Northern Cape
Department of Education

**PROVINCIAL PREPARATORY EXAMINATION/**
***PROVINSIALE VOORBEREIDENDE EKSAMEN***

**GRADE 12/*GRAAD 12***

***MATHEMATICS/WISKUNDE***

**PAPER 2/*VRAESTEL 2***

**SEPTEMBER 2026**

**MARKING GUIDELINES/*NASIENRIGLYNE***

***MARKS*/PUNTE: 150**

**These marking guidelines consist of 14 pages./**
***Hierdie nasienriglyne bestaan uit 14 bladsye.***

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**NOTE:**

- If a learner answers a question TWICE, only mark the FIRST attempt.
- If a learner has crossed out (cancelled) an attempt of a question and not redone the question, mark the crossed-out (cancelled) 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:***

- *As 'n leerder 'n vraag TWEE KEER beantwoord, sien slegs die EERSTE poging na.*
- *As 'n leerder 'n poging om die vraag te beantwoord, doodgetrek (gekanselleer) het en nie dit oorgedoen het nie, sien die doodgetrekte (gekanselleerde) poging na.*
- *Volgehoue akkuraatheid word in ALLE aspekte van die nasienmemorandum toegepas.*
- *Aanvaarding van antwoorde/waardes om 'n probleem op te los, word NIE toegelaat nie.*

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

| **QUESTION 1** | | |
|---|---|---|
| 1.1 | $a = -5{,}51$<br>$b = 0{,}85$<br>$y = -5{,}51 + 0.85x$<br><br>• A/O FULL MARKS<br>• CORRECT A/B SWOPPED IN EQUATION 2/3 | ✓$a = -5{,}51$<br>✓$b = 0{,}85$<br>✓answer<br>(3) |
| 1.2 | $y = -5{,}51 + 0{,}85(113)$<br>$= 90{,}54$<br>$= 91$ CA FROM 1.1 | ✓substitution<br>✓answer<br>(2) |
| 1.3 | $r = 0.897$<br>$r = 0.90$<br><br>The prediction is VALID | ✓ value of $r$.<br>✓valid<br>(2) |
| 1.4 | $\tilde{x} + \sigma$<br>$90.09 + 29.41$<br>119.5<br>2 *learners* | ✓90.09<br>✓29.41<br>✓2 learners<br>(3) |
| | | **[10]** |

| **QUESTION 2** | | |
|---|---|---|
| 2.1 | 120 learners accurate mark | ✓answer (1) |
| 2.2 | $Q_1 = \frac{1}{4}(120) = 30$<br>$Q_3 = \frac{3}{4}(120) = 90$<br>IQR $= 44 - 26 = 18$ (17-19) | ✓44<br>✓26<br>✓answer<br>(3) |
| 2.3 | $Q_2 = \frac{1}{2}(120) = 60$<br>$Q_2$=35 | ✓60<br>✓35<br>(2) |
| 2.4 | $120 - 76 = 44$ learners accept 43 – 45 | ✓method<br>✓answer<br>(2) |
| | | **[8]** |

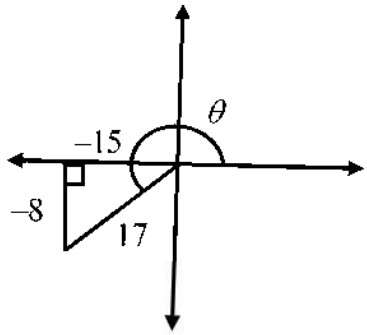
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| **QUESTION 3** | | |
|---|---|---|
| 3.1 | $m_{CD}=\frac{12-(-8)}{0-(-5)}$<br>$m_{CD}=4$<br>• $x/y$ BD<br>• $x$ swopped in the denominator CA 1/2 | ✓substitution<br>✓answer<br>(2) |
| 3.2 | $y=4x+c$<br>$0=4(2.5)+c$<br>$0=10+c$<br>$c=-10$<br>$y=4x-10$ | ✓gradient<br>✓substitution<br>✓answer<br>(3) |
| 3.3 | $t=4(6)-10$<br>$t=14$ | ✓substitution<br>✓answer<br>(2) |
| 3.4 | $\tan\theta=4$<br>$\theta=75,96^{\circ}$ | ✓substitution<br>✓answer<br>(2) |
| 3.5 | $y=4x+12$<br>$0=4x+12$<br>$x=-3$<br>$E(-3;0)$ | ✓ $y=4x+12$<br>✓0<br>✓ $-3$<br>(3) |
| 3.6 | $3y-x=-19$<br>$3(4x-10)-x=-19$<br>$12x-30-x=-19$<br>$11x=11$<br>$x=1$<br>$y=4(1)-10$<br>$y=-6$<br>$B(1;-6)$ | ✓substitution<br>✓simplification<br>✓ $x=1$<br>✓ $y=-6$<br>(4) |

| | | |
|---|---|---|
| 3.7 | $m_{EA} = \tan 57{,}26° = 1{,}56$<br>$y = 1{,}56x + c$<br>$0 = 1{,}56(-3) + c \quad (-3;0)$<br>$c = 4{,}67$ | ✓$m_{EA} = 1{,}56$<br>✓ $c = 4{,}67$ |
| | $EA = \sqrt{(-3-6)^2 + (0-14)^2}$<br>$= \sqrt{277}$ | ✓$\sqrt{277}$ |
| | Area of $\Delta EAF = \frac{1}{2}(\sqrt{277})(5{,}5)\sin 57{,}26°$<br>$= 38{,}5$ units$^2$ | ✓substitution<br>✓38,5 units |
| | Area of $\Delta EOG = \frac{1}{2}(3)(4{,}67)$<br>$= 7{,}0$ units$^2$ | ✓7,0 units$^2$ |
| | Area of AGOF = 38,5 - 7,0<br>$= 31{,}5$ units$^2$ | ✓answer<br>(7) |
| | **OR** | |
| | $AE = \sqrt{(-3-6)^2 + (0-14)^2}$<br>$= \sqrt{277}$ | ✓ Length of AE |
| | Area of $\Delta AEF = \frac{1}{2}(\frac{11}{2})(\sqrt{277})\sin 57{,}26°$<br>$= 38{,}50\,(u)^2$ | ✓Subs<br>✓ Area of $\Delta$ AEF |
| | $\tan 57{,}26° = \frac{OG}{3}$<br>$OG = 3\tan 57{,}26°$<br>$= 4{,}67$ | ✓ Equation<br>✓ Length of OG |
| | Area of $\Delta EOG = \frac{1}{2}(3)(4{,}67)$<br>$= 7{,}005$ | ✓area of $\Delta$ EOG |
| | Area of AGOF=38,50-7,005<br>$= 31{,}50\,(u)^2$ | ✓ Answer<br>(7) |
| | | **[23]** |

| **QUESTION 4** | | |
|---|---|---|
| 4.1 | $(x+2)^2+(y-6)^2=10+(2)^2+(6)^2$<br>$(x+2)^2+(y-6)^2=50$<br>$A(-2;6)$ | ✓standard form<br>✓ –2<br>✓ 6<br>(3) |
| 4.2 | Line from centre to midpt of chord. | ✓answer<br>(1) |
| 4.3 | $m=\frac{6-9}{-2-4}=\frac{1}{2}$<br>$m_{PQ}=-2$<br>$y=-2x+c$<br>$9=-2(4)+c$<br>$9+8=c$<br>$y=-2x+17$ | ✓gradient of AB.<br>✓gradient of PQ.<br>✓substituion<br>✓answer<br>(4) |
| 4.4 | $x^2+y^2+4x-12y-10=0$<br>$x^2+(-2x+17)^2+4x-12(-2x+17)-10=0$<br>$x^2+4x^2-68x+289+4x+24x-204-10=0$<br>$5x^2-40x+75=0$<br>$x^2-8x+15=0$<br>$(x-3)(x-5)=0$<br>$x=3 \text{ or } x=5$<br>$y=-2(3)+17 \text{ or } y=-2(5)+17$<br>$y=11 \text{ or } y=7$<br>$P(3;11)\ Q(5;7)$ | ✓substituion<br>✓standard form<br>✓factors<br>✓$x$-values<br>✓$y$-values<br>(5) |

| | | |
|---|---|---|
| 4.5 | $x^2+y^2+4x-12y-10=0$<br>$x^2+(2x+k)^2-12(2x+k)-10=0$<br>$x^2+4x^2+4kx+k^2+4x-24x-12k-10=0$<br>$5x^2+4kx-20x+k^2-12k-10=0$<br>$\Delta<0$<br>$(4k-20)^2-4(5)(k^2-12k-10)<0$<br>$16k^2-160k+400-20k^2+240k+200<0$<br>$-4k^2+80k+600<0$<br>$k^2-20k-150>0$<br>$k=\frac{-(-20)\pm\sqrt{(-20)^2-4(1)(-150)}}{2(1)}$<br>$k=10-5\sqrt{10}\ \ or\ \ k=10+5\sqrt{10}$<br>$\therefore k<10-5\sqrt{10}\ \ or\ k>10+5\sqrt{10}$ | ✓substitution<br>✓standard form<br>✓ $\Delta<0$<br>✓substitution<br>✓substitution<br>✓✓answer<br>(7) |
| | | **[20]** |

| **QUESTION 5** | | |
|---|---|---|
| 5.1.1 | <br>$\tan\theta=\frac{-8}{-15}=\frac{8}{15}$ | ✓ $x=-15$<br>✓answer<br>(2) |
| 5.1.2 | $\cos(180^\circ-\theta)$<br>$=-\cos\theta$<br>$=-\left(\frac{-15}{17}\right)$<br>$=\frac{15}{17}$ | ✓ $-\cos\theta$<br>✓answer<br>(2) |

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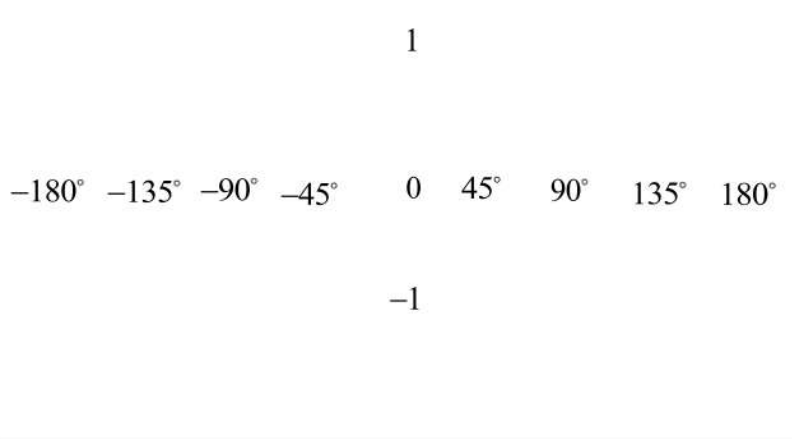
| | | |
|---|---|---|
| 5.1.3 | $\sin\left(\frac{\theta}{2}-15^\circ\right).\cos\left(\frac{\theta}{2}-15^\circ\right)$<br>$=\frac{1}{2}\sin\left(2.\left(\frac{\theta}{2}-15^\circ\right)\right)$<br>$=\frac{1}{2}\sin\left(\theta-30^\circ\right)$<br>$=\frac{1}{2}\left(\sin\theta.\cos 30^\circ-\cos\theta.\sin 30^\circ\right)$<br>$=\frac{1}{2}\left[\frac{-8}{17}.\frac{\sqrt{3}}{2}-\frac{-15}{17}.\frac{1}{2}\right]$<br>$=\frac{1}{2}\left[\frac{-8\sqrt{3}+15}{34}\right]$<br>$=\frac{-8\sqrt{3}+15}{68}$ | ✓$\frac{1}{2}\left[2\sin\left(\frac{\theta}{2}-15°\right)\cos\frac{\theta}{2}-15°\right]$<br>✓$\frac{1}{2}\sin\left(2.\left(\frac{\theta}{2}-15^\circ\right)\right)$<br>✓$\frac{1}{2}\sin\left(\theta-30^\circ\right)$<br>✓expansion<br>✓substitution<br>✓answer<br>(6) |
| 5.2.1 | $\frac{\tan\left(180^\circ-x\right).\cos\left(-x\right).\cos\left(180^\circ+x\right)}{4\cos\left(90^\circ+x\right)}$<br>$=\frac{-\tan x.\cos x.\left(-\cos x\right)}{-4\sin x}$<br>$=\frac{-\frac{\sin x}{\cos x}.\cos x.\left(-\cos x\right)}{-4\sin x}$<br>$=-\frac{1}{4}\cos x$ | ✓$-\tan x$<br>✓$\cos x$<br>✓$-\cos x$<br>✓$-4\sin x$<br>✓$-\frac{\sin x}{\cos x}$<br>✓answer<br>(6) |
| 5.2.2 | $x\in(90°;270°)$ | ✓CV<br>✓Correct Notation<br>(2) |
| | | **[18]** |

**QUESTION 6**

| | | |
|---|---|---|
| 6.1.1 | $f(x)=\dfrac{\sin 2x.\cos 2x}{2\sin^2 2x-2\cos^2 2x}$<br>$=\dfrac{\frac{1}{2}\sin(2.2x)}{-2(\cos^2 2x-\sin^2 2x)}$<br>$=\dfrac{\frac{1}{2}\sin 4x}{-2\cos 4x}$<br>$=-\dfrac{1}{4}\tan 4x$ | ✓$\frac{1}{2}\sin(2.2x)$<br>✓ –2 Common factor<br>✓ $-2\cos 4x$<br>✓answer<br>(4) |
| 6.1.2 | $x=22.5^{\circ}\quad x=67,5^{\circ}$ | ✓ $x=22.5^{\circ}$<br>✓ $x=67.5^{\circ}$<br>(2) |
| 6.2 | $\sum_{r=0}^{\infty}(\sin x)^{2r}=2\tan x$<br>$(\sin x)^{2(0)}+(\sin x)^{2(1)}+(\sin x)^{2(2)}+\ldots\ldots=2\tan x$<br>$1+\sin^2 x+\sin^4 x+\ldots\ldots=2\tan x$<br>$a=1\quad r=\sin^2 x$<br>$2\tan x=\dfrac{1}{1-\sin^2 x}$<br>$2\tan x=\dfrac{1}{\cos^2 x}$<br>$2\dfrac{\sin x}{\cos x}=\dfrac{1}{\cos^2 x}$<br>$2\sin x\cos^2 x=\cos x$<br>$2\sin x.\cos^2 x-\cos x=0$<br>$\cos x(2\sin x\cos x-1)=0$<br>$\cos x=0\quad \sin 2x=1$<br>$2x=90^{\circ}+k.360^{\circ}$<br>$x=45^{\circ}+k.180^{\circ}\ ,k\in Z$<br>**OR** | ✓expansion<br>✓$a$ and $r$<br>✓substitution in $S_{\infty}$<br>✓$1-\sin^2 x=\cos^2 x$<br>✓standard form<br>✓both equations<br>✓ $x=45^{\circ}+k.180^{\circ}\ ,k\in Z$<br>(7) |

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| | | |
|---|---|---|
| | $\sum_{r=0}^{\infty}(\sin x)^{2r} = 2\tan x$ | |
| | $(\sin x)^{2(0)} + (\sin x)^{2(1)} + (\sin x)^{2(2)} + \ldots\ldots = 2\tan x$ | ✓expansion |
| | $1 + \sin^2 x + \sin^4 x + \ldots\ldots = 2\tan x$ | ✓$a$ and $r$ |
| | $a = 1 \quad r = \sin^2 x$ | |
| | $2\tan x = \dfrac{1}{1-\sin^2 x}$ | ✓substitution |
| | $2\tan x = \dfrac{1}{\cos^2 x}$ | ✓$1-\sin^2 x = \cos^2 x$ |
| | $2\dfrac{\sin x}{\cos x} = \dfrac{1}{\cos^2 x}$ | |
| | $LCD = \cos^2 x$ | |
| | $\cos^2 x\left(\dfrac{2\sin x}{\cos x}\right) = \left(\dfrac{1}{\cos^2 x}\right)\cos^2 x$ | |
| | $2\sin x.\cos x = 1$ | ✓$2\sin x.\cos x = 1$ |
| | $\sin 2x = 1$ | ✓$\sin 2x = 1$ |
| | $2x = 90^\circ + k.360^\circ$ | |
| | $x = 45^\circ + k.180^\circ \ , k \in Z$ | ✓$x = 45^\circ + k.180^\circ \ , k \in Z$ (7) |
| | | **[13]** |

| **QUESTION 7** | | | |
|---|---|---|---|
| 7.1 | $180^\circ$ | ✓answer | (1) |
| 7.2 | $y \in \left[\frac{1}{2}; \frac{3}{2}\right]$ | ✓✓answer | (2) |
| 7.3 |  | ✓shape<br>✓turning points<br>✓ $x$-intercepts<br>✓ $y$-intercept | (4) |
| 7.4 | 2 | ✓✓answer | (2) |
| 7.5 | 3 | ✓✓answer | (2) |

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| | | |
|---|---|---|
| 7.6 | $\cos(90° + 2x) \cdot \cos(x - 45°) \geq 0$<br>$= -\sin 2x \cdot \cos(x - 45°) \geq 0$<br>$= [\sin 2x][-\cos(x - 45°)] \geq 0$<br>$[-180° ; -90°]$ or [-45° ; 0°] or [90° ; 135°] | ✓ co-function<br>✓ $[-180° ; -90°]$<br>✓ [-45° ; 0°]<br>✓ [90° ; 135°]<br>(4) |
| | | **[15]** |

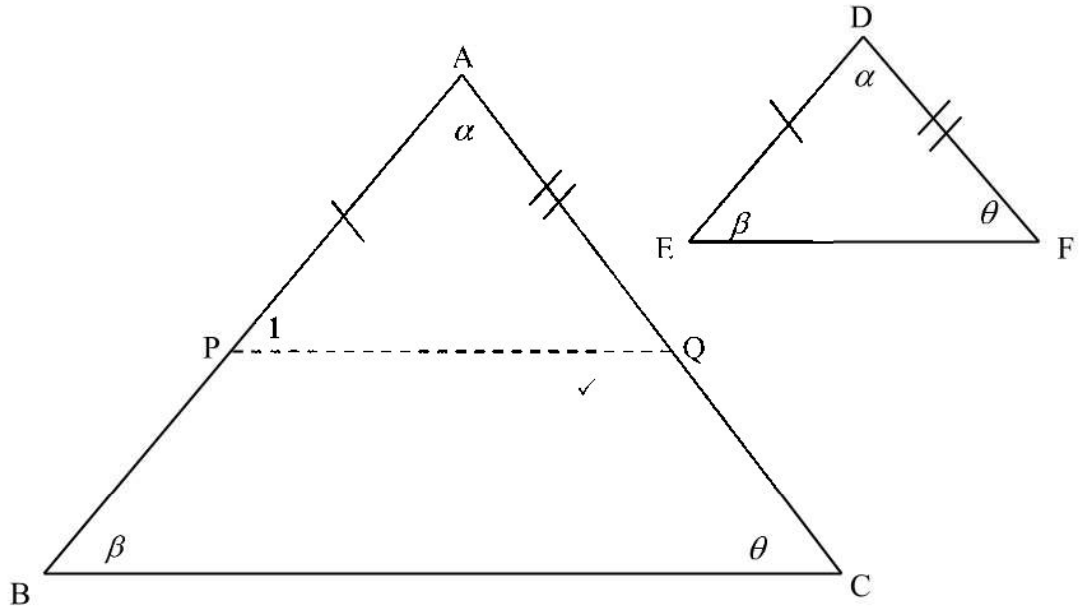
| **QUESTION 8** | | |
|---|---|---|
| 8.1 | $Area = \frac{1}{2}(22)(22)\sin 50°$<br>$= 185,38m^2$ | ✓correct formula<br>✓substitution<br>✓answer<br>(3) |
| 8.2 | $AB^2 = (22)^2 + (22)^2 - 2(22)(22)\cos 50°$<br>$AB = \sqrt{345,78...}$<br>$= 18,60m$<br>**OR**<br>$B\hat{A}C = 65°$ $(\angle s\ opp = sides)$<br>$\frac{AB}{\sin 50°} = \frac{BC}{\sin B\hat{A}C}$<br>$AB = \frac{22.\sin 50°}{\sin 65°}$<br>$AB = 18,60\ m$ | ✓substitution<br>✓answer<br>✓substitution<br>✓answer<br>(2) |
| 8.3 | $\cos 25° = \frac{18,60}{DB}$<br>$DB = \frac{18,60}{\cos 25°}$<br>$DB = 20,52m$ | ✓substitution<br>✓answer<br>(2) |
| 8.4 | In ΔBDC<br>$\frac{\sin 58°}{22} = \frac{\sin\hat{C}}{20,52}$<br>$\sin\hat{C} = \frac{20,52\ sin\ 58°}{22}$<br>$\hat{C} = 52,28°$<br>$D\hat{B}C = 180° - 58° - 52,28° = 69,72°$ | ✓substitution into sine rule.<br>✓value of $\hat{C}$<br>✓answer<br>(3) |
| | | **[10]** |

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| **QUESTION 9** | | |
|---|---|---|
| 9.1 | QR=RS (Tan from same ext pt)<br>$R\hat{Q}S = \frac{180^\circ - 76^\circ}{2} (\angle s\ opp = sides)$ or (sum ∠'s of Δ)<br>$= 52^\circ$ | ✓ S✓ R<br>✓ S/R<br>✓ answer<br>(4) |
| 9.2 | $\hat{P} = 52^\circ$ (tan *chord – theorem*) | ✓S ✓R<br>(2) |
| 9.3 | $Q\hat{T}S = 2(52^\circ) = 104^\circ$ ($\angle$ *at center* $= 2\angle$ at circumference) | ✓S ✓R<br>(2) |
| | | **[8]** |

| **QUESTION 10** | | |
|---|---|---|
| 10.1 | $\frac{TR}{WR} = \frac{QR}{VR}$ (Prop theorem QT ‖ VW)<br>$\frac{TR}{WR} = \frac{5}{3}$ | ✓S/R<br>✓answer<br>(2) |
| 10.2 | PT=TR<br>$\frac{PU}{UV} = \frac{PT}{TW}$ (Prop theorem QT‖VW)<br>$\frac{PU}{UV} = \frac{5}{2}$ | ✓S<br>✓ S<br>✓answer<br>(3) |
| 10.3 | $\frac{\text{Area of } \Delta PUT}{\text{Area of } \Delta PVW} = \frac{\frac{1}{2} PU.PT\sin\hat{P}}{\frac{1}{2} PV.PW\sin\hat{P}}$<br>$= \frac{(5x)(5y)}{(7x)(7y)}$<br>$= \frac{25}{49}$<br>**NOTE**: If perpendicular heihgt is used, construction must be shown on diagram | ✓formula<br>✓substitution<br>✓answer<br>(3) |
| | | **[8]** |

**QUESTION 11**




| | | |
|---|---|---|
| 11.1 | In ΔAPQ and ΔDEF<br>AQ = DF [construction/*konstruksie*]<br>$\hat{A} = \hat{D}$ [given/*gegee*]<br>AP = DE [construction/*konstruksie*]<br>∴ ΔAPQ ≡ ΔDEF [S∠S]<br>$\hat{P}_1 = \hat{E}$<br>$\hat{P}_1 = \hat{B}$ [$\hat{E} = \hat{B}$]<br>PQ\|\|BC [corresp ∠'s/*ooreenkomstige ∠e*]<br>$\frac{AP}{AB} = \frac{AQ}{AC}$ [Prop theorem PQ\|\|BC]<br>But/*maar* AP = DE and/en AQ = DF<br>$\therefore \frac{DE}{AB} = \frac{DF}{AC}$ | no construction = 0<br>✓construction<br>✓∴ ΔAPQ ≡ ΔDEF [S∠S]<br>✓ $\hat{P}_1 = \hat{E}$<br>✓ PQ ‖ BC<br>✓S/R<br>✓S<br>(6) |
| 11.2.1 | $\hat{M}_1 = \theta$ (tan chord theorem)<br>$\hat{P}_2 = \theta$ (∠s opp = sides)<br>$M\hat{S}P = 180° - 2\theta$ | ✓S/R<br>✓S<br>✓answer<br>(3) |
| 11.2.2 | ΔKZS and ΔSRP<br>$\hat{K}_2 = \hat{S}_2$ (alt ∠s SL\|\|KZ)<br>$\hat{S}_1 = \hat{P}_1 = \theta$ (proved)<br>$\hat{Z} = \hat{R}$ (sum of ∠s in Δ)<br>ΔKZS\|\|\|ΔSRP (AAA) | ✓S/R<br>✓S<br>✓R<br>(3) |

| | | |
|---|---|---|
| 11.2.3 | $\widehat{P}_2 = \theta$ (Vert opp $\angle$s =)<br>PT\|\|SZ (Corresp $\angle$s =)<br>$\frac{KT}{TZ} = \frac{KP}{SP}$ (Prop theorem PT\|\|SZ)<br>$KT = \frac{TZ.KP}{SP}$<br>$\therefore KT = \frac{TZ.KP}{MS}$ (SP = MS) | ✓S/R<br>✓S/R<br>✓S/R<br>✓S<br>✓R<br>(5) |
| | | **[17]** |

**TOTAL: 150**

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