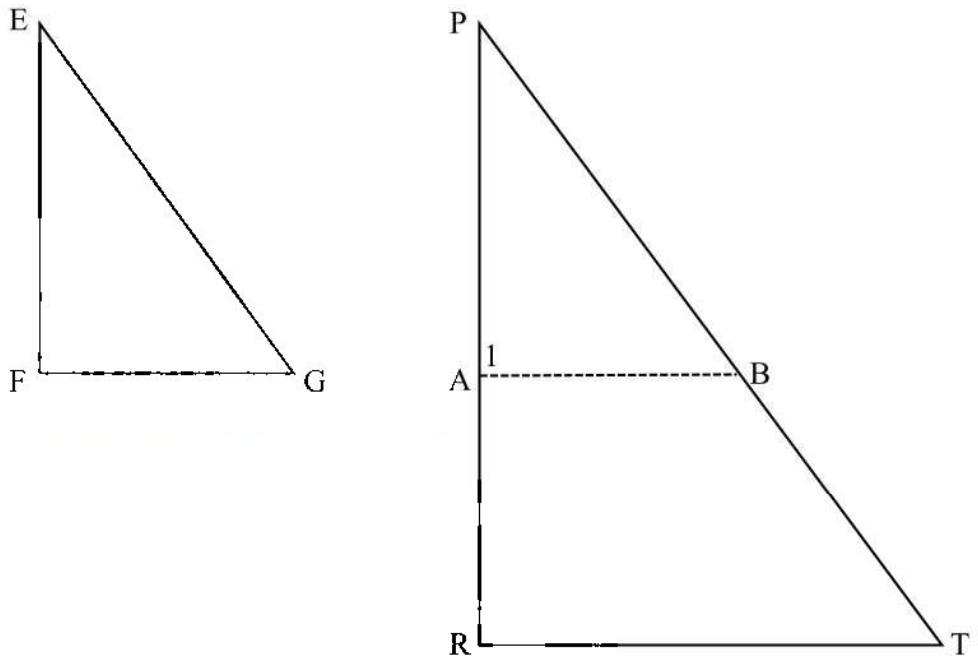



| | | |
|---|---|---|
| 9.1 | $\hat{B}_1 = 81°$ $\angle$ at centre is $2\times\angle$ at circumf/*midpt* $\angle = 2\times\angle$ *by omtrek* | ✓S ✓R (2) |
| 9.2 | $\hat{G}_1 = 81°$ $\angle$'s in same segment/ $\angle$ *'e in dies segment* | ✓S ✓R (2) |
| 9.3 | $\hat{G}_1 = F\hat{E}D = 81°$ ext $\angle$ cyclic quad ext /*buite* $\angle$ *kvh*<br>$F\hat{E}D = \hat{D}_1 = 81°$ given/*gegee* | ✓S ✓R<br>✓S (3) |
| | | **[7]** |

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**QUESTION/*VRAAG* 10**

10.1




Draw AB with A on PR and B on PT so that EF = PA and EG = PB ✓constr/*konstr*
*/Trek AB met A op PR en B op PT sodat EF = PA en EG = PB*

In ΔEFG and/*en* ΔPAB:

(i) EF = PA constr/*konstr*

(ii) EG = PB constr/*konstr*

(iii) $\hat{E} = \hat{P}$ given/*gegee* ✓≡proof/*bewys*

$\Delta EFG \equiv \Delta PAB$ SAS/*SHS*

$\therefore \hat{F} = \hat{A}_1$ $\equiv \Delta$

But/*maar*: $\hat{F} = \hat{R}$ given/*gegee*

$\therefore \hat{A}_1 = \hat{R}$

$\therefore AB \parallel RT$ corresp ∠ 's equal/*ooreenk ∠ 'e gelyk* ✓R

$\therefore \frac{PA}{PR} = \frac{PB}{PT}$ prop theorem $AB \parallel RT$ /*eweredigh st* $AB \parallel RT$ ✓S ✓R

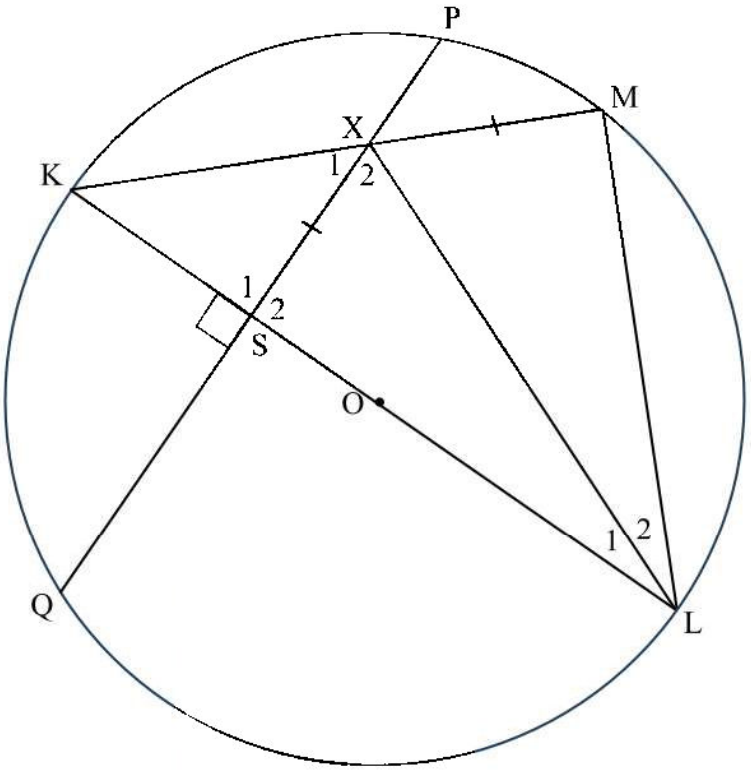
and/*en* EF = PA constr/*konstr* ✓S

EG = PB constr/*konstr*

$\therefore \frac{EF}{PR} = \frac{EG}{PT}$

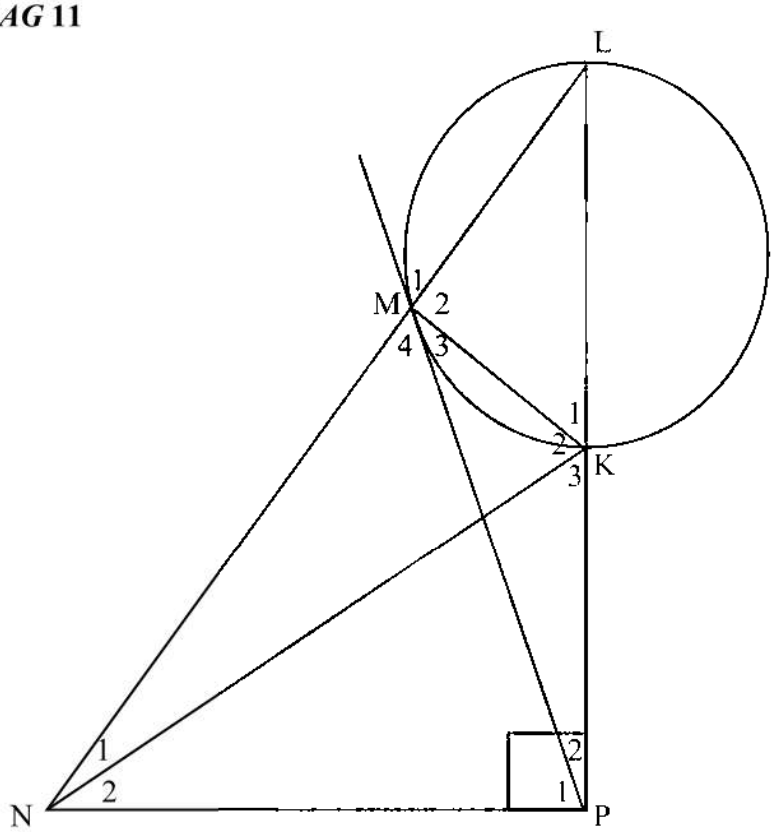
(6)

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| | | |
|---|---|---|
| 10.2 |  | |
| 10.2.1 | $\Delta SXL \equiv \Delta MXL$ $\angle\angle S$ | ✓S<br>(1) |
| 10.2.2<br>(a) | $KL^2 = KM^2 + ML^2$ Pythagoras<br>$20^2 = KM^2 + 12^2$<br>$KM^2 = 256$<br>$KM = 16$ | ✓S<br>✓subst/*verv*<br>✓answer/<br>*antwoord*<br>(3) |
| (b) | $\frac{KX}{SX} = \frac{KL}{ML}$ $\Vert\Vert\Delta$'s<br>$\frac{KX}{SX} = \frac{20}{12} = \frac{5}{3}$<br><br>**OR/*OF***<br><br>$\frac{KX}{KL} = \frac{SX}{ML}$ $\Vert\Vert\Delta$'s<br>$\frac{KX}{20} = \frac{SX}{12}$<br>$\frac{KX}{SX} = \frac{20}{12} = \frac{5}{3}$ | ✓S ✓R<br>✓$\frac{5}{3}$<br>(3)<br><br>✓S ✓R<br>✓$\frac{5}{3}$<br>(3) |

| | | |
|---|---|---|
| (c) | $ML = SL = 12$ $\Delta SXL \equiv \Delta MXL$<br>$\therefore KS = 8$ | ✓S |
| | $\frac{KS}{KM} = \frac{SX}{ML}$ $\parallel\parallel \Delta$'s | ✓S |
| | $\frac{8}{KX + XM} = \frac{XM}{12}$ $KX + XM$ and/*en* $SX = XM$ | ✓S |
| | $XM(KX + XM) = 96$ | |
| | $XM\left(\frac{5}{3}XS + XM\right) = 96$ from/*uit* 10.2.2 (b) | ✓subst/*verv* |
| | $XM\left(\frac{5}{3}XM + XM\right) = 96$ | |
| | $XM\left(\frac{8}{3}XM\right) = 96$ | |
| | $XM^2 = 36$ | |
| | $XM = 6$ | ✓answer/*antwoord*<br>(5) |
| | **OR/*OF*** | |
| | In $\Delta KML$: | |
| | $\cos L = \frac{20^2 + 12^2 - 16^2}{2(20)(12)}$ | ✓Subs cos rule |
| | $\cos L = \frac{3}{5}$ | ✓$\frac{3}{5}$ |
| | $\hat{L} = 53,13°$ | |
| | $\therefore \hat{L}_1 = \hat{L}_2 = 26,57°$ | ✓26,57° |
| | In $\Delta XML$: | |
| | $M = 90°$ $\angle$ in semi circle | ✓S/R |
| | $\tan 26,57° = \frac{XM}{12}$ | |
| | $XM = 6$ | ✓answer/*antwoord*<br>(5) |
| | | **[18]** |

**QUESTION/*VRAAG* 11**




| | | |
|---|---|---|
| 11.1 | $\hat{N} = \hat{M}_4$ ∠'s opp equal sides/∠ *'e teenoor gelyke sye*<br>$\hat{M}_4 = \hat{M}_1$ vertically opp ∠'s/*regoorst ∠'e*<br>$\hat{M}_1 = \hat{K}_1$ tan-chord theorem/*rklyn krd stelling*<br>$\therefore \hat{N} = \hat{K}_1$<br>$\therefore$ KMNP is cyclic quad/*kvh* converse ext∠ cyclic quad/*omg buite ∠ kvh* | ✓S/R<br>✓S<br>✓S/R<br><br>✓R<br>(4) |
| 11.2 | $\hat{M}_2 = \hat{P} = 90°$ ext∠ cyclic quad/*buite ∠ kvh*<br>$\therefore$ LK is diameter of the circle chord subtend 90°∠/converse ∠ in semi-circle<br>$\therefore$ *LK is middellyn van die sirkel* *koord onderspan 90°∠/omg ∠ in semi sirkel* | ✓S<br>✓R<br><br>(2) |
| 11.3 | In ΔMKP and/*en* ΔLMP :<br>(i) $\hat{P} = \hat{P}$ common/*gemeensk*<br>(ii) $\hat{M}_3 = \hat{L}$ tan-chord theorem/*rklyn krd stelling*<br>(iii) $M\hat{K}P = L\hat{M}P$ int ∠'s Δ/*binne∠'e Δ*<br>$\therefore \Delta MKP \,|||\, \Delta LMP$ ∠ ∠ ∠ | <br>✓S<br>✓S/R<br>✓S or/*of*<br>✓R<br>(3) |
| 11.4 | $\frac{KP}{MP} = \frac{MP}{LP}$ ||| Δ's<br>$\therefore MP^2 = KP.LP$ | ✓S/R<br><br>(1) |

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| | | | |
|---|---|---|---|
| 11.5 | $LN^2 = NP^2 + LP^2$<br>$\therefore PL = 2 \times PK$<br>and/*en* $NP = MP$<br>$\therefore LN^2 = MP^2 + (2PK)^2$<br>$LN^2 = PK.PL + (2PK)^2$<br>$LN^2 = PK.2PK + (2PK)^2$<br>$LN^2 = 6PK^2$<br>$LN = \sqrt{6}PK$ | Pythagoras<br>given/*gegee*<br>given/*gegee*<br><br><br>$MP^2 = KP.LP$ and/*en* $PL = 2 \times PK$ | ✓S<br><br><br>✓S<br><br><br>✓Subst/*Verv*<br>✓Simpl/ *vereenvoudig*<br>(4) |
| 11.6 | $\Delta NLP \text{ III } \Delta KLM$<br>$\therefore \frac{NL}{KL} = \frac{NP}{KM}$<br>$NP = \frac{KM.NL}{KL}$<br>$NP = \frac{KM.\sqrt{6}PK}{KL}$<br>$PK = KL$<br>$NP = \sqrt{6}KM$ | <br>III $\Delta$'s<br><br>LN = $\sqrt{6}$PK proven /*bewys*<br>given/*gegee* | <br>✓S/R<br><br>✓S<br><br><br>✓S<br>(3) |
| | | | **[17]** |

**TOTAL/ *TOTAAL*: 150**

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