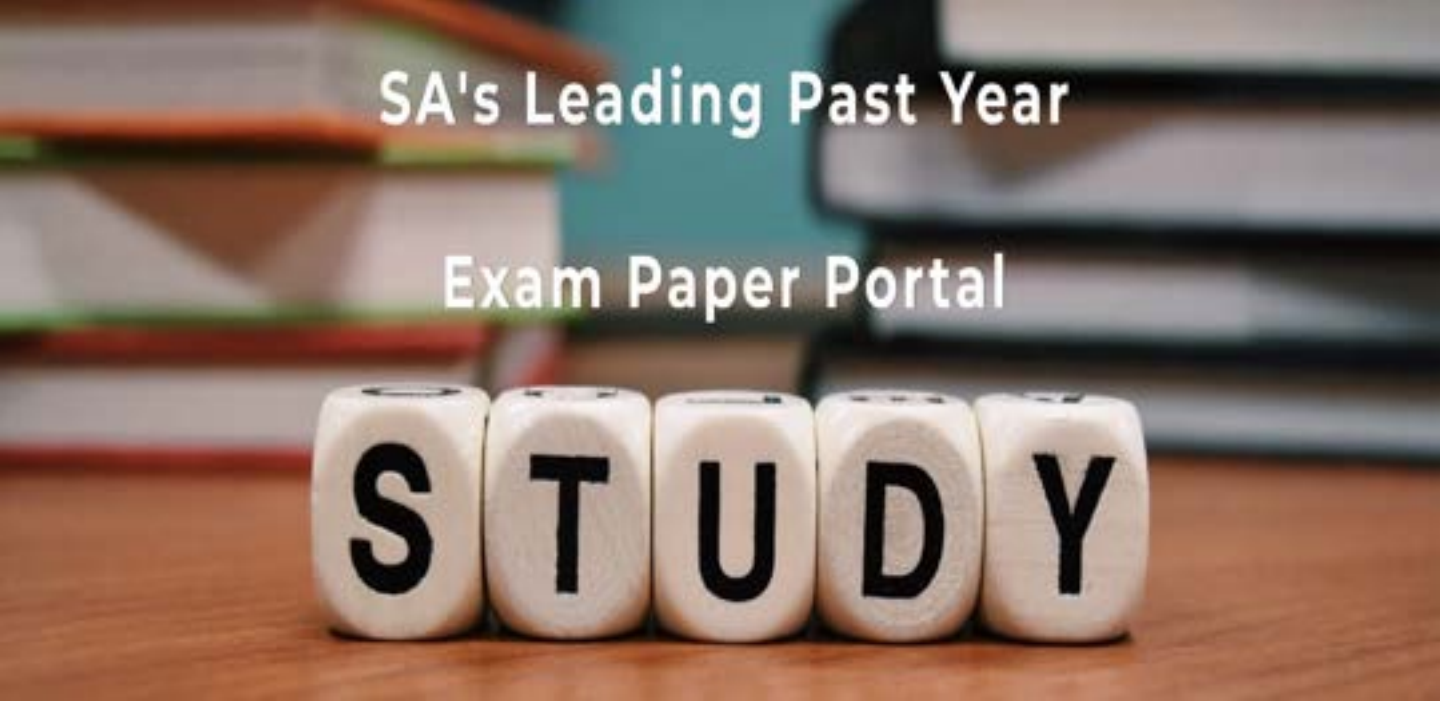

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GRADE/*GRAAD* 12

MATHEMATICS P2/*WISKUNDE V2* MEMORANDUM

SEPTEMBER 2016

MARKS: 150
PUNTE: 150

This memorandum consists of 17 pages.
Hierdie memorandum bestaan uit 17 bladsye.

QUESTION 1 / *VRAAG 1*

1.1	$y = 12{,}01 + 0{,}88x$	✓ value of a/*waarde van a* ✓value of b/*waarde van b* ✓ equation / *vergelyking* (3)
1.2	$y = 12{,}01 + 0{,}88(46)$ $= 52\%$	✓sub. 46 into the equation / *vervang 46 in die vergelyking* ✓answer / *antwoord* (2)
1.3	No, the preparatory exam mark is the independent variable. Hence we cannot determine the prep. exam marks using the final exam./*Nee,die voorbereidende eksamenpunt is die onafhanklike veranderlike. Dus kan ons nie die voorbereidende eksamenpunt met behulp van die finale eksmenpunt bepaal nie.*	✓answer / *antwoord* ✓reason /*rede* (2)
1.4	$\bar{x} = 60{,}58$ $\bar{y} = 65{,}33$ LHS/ *ILK* = $y = 65{,}33$ RHS/*RK* = $12{,}01 + 0{,}88(60{,}58) = 65{,}32$ LHS/*ILK* = RHS / *RK* $(\bar{x}\ ;\ \bar{y})$ lies on the regression line	✓ $\bar{x} = 60{,}58$ ✓ $\bar{y} = 65{,}33$ ✓sub. into RHS / *vervang in RK* ✓ LHS = RHS and conclusion / *LK = RK en gevolgtrekking* (4)
1.5	r = 0,98	✓ value of r / *waarde van r* (1)
1.6	There is a very strong positive correlation between prep. marks and final marks./ *Daar is'n sterk positiewe korrelasie tussen die voorbereidende punte en die finale punte.*	✓very strong / *baie sterk* ✓positive / *positief* (2) **[14]**

QUESTION 2 / *VRAAG 2*

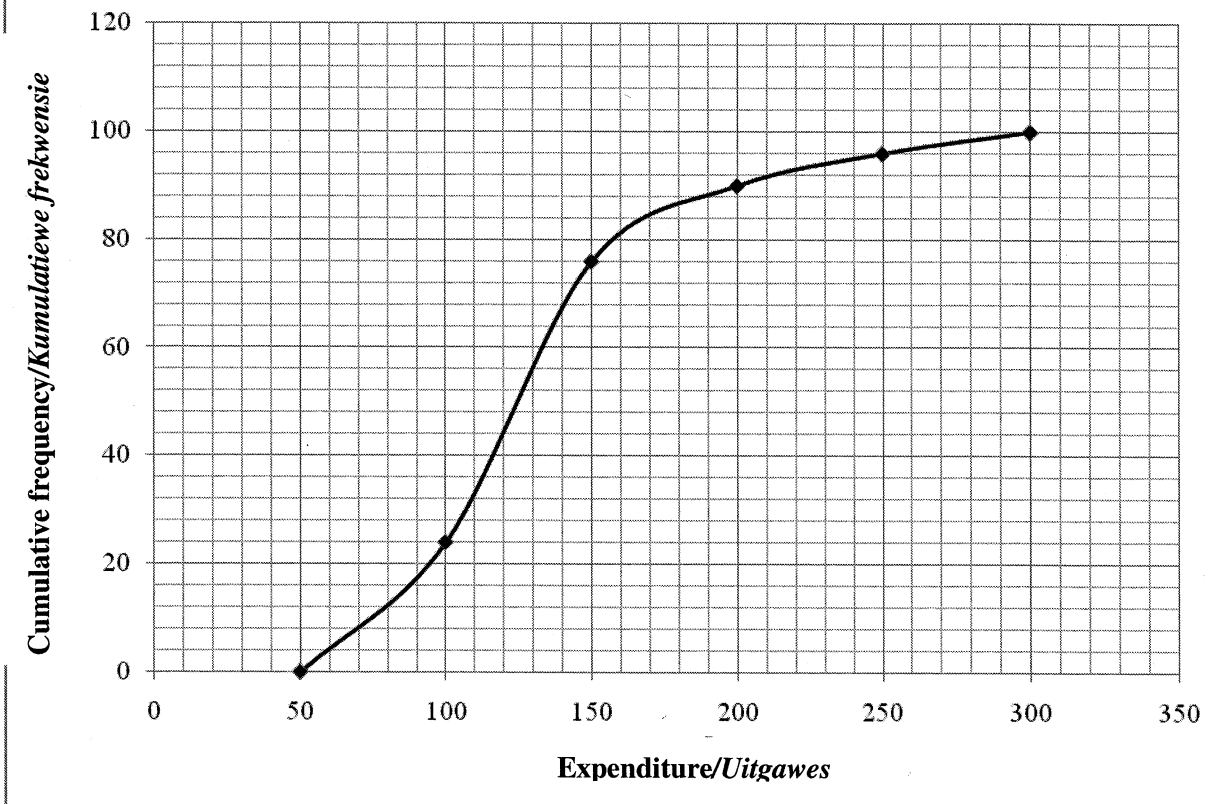
2.1 $a = 6$ ✓ answer / *antwoord* (1)

2.2

Expenditure (in rand)	Frequency	Cumulative frequency
$50 \leq x < 100$	24	24
$100 \leq x < 150$	52	76
$150 \leq x < 200$	14	90
$200 \leq x < 250$	**6**	96
$250 \leq x < 300$	4	100

✓ 76; 90
✓96;100 (2)

2.3

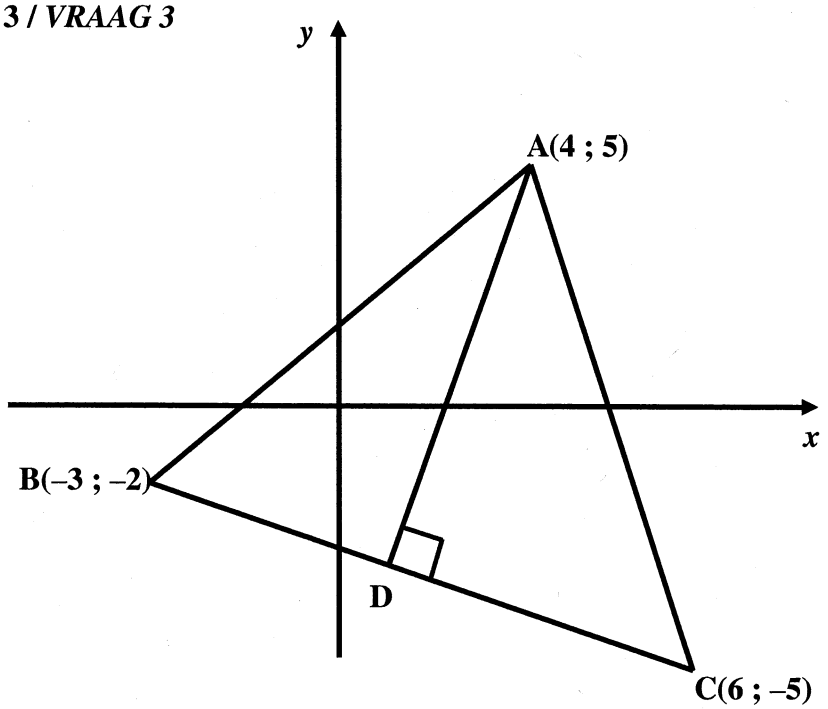


✓Correct points ✓Shape ✓Grounding /✓*Korrekte punte* ✓*Vorm* ✓*grondvlak* (3)

2.4 $100 \leq x < 150$ ✓answer / *antwoord* (1)

[7]

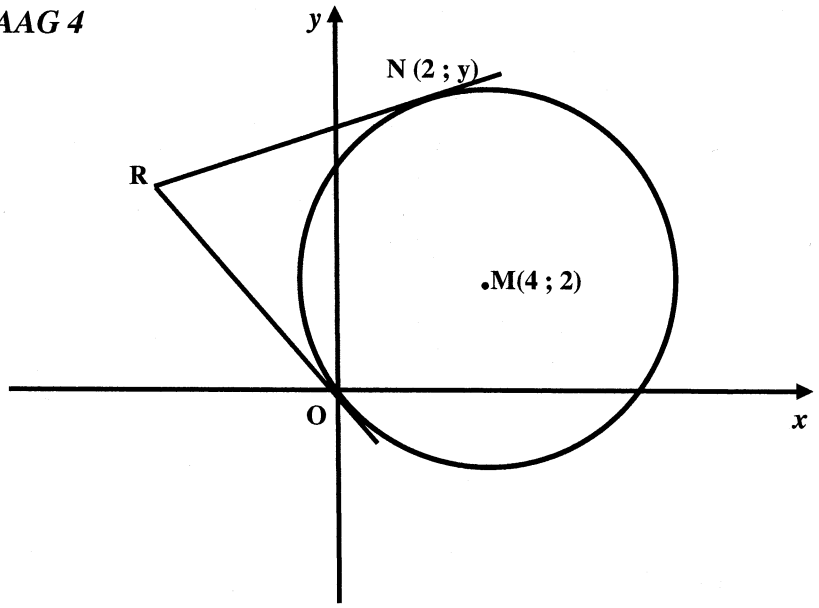
QUESTION 3 / *VRAAG 3*



3.1	$BC = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ $= \sqrt{(6+3)^2+(-5+2)^2}$ $= \sqrt{90}$ or/*of* $3\sqrt{10}$ or /*of* 9,49	✓sub. into the distance formula / *Vervang in die afstandformule* ✓ answer / *antwoord* (2)
3.2	$m_{BC} = \frac{y_2-y_1}{x_2-x_1}$ $= \frac{-5+2}{6+3}$ $= -\frac{1}{3}$ $y+5 = -\frac{1}{3}(x-6)$ or/ *of* $y+2 = -\frac{1}{3}(x+3)$ $y = -\frac{1}{3}x-3$ or $3y = -x-9$	✓ sub. into gradient formula / *vervang in die gradiënt formule* ✓ $-\frac{1}{3}$ ✓ equation / *vergelyking* (3)
3.3	$m_{AD} = 3$ $y-5 = 3(x-4)$ $y = 3x-7$	✓ $m_{AD} = 3$ ✓sub. of the point / *vervanging van die punt* ✓equation / *vergelyking* (3)

3.4	$-\frac{1}{3}x-3 = 3x-7$ $-x-9 = 9x-21$ $-10x = -12$ $x = \frac{6}{5}$ $y = 3(\frac{6}{5})-7$ $= -\frac{17}{5}$ $\therefore D(\frac{6}{5};-\frac{17}{5})$	✓ equating the two equations / *stel die twee vergelykings gelyk aan mekaar* ✓ x- value / *x-waarde* ✓ y-value / *y-waarde* (3)
3.5	$m_{AB} = \frac{5+2}{4+3}$ $= 1$ $\tan\alpha = 1$ $\alpha = 45°$ $\tan\beta = 3$ $\beta = 71{,}57°$ $B\hat{A}D = 71{,}57° - 45°$ $= 26{,}57°$	✓ $m_{AB} = 1$ ✓ $\tan\alpha = 1$ ✓ $\alpha = 45°$ ✓ $\beta = 71{,}57°$ ✓answer / *antwoord* (5)
3.6	Equation of a line AE ∥ BC/ *vergelyking van AE ∥ BC* $y-5 = -\frac{1}{3}(x-4)$ $3y-15 = -x+4$ AE: $3y+x = 19$ x-intercept/x-afsnit is $3(0)+x = 19$ $x = 19$ E (19: 0)	✓ sub. of $-\frac{1}{3}$ and point into the equation / *vervanging van* $-\frac{1}{3}$ *en die punt in die vergelyking* ✓equation of AE / *vergelyking van AE* ✓ x –intercepts / *x-afsnit* ✓answer / *antwoord* (4) **[20]**

QUESTION 4 / *VRAAG 4*



4.1	$(x-4)^2+(y-2)^2 = r^2$ $(0-4)^2+(0-2)^2 = r^2$ $20 = r^2$ $(x-4)^2+(y-2)^2 = 20$	✓sub. of M into equation of a circle / *vervang M in die vergelyking van die sirkel* ✓sub. of O(0; 0) / *vervang (0;0)* ✓ value of r^2 / *waarde van* r^2 (3)
4.2	$(x-4)^2+(y-2)^2 = 20$ Subst/*Verv*(2 ; *y*) $(2-4)^2+(y-2)^2 = 20$ $4+y^2-4y+4=20$ $y^2-4y-12=0$ $(y-6)(y+2) = 0$ $y = 6$ or/*of* $y=-2$ N/A **OR/*OF*** $(x-4)^2+(y-2)^2 = 20$ Subst/*Verv*(2 ; *y*) $(2-4)^2+(y-2)^2 = 20$ $(y-2)^2 = 16$ $y-2 = \pm 4$ $y = 6$ or/ *of* $y = -2$ N/A/*NVT*	✓sub of N(2 ; *y*) / *vervang N(2 ; y)* ✓ $y^2-4y-12=0$ ✓$(y-6)(y+2) = 0$ ✓ $y = 6$ (4) **OR / *OF*** ✓sub of N(2 ; *y*) / *vervang N(2 ; y)* ✓ $(y-2)^2 = 16$ ✓ $y-2 = \pm 4$ ✓ $y = 6$ (4)

4.3	$m_{OM} = \frac{2}{4} = \frac{1}{2}$ $m_{OR} = -2$ Equation of OR is /Vergelyking van OR: $y = -2x$	✓ $m_{OM} = \frac{1}{2}$ ✓ $m_{OR} = -2$ ✓ $y = -2x$ (3)
4.4	$m_{MN} = \frac{6-2}{2-4} = -2$ $m_{NR} = \frac{1}{2}$ $y-6 = \frac{1}{2}(x-2)$ $2y - 12 = x - 2$ NR: $2y - x - 10 = 0$ $y = -2x$ $2(-2x) - x - 10 = 0$ $-5x = 10$ $x = -2$ $y = -2(-2) = 4$ $R(-2 ; 4)$ **OR** $RO^2 = NR^2$ $x^2 + y^2 = (x-2)^2 + (y-6)^2$ $x^2 + y^2 = x^2 - 4x + 4 + y^2 - 12y + 36$ $4x + 12y = 40$ $x + 3y = 10$ and $y = -2x$ $x + 3(-2x) = 10$ $x - 6x = 10$ $-5x = 10$ $x = -2$ $y = -2(-2) = 4$ $R(-2 ; 4)$	✓ $m_{MN} = -2$ ✓ $m_{NR} = \frac{1}{2}$ ✓ $y-6 = \frac{1}{2}(x-2)$ ✓ $2(-2x) - x - 10 = 0$ ✓ $x = -2$ ✓ $y = 4$ (6) ✓ $x^2 + y^2 = (x-2)^2 + (y-6)^2$ ✓ $4x + 12y = 40$ ✓ $x + 3y = 10$ ✓ $x + 3(-2x) = 10$ ✓ $x = -2$ ✓ $y = 4$ (6)

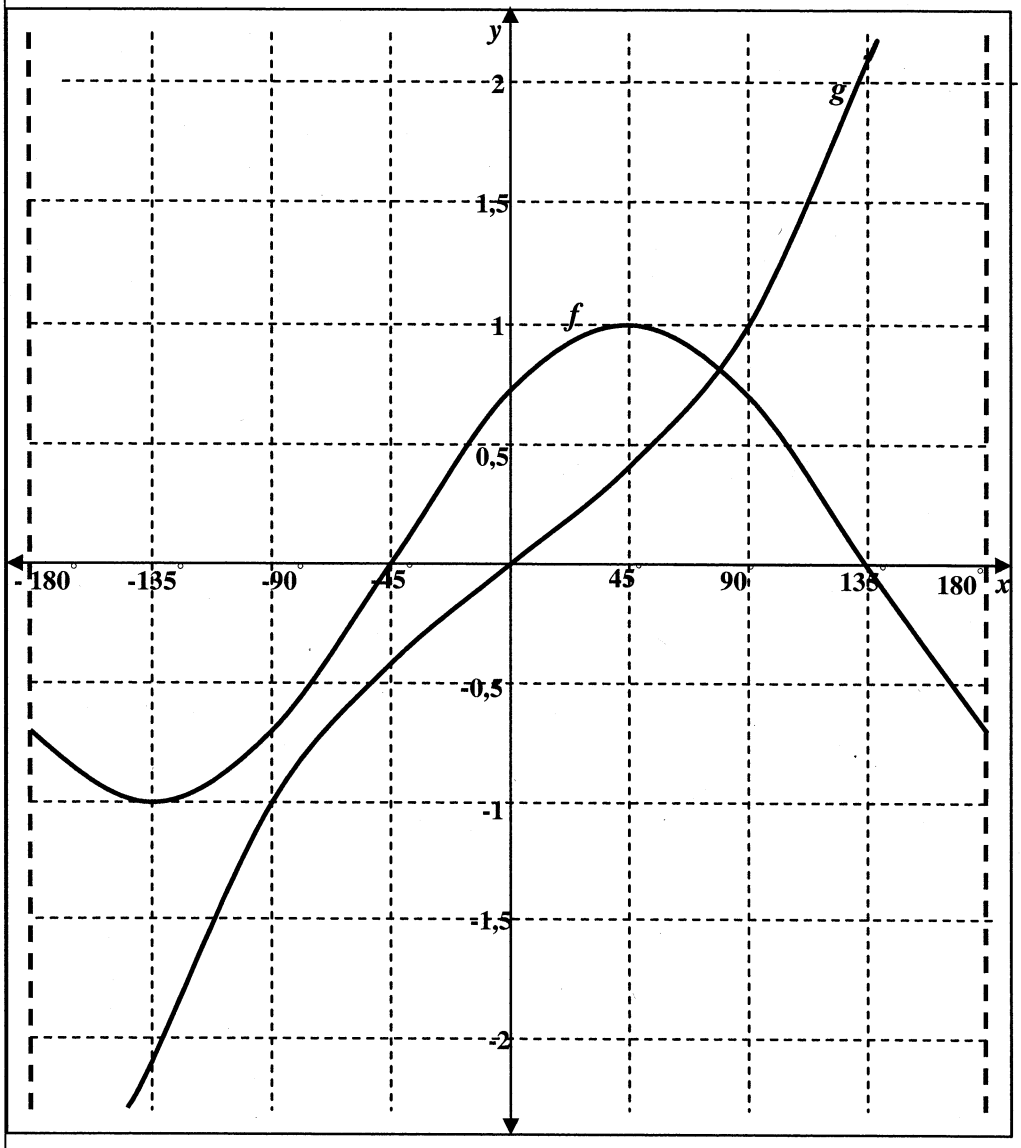
4.5	MNRO is a kite because/*vlieër omdat* OR = RN and /*en* MN = OM	✓Kite/*Vlieër* ✓ adjacent sides equal /*aangr.sye gelyk* (2) **[18]**

QUESTION 5 / *VRAAG 5*

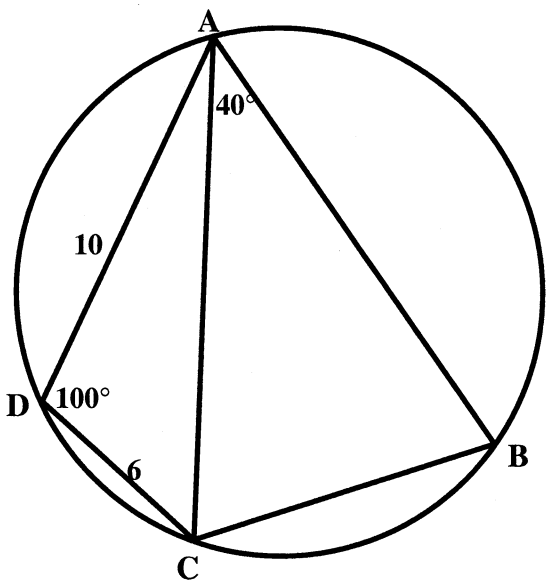
5.1	$\frac{\cos(180°+x)\,.\tan(360°-x).\sin^2(90°-x)}{\sin(180°-x)}+\sin^2 x$ $=\frac{(-\cos x).(-\tan x).\cos^2 x}{\sin x}+\sin^2 x$ $=\frac{\cos x.\frac{\sin x}{\cos x}.\cos^2 x}{\sin x}+\sin^2 x$ $=\cos^2 x+\sin^2 x$ $=1$	✓$-\cos x$ ✓$-\tan x$ ✓$\cos^2 x$ ✓$\sin x$ ✓$\cos^2 x+\sin^2 x$ ✓answer/*antwoord* (6)
5.2.1	$\cos(A-B)-\cos(A+B)$ $=\cos A\cos B+\sin A\sin B-[\cos A\cos B-\sin A\sin B]$ $=\cos A\cos B+\sin A\sin B-\cos A\cos B+\sin A\sin B$ $=2\sin A\sin B$	✓expansion of cos(A–B) / *uitbreiding van cos(A–B)* ✓expansion of cos(A+B) / *uitbreiding van cos(A+B)* ✓simplification / *vereenvoudig* (3)
5.2.2	$\cos 15°-\cos 75°=\cos(45°-30°)-\cos(45°+30°)$ $=2\sin 45°.\sin 30°$ $=2\times\frac{\sqrt{2}}{2}\times\frac{1}{2}$ or/*of* $2\times\frac{1}{\sqrt{2}}\times\frac{1}{2}$ $=\frac{\sqrt{2}}{2}$ or/ *of* $\frac{1}{\sqrt{2}}$	✓ $45°-30°$ and / *en* $45°+30°$ ✓$2\sin 45°.\sin 30$ ✓$\frac{\sqrt{2}}{2}\times\frac{1}{2}/\frac{1}{\sqrt{2}}\times\frac{1}{2}$ ✓answer / *antwoord* (4)

	OR $\cos 15° - \cos 75°$ $= \cos(45° - 30°) - \cos(45° + 30°)$ $= \cos 45°\cos 30° + \sin 45°\sin 30° - [\cos 45°\cos 30° - \sin 45°\sin 30°]$ $= 2\sin 45°\sin 30°$ $= 2 \times \frac{\sqrt{2}}{2} \times \frac{1}{2}$ or/*of* $2 \times \frac{1}{\sqrt{2}} \times \frac{1}{2}$ $= \frac{\sqrt{2}}{2}$ or/ *of* $\frac{1}{\sqrt{2}}$	✓ $45° - 30°$ and / *en* $45° + 30°$ ✓$2\sin 45°.\sin 30$ ✓$\frac{\sqrt{2}}{2} \times \frac{1}{2} / \frac{1}{\sqrt{2}} \times \frac{1}{2}$ ✓answer / *antwoord* (4)
5.3	$AB^2 = (\cos\theta - 6)^2 + (\sin\theta - 7)^2$ $86 = \cos^2\theta - 12\cos\theta + 36 + \sin^2\theta - 14\sin\theta + 49$ $86 = 1 + 36 + 49 - 12\cos\theta - 14\sin\theta$ $0 = -12\cos\theta - 14\sin\theta$ $14\sin\theta = -12\cos\theta$ $\frac{\sin\theta}{\cos\theta} = \frac{-12}{14}$ $\tan\theta = -\frac{6}{7}$/-0,86	✓ sub. into the distance formula / *vervang in die afstandformule* ✓simplification / *vereenvoudig* ✓$14\sin\theta = -12\cos\theta$ ✓ $\tan\theta = -\frac{6}{7}$/ 0,86 (4) **[17]**

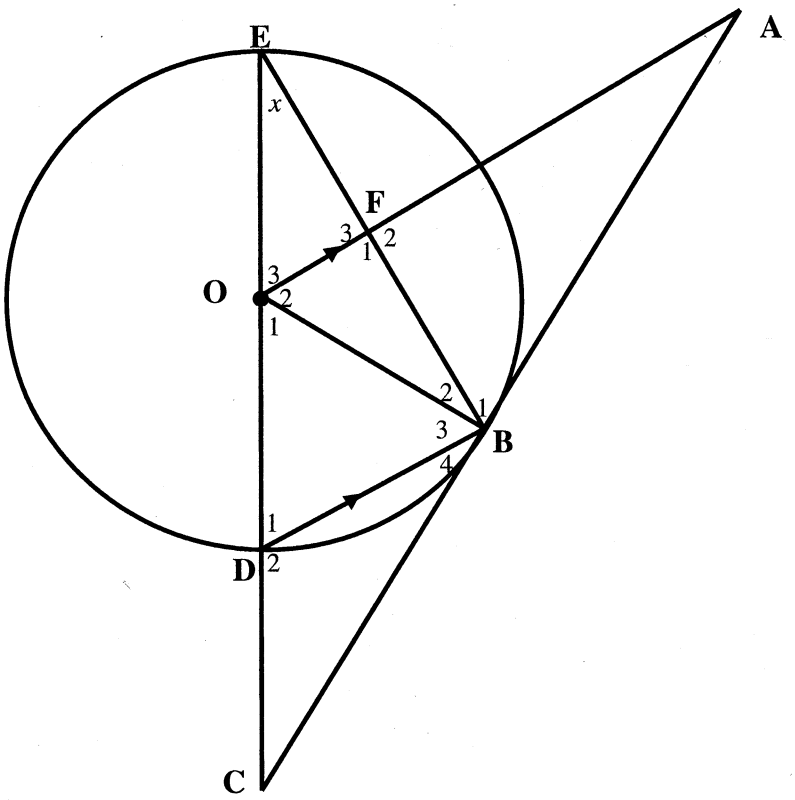
QUESTION 6 / *VRAAG 6*

6.1	 *f*: ✓ *x*-int/ *x-afsnitte* ✓ *y*-int,/*y-afsnit* ✓turning points / *draaipunte* *g*: ✓asymptotes, / *asimptote* ✓ passing (0,0) (-90°;-1) (90°;1), *gaan deur die punt (0;0)* (-90°;-1) (90°;1) ✓ (6)	
6.2.1	$x = -45°$ or $x = 135°$	✓ $x = -45°$ ✓ $x = 135°$ (2)
6.2.2	$x = 180°$ *or / of* $x = -180°$	✓$x = 180°$ ✓ $x = -180°$ (2)
6.2.3	$y \in [-1;1]$ or/*of* $-1 \leq y \leq 1$	✓answer / *antw* (1)
6.2.4	1	✓answer / *antw* (1)
6.2.5	$x \in (-180°;-45°)$ *or / of* $(0° ; 135°)$ **OR** $-180° < x < -45°$ or/of $0° < x < 135°$	✓ $-180°; -45°$ ✓ $0°; 135°$ ✓notation / *notasie* (3) **[15]**

QUESTION 7 / *VRAAG 7*

		
7.1	$AC^2 = 10^2 + 6^2 - 2(10)(6)\cos 100°$ $= 156{,}8377813$ $AC = 12{,}5$ units/*eenhede* $\hat{B} = 80°$ (opp angles of a cyclic quad/*teenoorst<e van koordev*) In ΔABC, $\frac{BC}{\sin 40°} = \frac{AC}{\sin B}$ $\frac{BC}{\sin 40} = \frac{12{,}5}{\sin 80°}$ $BC = \frac{12{,}5 \times \sin 40°}{\sin 80°}$ $= 8{,}2$ units	✓sub. into cosine rule / *vervang in die kosinus-reël* ✓ 156,8377813 ✓12,5 units / *eenhede* ✓$\hat{B} = 80°$ ✓sub. into sine rule / *vervang in die sinus-reël* ✓ answer / *antwoord* (6)
7.2	Area of $\Delta ABC = \frac{1}{2}AC.BC.\sin 60°$ $= \frac{1}{2}(12{,}5)(8{,}2)\sin 60°$ $= 44{,}4$ square units	✓ 60° ✓ sub. into the area rule / *vervang in die oppervlakte-reël* ✓ answer / *antwoord* (3) **[9]**

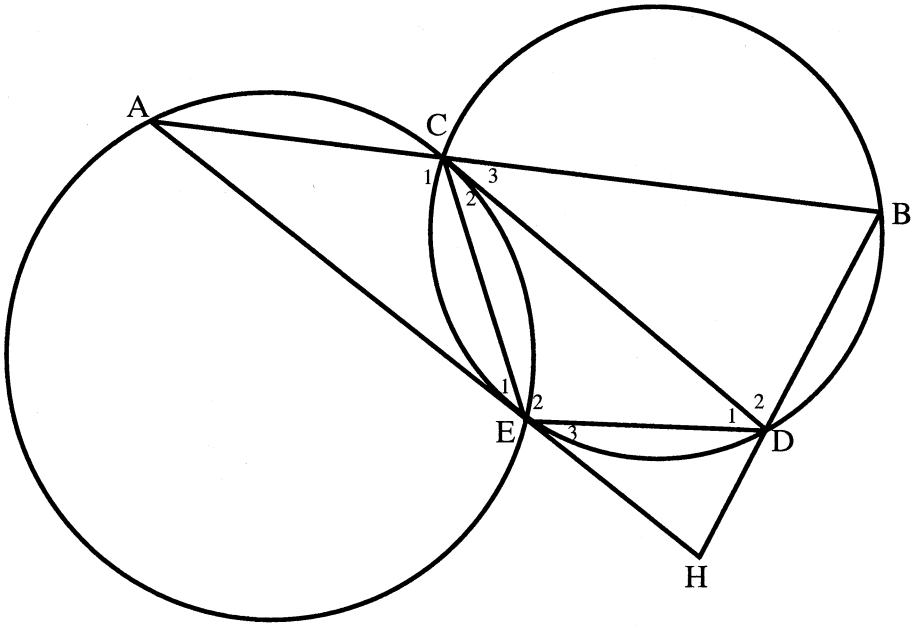
QUESTION 8 / *VRAAG 8*

8.1.1	90°	✓ ans / *antwoord* (1)
8.1.2	Angle in the alternate segment Die hoek in die teenoorstaande segment	✓ ans / *antwoord* (1)
8.2		
8.2.1	$\hat{B}_4 = \hat{E} = x$ (tan chord theorem / *hoek tussen raaklyn en koord*) $\hat{B}_4 = \hat{A} = x$ (corresponding angles / *ooreenkomstige hoeke*) $\hat{B}_2 = \hat{E} = x$ (radii / *radiusse* OE = OB)	✓S ✓R ✓S ✓R ✓S ✓R (6)
8.2.2	$\hat{B}_2 + \hat{B}_3 = 90°$ (subtended by a diameter / *onderspan deur middellyn*) $C\hat{B}E = 90° + x$	✓S ✓R ✓ ans / *antwoord* (3)
8.2.3	In ΔDBE, $\frac{EO}{OD} = \frac{EF}{FB}$ (line ‖ to one side of a Δ / lyn ‖ *aan een sy van* Δ) But/maar $\frac{EO}{OD} = 1$ (radii / *radiusse)* $\frac{EF}{FB} = 1$ EF = FB F is the midpoint of EB / *F is die middelpunt van EB*	✓S ✓R ✓ S ✓ EF = FB (4)

	OR In Δ EOF and ΔBOF $\hat{E} = \hat{B}_2$ (Proven in 8.2.1/Bewys in 8.2.1)) EO = OB (radii/radiusse) $\hat{D}_1 = \hat{B}_3$ ($\angle$s opp = sides/$\angle$e teenoor gelyke sye) $\hat{D}_1 = \hat{O}_3$ (corresp $\angle$ s/ooreenkomstige $\angle$e BD$\parallel$AO) $\therefore \hat{B}_3 = \hat{O}_3$ $\therefore \hat{B}_3 = \hat{O}_2$ (alt $\angle$ s/verwisselende $\angle$e BD$\parallel$AO) $\therefore \hat{O}_3 = \hat{O}_2$ Δ EOF $\equiv$ ΔBOF (AAS/HHS) EF = FB	✓$\hat{E} = \hat{B}_2$ ✓$\hat{D}_1 = \hat{B}_3$ ✓$\hat{D}_1 = \hat{O}_3$ ✓Δ EOF $\equiv$ ΔBOF (AAS/HHS) (4)
8.2.4	OF $\perp$ EB (line from centre to a midpoint / *lyn uit middelpunt van sirkel na middelpunt van koord)* EF = 4 (F is the midpoint / *F is die middelpunt*) $OE^2 = OF^2 + EF^2$ $= 3^2 + 4^2$ $= 25$ OE = 5 ED = 10 cm **OR / *OF*** $\hat{F}_3 = 90°$ (corresponding angles / *ooreenkomstige hoeke)* EF = 4 (F is the mid point / *F is die middelpunt*) $OE^2 = OF^2 + EF^2$ $= 3^2 + 4^2$ $= 25$ OE = 5 ED = 10 cm	✓ S/R ✓ EF = 4 ✓ OE = 5 ✓ans / *antwoord* **OR / *OF*** ✓ S/R ✓ EF = 4 ✓ OE = 5 ✓ans / *antwoord* (4)

	OR / *OF*	**OR / *OF***
	$OF = \frac{1}{2}DB$ (midpoint theorem/*middelpunt formule*)	✓ $OF = \frac{1}{2}DB$
	$DB = 6$ cm	✓ $DB = 6$
	In ΔEDB, $ED^2 = 6^2 + 8^2$ (Pythagoras thm/ *Pythagoras formule*)	✓Application of Pythagoras thm/*Toepassing van formule*
	$= 100$	✓ ans/*antwoord* (4)
	$ED = 10$	**[19]**

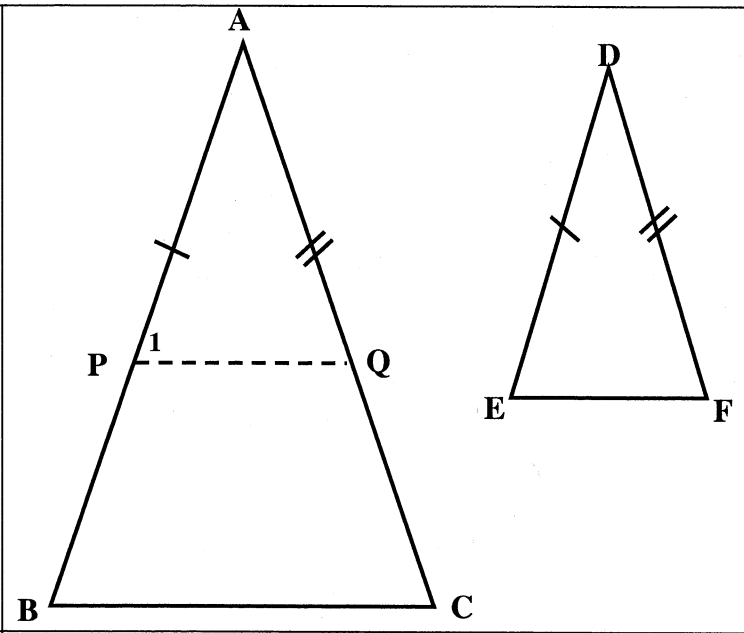
QUESTION 9 /*VRAAG 9*



9.1	$\hat{A} = \hat{C}_2$ (tan CD and chord CE / *raaklyn CD en koord CE)*	✓ $\hat{A} = \hat{C}_2$
		✓reason / *rede*
	$= \hat{E}_3$ (tan AEH and chord ED / *raaklyn AEH en koord ED*)	✓ $\hat{C}_2 = \hat{E}_3$
		✓ reason / *rede*
	But they are corresponding angles / *Maar hulle is ooreenkomstige hoeke*	✓corresponding angles / *ooreenkomstige hoeke*
	AB ‖ ED	(5)

	OR/*OF*	**OR/*OF***
	$\hat{A}+\hat{C}_1+\hat{E}_1=180°$ (sum of angles in a Δ/*som van die binne ∠^{e} van* Δ)	✓$\hat{A}+\hat{C}_1+\hat{E}_1=180°$ and $\hat{C}_2+\hat{E}_2+\hat{D}_1=180°$
	$\hat{C}_2+\hat{E}_2+\hat{D}_1=180°$ (Sum of angles in a Δ / *som van die binne ∠^{e} van* Δ)	✓$\hat{A}=\hat{C}_2$ ✓reason / *rede*
	But $\hat{A}=\hat{C}_2$ (tan CD and chord CE/ *raaklyn CD en koord CE*)	✓$\hat{E}_1=\hat{D}_1$
	$\hat{E}_1=\hat{D}_1$ (tan AEH and chord CE/ *raaklyn AEH en koord CE)*	✓ alt.angles / verwisselende *hoeke* (5)
	$\therefore \hat{C}_1=\hat{E}_2$ but they are alt.angles/ *Maar hulle is verwisselende hoeke* AB ∥ ED	
9.2	ACDE is a parallelogram because one pair of opposite sides (AC and ED) are equal and parallel / *ACDE is 'n parallelogram omdat een paar teenoorstaande sye (AC en ED) gelyk en ewewydig is*	✓answer / *antwoord* ✓reason / *rede* (2)
9.3	In ΔABH, $\frac{AC}{CB}=\frac{HD}{DB}$ (proportionality thm or AH ∥ CD/ *eweredigheidstelling of* AH ∥ CD) $\frac{HE}{EA}=\frac{HD}{DB}$ (proportionality thm or AB ∥ ED / *eweredigheidstelling* AB ∥ ED) $\frac{AC}{CB}=\frac{HE}{EA}$	✓$\frac{AC}{CB}=\frac{HD}{DB}$ ✓reason / *rede* ✓$\frac{HE}{EA}=\frac{HD}{DB}$ ✓reason / *rede* (4) **[11]**

QUESTION 10



10.1

Const: On AB ,mark off AP = DE and on AC, mark off AQ = DF/ *Op AB, merk op AP = DE en op AC, mark of AQ = DF.*

✓Construction/ *konstruksie*

Proof/*Bewys*: In ΔAPQ and Δ DEF:

AP = DE (const/*konstr*)

AQ = DF (const/ *konstr*)

$\hat{A} = \hat{D}$ (given / gegee)

ΔAPQ ≡ ΔDEF (SAS/SHS)

✓ ΔAPQ ≡ ΔDEF (SAS) (SHS)

$\hat{P}_1 = \hat{E}$

✓ $\hat{P}_1 = \hat{E}$

$\hat{P}_1 = \hat{B}$ $(\hat{E} = \hat{B})$

✓ $\hat{P}_1 = \hat{B}$

PQ ∥ BC (corresp. angles =/ *ooreenkomstige hoeke*)

✓ PQ ∥ BC

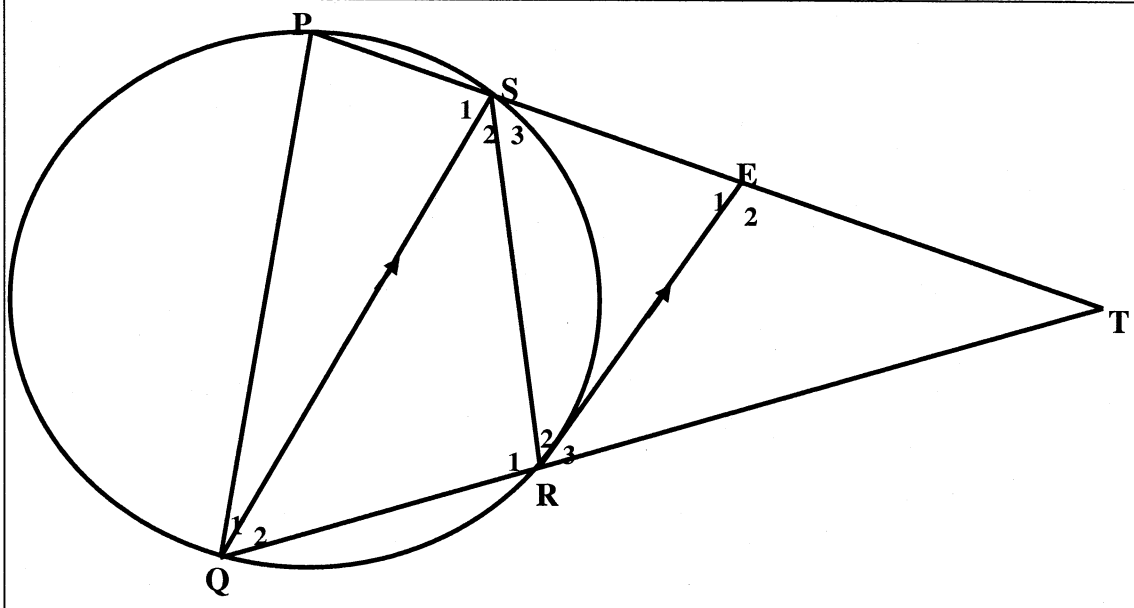
$\frac{AB}{AP} = \frac{AC}{AQ}$ (line // one side of a Δ / lyn // aan een sy van Δ)

✓ $\frac{AB}{AP} = \frac{AC}{AQ}$

$\frac{AB}{DE} = \frac{AC}{DF}$ (AP = DE and AQ = DF)

✓line // to one side of a triangle / *lyn // aan een sy van 'n driehoek*

(7)



10.2.1	$\hat{Q}_2 = \hat{R}_2$ (tan-chord theorem/ *tan-koord*) $= \hat{S}_2$ (alt angles QS//RE/*verwisselende*) QR = RS (side opp. of equal angles/ *sye teenoor gelyke hoeke*)	✓S✓R ✓S ✓R (4)
10.2.2	In ΔRST and ΔPQT $\hat{T} = \hat{T}$ (common/*gemeenskaplik*) $\hat{R}_2 + \hat{R}_3 = \hat{P}$ (ext. angle of a c.q PQRS/*buite hoek van kdvh PQRS*) $\hat{S}_3 = \hat{Q}_1 + \hat{Q}_3$ (ext. angle of c.q **or** 3rd angle inΔ/ *buite hoek van kdvh PQRS*) ΔRST ||| Δ PQT (AAA/ *HHH*)	✓$\hat{T} = \hat{T}$ ✓ $\hat{R}_2 + \hat{R}_3 = \hat{P}$ ✓Reason/Rede ✓3rd angle **or** Reason /*3e hoek of rede* (4)

10.2.3	$\frac{RS}{PQ} = \frac{ST}{QT} = \frac{RT}{PT}$ $(\Delta RST \ \|\|\| \ \Delta PQT)$	✓ R($\Delta RST \ \|\|\| \ \Delta PQT$)
	$\frac{RS}{PQ} = \frac{RT}{PT}$ .....(1) In ΔQST, QS ‖ RE	✓ $\frac{RS}{PQ} = \frac{RT}{PT}$
	$\therefore \frac{SE}{ET} = \frac{QR}{RT}$ (line drawn parallel to one side of a Δ/ *lyn parallel aan een sy van 'n* Δ)	✓ $\therefore \frac{SE}{ET} = \frac{QR}{RT}$ ✓ Reason/*rede*
	$\therefore \frac{SE}{ET} = \frac{RS}{RT}$ (QR = RS proved/bewys in 10.2.1)	
	$\therefore \frac{SE}{ET} = \frac{RS}{RT} = \frac{PQ}{PT}$ (from equation/u*it vergelyking* (1))	✓ $\therefore \frac{SE}{ET} = \frac{RS}{RT}$ (5)
		[20]

TOTAL / TOTAAL: 150

ANALYSIS GRID

Q.no	Concepts	Level 1	Level 2	Level 3	Level 4	Total
1.1	Equation of Regression line		3			
1.2	Prediction	2				
1.3	Estimation and Analysis				2	
1.4	$(\bar{x}\ ;\ \bar{y})$		4			
1.5	Correlation coefficient	1				
1.6	Relationship between the two variables	2				
Total		**5**	**7**		**2**	**14**
2.1	Finding the value of unknown	1				
2.2	Cumulative frequency table	2				
2.3	Ogive		3			
2.4	Modal class	1				
Total		**4**	**3**			**7**
3.1	Distance	2				
3.2	Equation of st. line	3				
3.3	Altitude		3			
3.4	Points of intersection		3			
3.5	Angle between two lines			5		
3.6	Analysis				4	
Total		**5**	**6**	**5**	**4**	**20**
4.1	Equation of a circle	3				
4.2	Distance		4			
4.3	Equation of a tangent			3		
4.4	Point of intersection			6		
4.5	Analysis	2				
Total		**5**	**4**	**9**		**18**
5.1	Reduction and identity		6			
5.2.1	Compound angle		3			
5.2.2	Deduction and special angle			4		
5.3	Trig and distance				4	
Total			**9**	**4**	**4**	**17**
6.1	Sketching of graphs			6		
6.2.1	Solutions	2				
6.2.2	Asympote		2			
6.2.3	Range	1				
6.2.4	Solutions	1				
6.2.4	Inequality			3		
Total		**4**	**2**	**9**		**15**
7.1	Application of cosine rule and sine rule		3	3		
7.2	Area rule		3			
Total			**6**	**3**		**9**

8.1.1	Diameter	1				
8.1.2	Tan-chord	1				
8.2.1	Geo. Reasoning			6		
8.2.2	App.tan-chord		3			
8.2.3	Proving mid point			4		
8.2.4	App. of thm		4			
Total		**2**	**7**	**10**		**19**
9.1	Tan- chord		5			
9.2	Parallellogram			2		
9.3	Proportinality			2	2	
Total			**5**	**4**	**2**	**11**
10.1	Similarity theorem		7			
10.2.1	Side opp. of equal angles	4				
10.2.2	Cyclic quad.		4			
10.2.3	Application of Similarity				5	
Total		**4**	**11**		**5**	**20**
Gr.Total		**29**	**60**	**44**	**17**	**150**
Expected marks		**30**	**52,5**	**45**	**22,5**	**150**
Actual %		**19,3%**	**40%**	**29,3%**	**11.3%**	**100**
Expected %		**20%**	**35%**	**30%**	**15%**	**100**