SA-STUDENT

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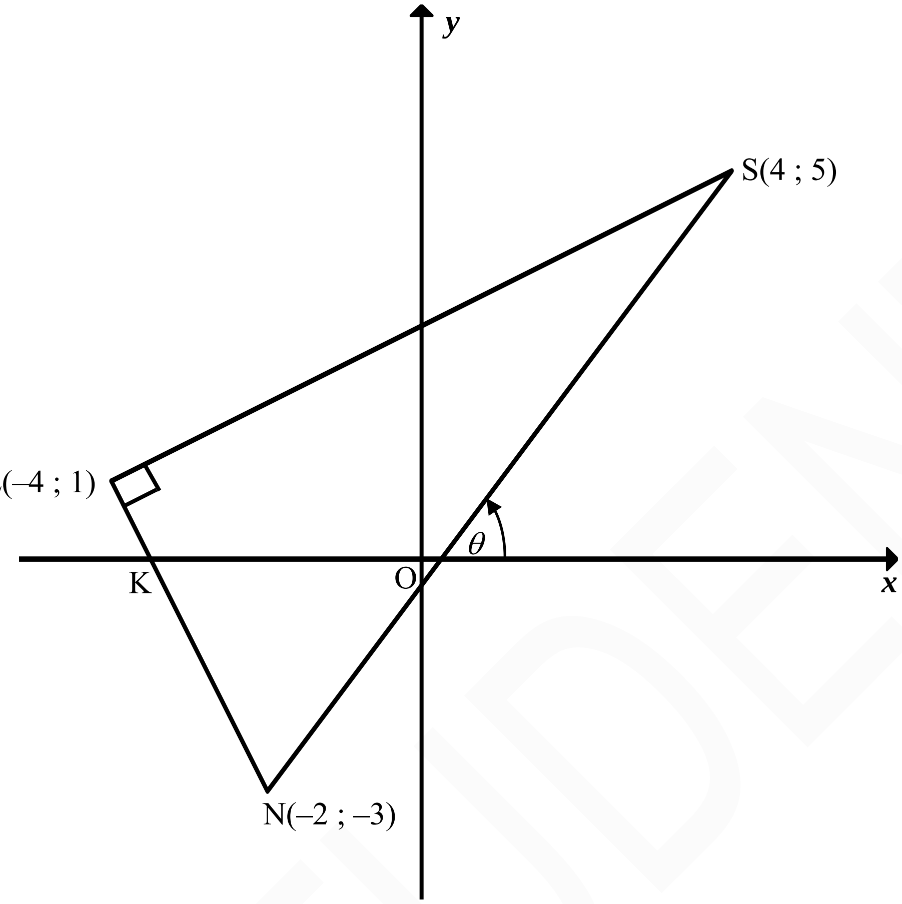
QUESTION/*VRAAG* 3

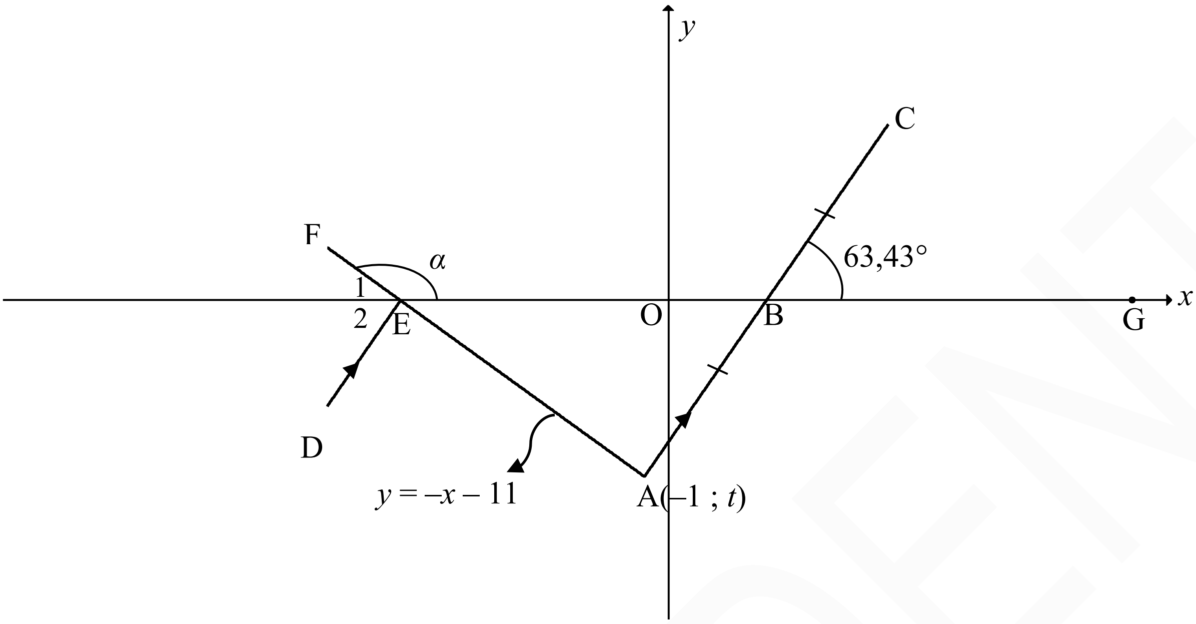


3.1	$SL = \sqrt{(x_S - x_L)^2 + (y_S - y_L)^2}$ $SL = \sqrt{(4-(-4))^2 + (5-1)^2}$ $SL = \sqrt{80} = 4\sqrt{5} = 8{,}94$ units	✓ substitution of S and L into correct formula ✓ answer (2)
3.2	$m_{SN} = \dfrac{5-(-3)}{4-(-2)}$ $m_{SN} = \dfrac{4}{3}$	✓ substitution of S and N into correct formula ✓ answer (2)
3.3	$m = \tan\theta = \dfrac{4}{3}$ $\theta = 53{,}13°$	✓ $\tan\theta = m_{SN}$ ✓ answer (2)
3.4	$m_{LN} = \dfrac{1-(-3)}{-4-(-2)}$ $m_{LN} = -2$ $L\hat{K}O = 116{,}565...°$ $L\hat{N}S = 116{,}565...° - 53{,}13°$ $L\hat{N}S = 63{,}44°$	✓ $m_{LN} = -2$ ✓ size of $L\hat{K}O$ ✓ answer (3)

	OR SN = 10 units $\sin L\hat{N}S = \frac{4\sqrt{5}}{10}$ $L\hat{N}S = 63{,}44°$	✓ SN = 10 units ✓ correct trig ratio ✓ answer (3)
	OR $LN = 2\sqrt{5}$ units $\tan L\hat{N}S = \frac{4\sqrt{5}}{2\sqrt{5}}$ $L\hat{N}S = 63{,}44°$	✓ $LN = 2\sqrt{5}$ units ✓ correct trig ratio ✓ answer (3)
	OR SN = 10 units $LN = 2\sqrt{5}$ units $\cos L\hat{N}S = \frac{2\sqrt{5}}{10}$ $L\hat{N}S = 63{,}44°$	✓ SN = 10 units and $LN = 2\sqrt{5}$ units ✓ correct trig ratio ✓ answer (3)
3.5	$m = \frac{4}{3}$ $1 = \frac{4}{3}(-4) + c$ $c = \frac{19}{3}$ $y = \frac{4}{3}x + \frac{19}{3}$ **OR** $y - 1 = \frac{4}{3}(x - (-4))$ $y - 1 = \frac{4}{3}x + \frac{16}{3}$ $y = \frac{4}{3}x + \frac{19}{3}$	✓ m_{SN} ✓ substitution of m_{SN} & L ✓ equation (3)
3.6	$SL = 4\sqrt{5}$ $LN = \sqrt{(-4-(-2))^2 + (1-(-3))^2}$ $LN = \sqrt{20} = 2\sqrt{5}$ Area $\Delta LSN = \frac{1}{2}(4\sqrt{5})(2\sqrt{5})$ $= 20$ units^2 **OR**	✓ $LN = \sqrt{20} = 2\sqrt{5}$ ✓ substitution into formula ✓ answer (3)

	SN = 10 units $LN=\sqrt{(-4-(-2))^2+(1-(-3))^2}$ $LN=\sqrt{20}=2\sqrt{5}$ Area $\Delta LSN=\frac{1}{2}(10)(2\sqrt{5})\sin 63,44°$ $= 20$ units^2	✓ $LN=\sqrt{20}=2\sqrt{5}$ ✓ substitution into formula ✓ answer (3)
3.7	$\hat{L}=90°$ SN is a diameter of circle S, L, N [chord subtends 90° **OR** converse ∠ in semi-circle] Centre of circle $= P\left(\frac{4+(-2)}{2};\frac{5+(-3)}{2}\right)$ $= P(1;1)$ **OR** Let the coordinates of P be $(a;b)$. Then, PL = PN: $(-4-a)^2+(1-b)^2=(-2-a)^2+(-3-b)^2$ $a-2b=-1$ …..equation 1 If PS = PN, then: $4a+2b=6$ ………….. equation 2 Solving simultaneously yields: $a=1$ and $b=1$ and $P(1;1)$ **OR** If PL = PN, then: $a-2b=-1$ …..equation 1 If PS = PL, then: $2a+b=3$ .....equation 2 Solving simultaneously yields: $a=1$ and $b=1$ and $P(1;1)$	✓ SN is a diameter of circle S, L, N ✓ x-value ✓ y-value (3) ✓ 2 correct linear equations ✓ x-value ✓ y-value (3) ✓ 2 correct linear equations ✓ x-value ✓ y-value (3)
3.8	$L\hat{P}N=\theta=53,13°$ [alt ∠s; LP ‖ x–axis] $\therefore L\hat{P}S=126,87°$ **OR** $L\hat{N}S=63,44°$ $\therefore L\hat{P}S=126,88°$ [∠ at centre = 2 ×∠ at circumference] **OR** $L\hat{S}N=26,56°$ [sum of ∠s in Δ] $S\hat{L}P=26,56°$ [∠s opp equal radii] $\therefore L\hat{P}S=126,88°$ [sum of ∠s in Δ] **OR** $(4\sqrt{5})^2=5^2+5^2-2(5)(5)\cos L\hat{P}S$ $\cos L\hat{P}S=-\frac{3}{5}$ $\therefore L\hat{P}S=126,87°$	✓ $L\hat{P}N$ ✓ answer (2) ✓ $L\hat{N}S$ ✓ answer (2) ✓ $L\hat{S}N$ ✓ answer (2) ✓ correct substitution into cosine formula ✓ answer (2)
		[20]

QUESTION/*VRAAG* 3



3.1.1	$y=-x-11$ A(–1 ; t) $t=-(-1)-11$ $t=-10$	✓ substitution ✓ value of t (2)
3.1.2	$\tan\alpha=-1$ $ref.\angle=45°$ $\therefore\alpha=135°$	✓ $\tan\alpha=-1$ ✓ 135° (2)
3.1.3	$\tan 63{,}43°=m_{AC}$ $m_{AC}=2$	✓ $\tan 63{,}43°=m_{AC}$ ✓ answer (2)
3.2	$m_{AC}=2$ A(–1 ; –10) $y=2x+k$ $-10=2(-1)+k$ $k=-8$ $y=2x-8$ **OR/*OF*** $y-y_1=2(x-x_1)$ $y-(-10)=2(x-(-1))$ $y=2x-8$	✓ substitution of m and A ✓ equation (2)

3.3.1	$y = 2x - 8$ $0 = 2x - 8$ $x_B = 4$ $\frac{x_C + (-1)}{2} = 4$ $\frac{y_C + (-10)}{2} = 0$ $x_C = 9$ $y_C = 10$ **OR/*OF*** by translation / *met translasie* $A \to B\ (x; y) \to (x+5; y+10)$ $B \to C\ (4;0) \to (4+5;\ 0+10) = (9\ ;\ 10)$	✓ $x_B = 4$ ✓ $x_C = 9$ ✓ $y_C = 10$ (3) ✓ $(x+5; y+10)$ ✓ $x_C = 9$ ✓ $y_C = 10$ (3)
3.3.2	$A\hat{B}E = 63{,}43°$ [vert. opp $\angle$'s =] $\hat{E}_2 = 63{,}43°$ [corres. $\angle$'s, DE ‖ AB] $\hat{E}_1 = 45°$ [$\angle$s on a str line] $F\hat{E}D = 108{,}43°$ **OR/*OF*** $E\hat{A}B = 135° - 63{,}43°$ $E\hat{A}B = 71{,}57°$ $D\hat{E}A = E\hat{A}B = 71{,}57°$ $F\hat{E}D = 108{,}43°$ **OR/*OF*** $A\hat{B}E = 63{,}43°$ [vert. opp $\angle$'s] $D\hat{E}O = 116{,}57°$ [co-int. $\angle$'s, DE ‖ AB] $F\hat{E}D = 360° - (116{,}57° + 135°)$ $= 108{,}43°$	✓ $A\hat{B}E = 63{,}43°$ ✓ $\hat{E}_1 = 45°$ ✓ $F\hat{E}D = 108{,}43°$ (3) ✓ $E\hat{A}B = 71{,}57°$ ✓ $D\hat{E}A = E\hat{A}B = 71{,}57°$ ✓ $F\hat{E}D = 108{,}43°$ (3) ✓ $A\hat{B}E = 63{,}43°$ ✓ $D\hat{E}O = 116{,}57°$ ✓ $F\hat{E}D = 108{,}43°$ (3)
3.4	$y = 0$ $x_E = -11$ $\frac{x_G + (-11)}{2} = 4$ $x_G = 19$ $(x-19)^2 + y^2 = 15^2$ $(x-19)^2 + y^2 = 225$	✓ $x_E = -11$ ✓ $x_G = 19$ ✓ $(x-19)^2 + y^2$ ✓ 225 (4)
		[18]

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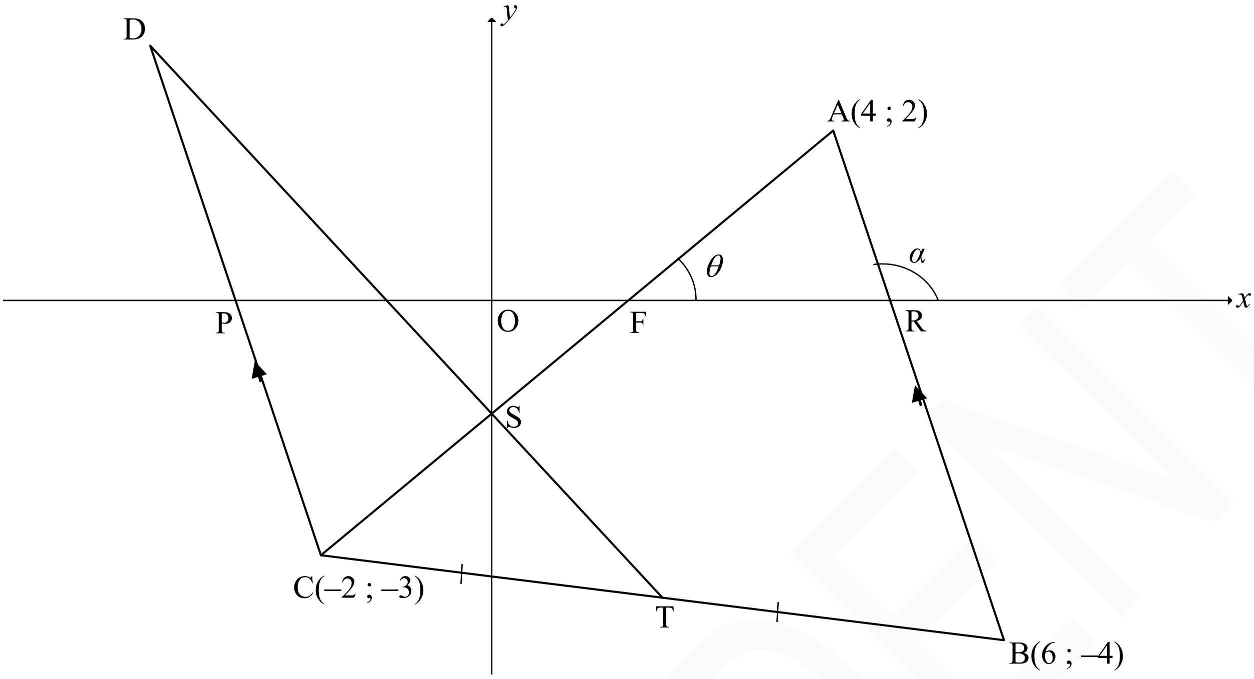
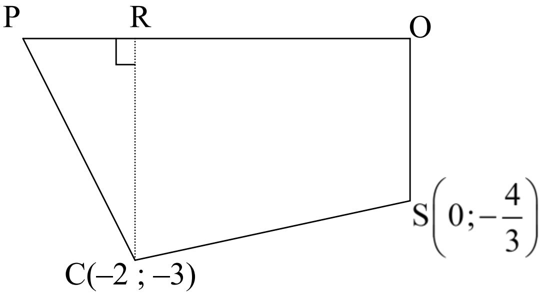
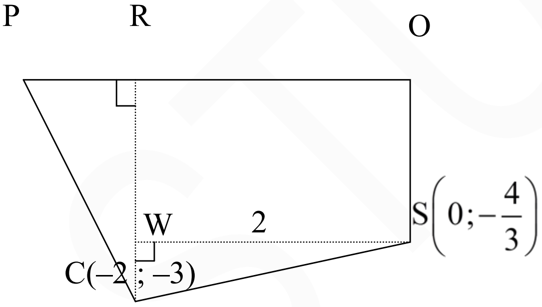


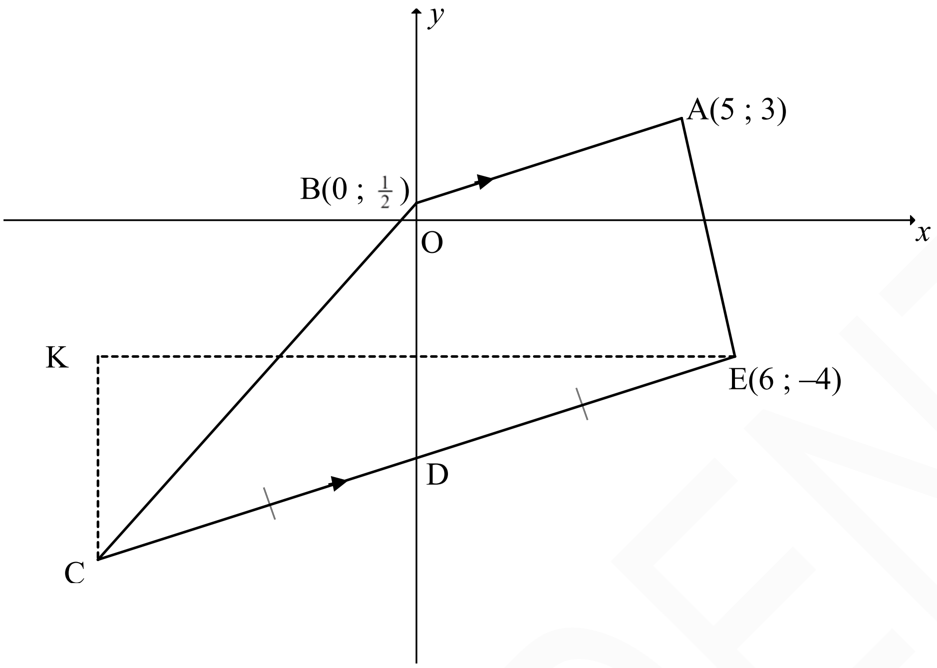
3.1.1	$m_{AB}=\frac{2-(-4)}{4-6}$ **OR** $m_{AB}=\frac{-4-2}{6-4}$ $m_{AB}=-3$ ANSWER ONLY: Full marks	✓ substitution ✓ answer (2)
3.1.2	$\tan\alpha=m_{AB}=-3$ $\alpha=108{,}43°$ ANSWER ONLY: Full marks	✓ $\tan\alpha=m_{AB}=-3$ ✓ answer (2)
3.1.3	$T\left(\frac{x_1+x_2}{2};\frac{y_1+y_2}{2}\right)$ $T\left(\frac{-2+6}{2};\frac{-3-4}{2}\right)$ $T\left(2\,;\frac{-7}{2}\right)$	✓ $x_T=2$ ✓ $y_T=\frac{-7}{2}$ (2)
3.1.4	$5(0)-6y=8$ $y=-\frac{4}{3}$ $S\left(0;\frac{-4}{3}\right)$	✓ $x_S=0$ ✓ $y_S=\frac{-4}{3}$ (2)
3.2	$m_{CD}=m_{AB}=-3$ $-3=-3(-2)+c$ OR $y-(-3)=-3(x-(-2))$ $c=-9$ $y=-3x-9$ $y=-3x-9$	✓ gradient ✓ substitution of C(–2 ; –3) ✓ equation (3)

3.3.1	$5x-6y=8$ $y=\frac{5}{6}x-\frac{8}{6}$ $\tan\theta=m_{AC}=\frac{5}{6}$ $\theta=39{,}81°$ $\hat{A}=108{,}43°-39{,}81°$ $=68{,}62°$ $D\hat{C}A=68{,}62°$ [alt ∠s ; DC‖AB]	✓ $\tan\theta=m_{AC}=\frac{5}{6}$ ✓ $\theta=39{,}81°$ ✓ $\hat{A}=68{,}62°$ ✓ answer (4)
3.3.2	$P(-3;0)$ and F(1,6 ; 0) Area POSC = Area ΔFPC – Area ΔOFS $=\frac{1}{2}(4,6)(3)-\frac{1}{2}(1,6)\left(\frac{4}{3}\right)$ = 6,9 – 1,07 = 5,83 units^2 **OR/*OF*** $P(-3;0)$ $FC=\sqrt{\left(-2-\frac{8}{5}\right)^2+(-3-0)^2}=\frac{3\sqrt{61}}{5}$ Area $\Delta PFC=\frac{1}{2}(PF)(FC)\sin O\hat{F}S$ $=\frac{1}{2}\left(\frac{23}{5}\right)\left(\frac{3\sqrt{61}}{5}\right)\sin 39,81°$ $=6{,}90$ Area $\Delta OFS=\frac{1}{2}\left(\frac{8}{5}\right)\left(\frac{4}{3}\right)$ = 1,07 Area POSC = 6,90 – 1,07 = 5,83 units^2 **OR/*OF***	✓ $P(-3;0)$ ✓ method ✓ $\frac{1}{2}(4,6)(3)$ ✓ $\frac{1}{2}(1,6)\left(\frac{4}{3}\right)$ ✓ answer (5) ✓ $P(-3;0)$ ✓ $\frac{1}{2}\left(\frac{23}{5}\right)\left(\frac{3\sqrt{61}}{5}\right)\sin 39,81°$ ✓ $\frac{1}{2}\left(\frac{8}{5}\right)\left(\frac{4}{3}\right)$ ✓ method ✓ answer (5)

		
	$P(-3;0)$	✓ $P(-3;0)$
	Area of POSC = Area of OSCR + Area of ΔPRC	✓ method
	$=\frac{1}{2}\left(\frac{4}{3}+3\right)\times 2+\frac{1}{2}(1\times 3)$	✓ $\frac{1}{2}\left(\frac{4}{3}+3\right)\times 2$ ✓ $\frac{1}{2}(1\times 3)$
	$=\frac{35}{6}$	
	$=5,83\text{ units}^2$	✓ answer (5)
	OR/ ***OF***	
		
	$P(-3;0)$	✓ $P(-3;0)$
	Area POSC = Area ROSW + Area ΔPRC + Area ΔWSC	✓ method
	$=\left(\frac{4}{3}\right)(2)+\frac{1}{2}(1)(3)+\frac{1}{2}(2)\left(\frac{5}{3}\right)$	✓ $\frac{1}{2}(1)(3)$ ✓ $\left(\frac{4}{3}\right)(2)+\frac{1}{2}(2)\left(\frac{5}{3}\right)$
	$=\frac{35}{6}$	
	$=5,83\text{units}^2$	✓ answer (5)
	OR/*OF*	

	$P(-3;0)$ Area of $\Delta PSC = \frac{1}{2}(PC)(CS)\sin D\hat{C}A$ $= \frac{1}{2}\left(\sqrt{10}\right)\left(\frac{\sqrt{61}}{3}\right)\sin 68,62°$ $= 3,833..$ Area of $\Delta POS = \frac{1}{2}(PO)(OS)$ $= \frac{1}{2}(3)\left(\frac{4}{3}\right)$ $= 2$ Area POSC = 3,833… + 2 $= 5,83\text{units}^2$	✓ $P(-3;0)$ ✓ $\frac{1}{2}\left(\sqrt{10}\right)\left(\frac{\sqrt{61}}{3}\right)\sin 68,62°$ ✓ $\frac{1}{2}(3)\left(\frac{4}{3}\right)$ ✓ method ✓ answer (5)
		[20]

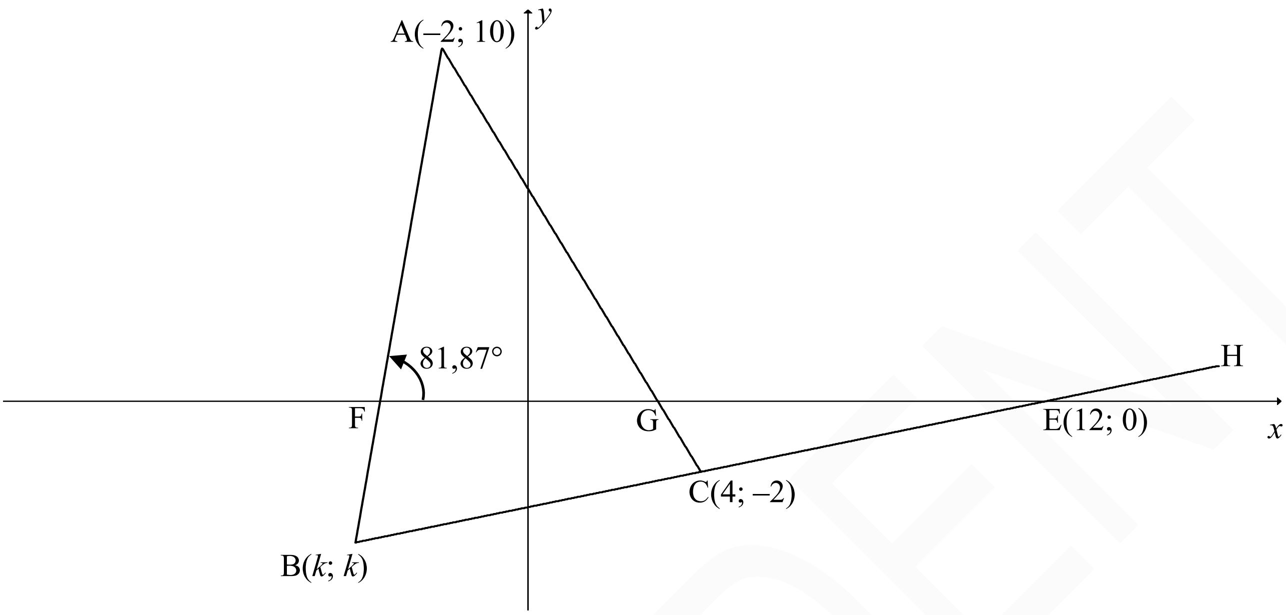
QUESTION/*VRAAG* 3



3.1	$m_{AB} = \dfrac{3-\frac{1}{2}}{5-0}$ $m_{AB} = \dfrac{1}{2}$ Answer only 2/2	✓ substitution ✓ answer (2)
3.2	$m_{CE} = m_{BA} = \dfrac{1}{2}$ $-4 = \dfrac{1}{2}(6)+c$ **OR/*OF*** $y-(-4) = \dfrac{1}{2}(x-6)$ $c = -7$ $y = \dfrac{1}{2}x - 7$	✓ gradient ✓ substitution of E ✓ answer (3)
3.3.1	D(0 ; –7) $\dfrac{x_C + 6}{2} = 0$ $\dfrac{y_C + (-4)}{2} = -7$ $x_C = -6$ $y_C = -10$ C(–6 ; –10) Answer only 3/3	✓ D(0 ; –7) ✓ $x_C = -6$ ✓ $y_C = -10$ (3)
3.3.2	Area Δ BCD $= \dfrac{1}{2}(7{,}5)(6)$ $= 22{,}5$ Area Δ ABD $= \dfrac{1}{2}(7{,}5)(5)$ $= 18{,}75$ Area ABCD $= 22{,}5 + 18{,}75 = 41{,}25$ units^2	✓ subst of correct base and height into the area formula ✓ area ΔBCD = 22,5 ✓ area ΔABD = 18,75 ✓ answer (4)

3.4.1	K(–6 ; –4)	✓ $x_K = -6$ ✓ $y_K = -4$ (2)
3.4.2a	KC = 6 units; KE = 12 units; $CE = \sqrt{(6)^2 + (12)^2}$ [Pythagoras] $CE = \sqrt{180} = 6\sqrt{5} = 13,42$ Perimeter ΔKEC = $6 + 12 + \sqrt{180}$ = 31,42 units	✓ KC = 6 units ✓ KE = 12 units ✓ CE ✓ answer (4)
3.4.2b	$\tan K\hat{C}E = \frac{KE}{KC} = \frac{12}{6} = 2$ $K\hat{C}E = 63,43°$ **OR/*OF*** $\sin K\hat{C}E = \frac{KE}{CE} = \frac{12}{\sqrt{180}} = \frac{2\sqrt{5}}{5}$ $K\hat{C}E = 63,43°$ **OR/*OF*** $m_{CE} = \frac{1}{2}$ $\tan\theta = \frac{1}{2}$ $\theta = 26,57°$ $K\hat{C}E = 90° - 26,57°$ $K\hat{C}E = 63,43°$ **OR/*OF*** $KE^2 = KC^2 + CE^2 - 2(KC)(CE)\cos K\hat{C}E$ $(12)^2 = (6)^2 + (\sqrt{180})^2 - 2(6)(\sqrt{180})(\cos K\hat{C}E)$ $\cos K\hat{C}E = \frac{\sqrt{5}}{5}$ $K\hat{C}E = 63,43°$	✓ trig ratio ✓ $\tan K\hat{C}E = 2$ ✓ answer (3) ✓ trig ratio ✓ $\sin K\hat{C}E = \frac{12}{\sqrt{180}}$ ✓ answer (3) ✓ $\tan\theta = \frac{1}{2}$ ✓ $\theta = 26,57°$ ✓ answer (3) ✓ substitution into cosine rule ✓ trig ratio ✓ answer (3)
		[21]

QUESTION/*VRAAG* 3

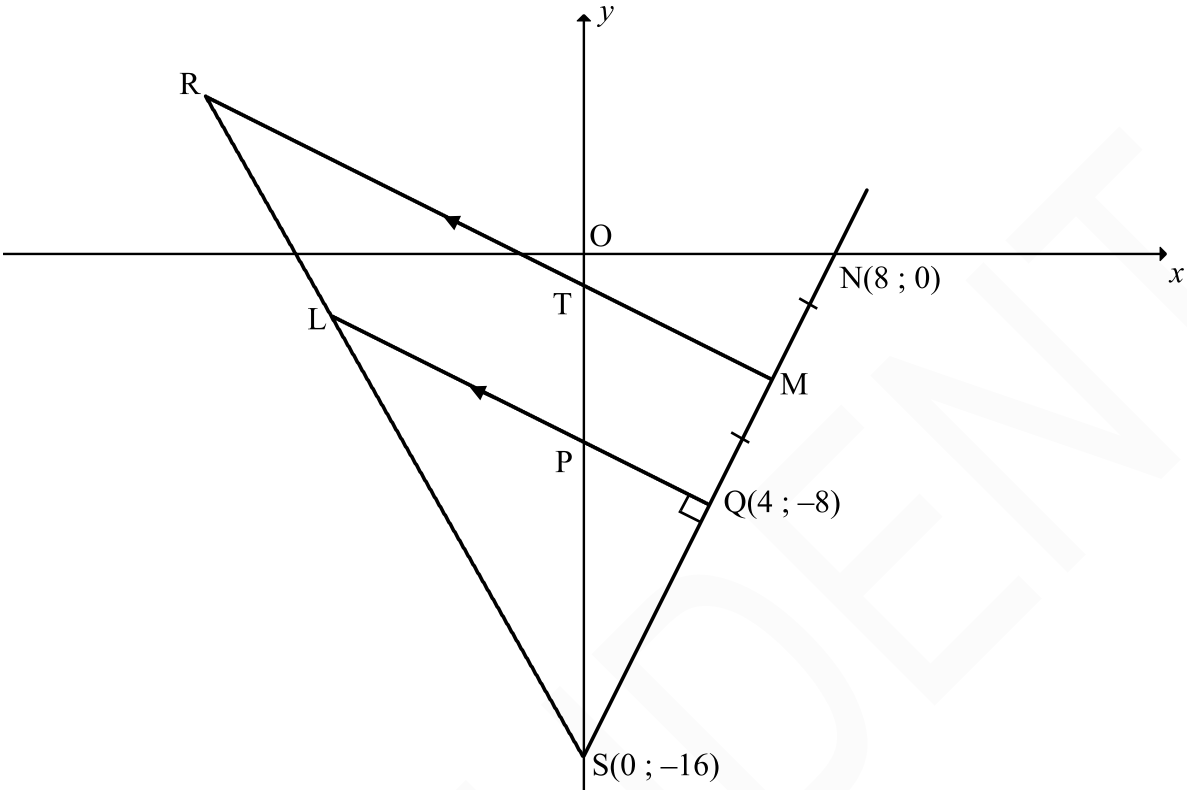


3.1.1	$m_{BE} = m_{CE} = \frac{0-(-2)}{12-4}$ **OR/*OF*** $m_{BE} = m_{CE} = \frac{-2-0}{4-12}$ $= \frac{1}{4}$ $= \frac{1}{4}$	✓ substitution C & E ✓ answer (2)
3.1.2	$m_{AB} = \tan 81{,}87°$ $m_{AB} = 7$ Answer only: Full marks *Slegs antw: Volpunte*	✓ substitution ✓ answer (2)
3.2	$y = mx + c$ $y - y_1 = m(x - x_1)$ $0 = \frac{1}{4}(12) + c$ or $y - 0 = \frac{1}{4}(x - 12)$ $c = -3$ $y = \frac{1}{4}x - 3$ $y = \frac{1}{4}x - 3$ **OR/*OF*** $y = mx + c$ $y - y_1 = m(x - x_1)$ $-2 = \frac{1}{4}(4) + c$ or $y - (-2) = \frac{1}{4}(x - 4)$ $c = -3$ $y = \frac{1}{4}x - 3$ $y = \frac{1}{4}x - 3$	✓ substitution of E ✓ answer (2) ✓ substitution of C ✓ answer (2)

3.3.1	$y=\frac{1}{4}x-3$ $k=\frac{1}{4}k-3$ $\frac{3}{4}k=-3$ $k=-4$ $\therefore B(-4;-4)$	✓ substitution ✓ answer (2)
	OR/*OF* $m_{BE}=\frac{1}{4}$ $\frac{0-k}{12-k}=\frac{1}{4}$ $-4k=12-k$ $k=-4$ $\therefore B(-4;-4)$ **OR/*OF*** $m_{BE}=\frac{1}{4}$ $\frac{k}{k-12}=\frac{1}{4}$ $4k=k-12$ $k=-4$	✓ substitution ✓ answer (2)
	OR/*OF* $m_{AB}=\tan 81{,}87°$ $m_{AB}=7$ $m_{AB}=\frac{10-k}{-2-k}$ $7(-2-k)=10-k$ $-14-7k=10-k$ $-6k=24$ $k=-4$ $\therefore B(-4;-4)$	✓ substitution ✓ answer (2)
	OR/*OF* EB: $y=\frac{1}{4}x-3$ and AB: $y=7x+24$ $\frac{1}{4}x-3=7x+24$ $\frac{27}{4}x=-27$ $x=k=-4$ $\therefore B(-4;-4)$	✓ equating EB & AB ✓ answer (2)

3.3.2	In ΔAFG: $m_{AC} = \frac{10-(-2)}{-2-4} = -2$ $\tan\theta = m_{AC} = -2$ $\theta = 180° - 63,43...°$ $\therefore \theta = 116,57°$ $\therefore \hat{A} = 116,57° - 81,87°$ [ext ∠ of Δ] $\therefore \hat{A} = 34,70°$ **OR/*OF*** In ΔABC: $a = BC = 2\sqrt{17}; b = AC = 6\sqrt{5}; c = AB = 10\sqrt{2}$ $a^2 = b^2 + c^2 - 2bc.\cos A$ $\left(2\sqrt{17}\right)^2 = \left(6\sqrt{5}\right)^2 + \left(10\sqrt{2}\right)^2 - 2(6\sqrt{5})(10\sqrt{2}).\cos A$ $\cos A = \frac{\left(6\sqrt{5}\right)^2 + \left(10\sqrt{2}\right)^2 - \left(2\sqrt{17}\right)^2}{2\left(6\sqrt{5}\right)\left(10\sqrt{2}\right)}$ $= 0,822...$ $\therefore A = 34,7°$	✓ $m_{AC} = -2$ ✓ $\tan\theta = -2$ ✓ $\theta = 116,57°$ ✓ answer (4) ✓ all 3 lengths ✓ substitution into the correct cosine rule ✓ cos A subject ✓ answer (4)
3.3.3	$M\left(\frac{12+(-2)}{2}; \frac{10+(0)}{2}\right)$ Diagonals intersect at the point (5 ; 5)	✓ *x*-value ✓ *y*-value (2)
3.4.1	BE = ET $4\sqrt{17} = \sqrt{(12-p)^2 + (0-p)^2}$ $\left(4\sqrt{17}\right)^2 = \left(\sqrt{(12-p)^2 + (0-p)^2}\right)^2$ $272 = 144 - 24p + p^2 + p^2$ $p^2 - 12p - 64 = 0$ $(p-16)(p+4) = 0$ $\therefore p = 16$ or $p = -4$ (n.a.) $\therefore T(16; 16)$	✓ substitution of E & T ✓ equating ✓ standard form ✓ factors ✓ $p = 16$ (5)
3.4.2a	$(x-12)^2 + y^2 = \left(4\sqrt{17}\right)^2 = 272$	✓ LHS ✓ RHS (2)
3.4.2b	$m_{radius} = \frac{1}{4}$ $m_{tangent} = -4$ $y = -4x + c$ $-4 = -4(-4) + c$ $c = -20$ $y = -4x - 20$ **OR/*OF*** $y - y_1 = -4(x - x_1)$ $y - (-4) = -4(x - (-4))$ $y = -4x - 20$	✓ $m_{tangent}$ ✓ substitution of B ✓ equation (3)
		[24]

QUESTION/VRAAG 3

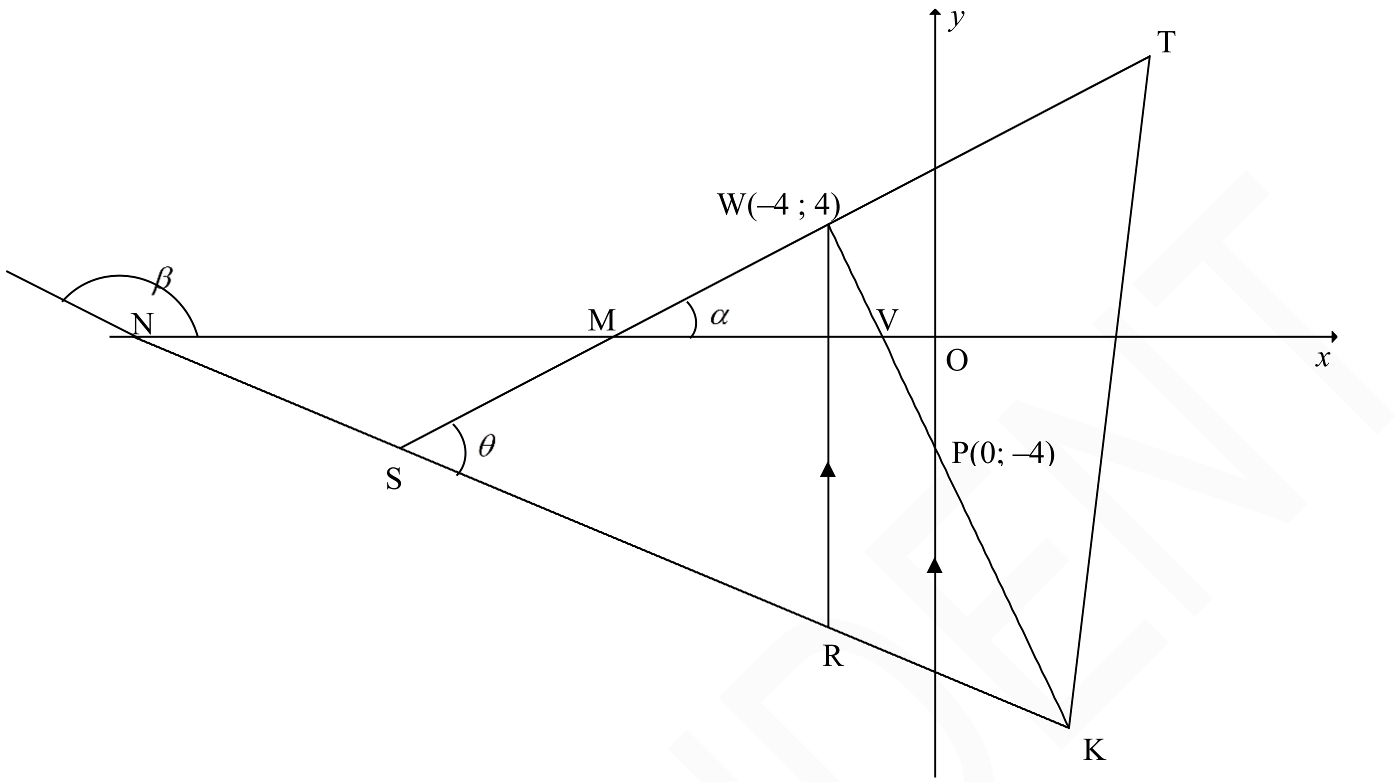


3.1	$M\left(\frac{4+8}{2};\frac{-8+0}{2}\right)$ $M(6;-4)$	✓ x_M ✓ y_M (2)
3.2	$m_{NS}=\frac{0-(-16)}{8-0}$ or $m_{NQ}=\frac{0-(-8)}{8-4}$ or $m_{QS}=\frac{-8-(-16)}{4-0}$ $=2$	✓ subst N and Q or N and Q or Q and S into gradient formula ✓ answer (2)
3.3	$m_{LQ}\times 2=-1$ [LQ ⊥ NS] $\therefore m_{LQ}=-\frac{1}{2}$ $-8=-\frac{1}{2}(4)+c$ **OR** $y+8=-\frac{1}{2}(x-4)$ $c=-6$ $y+8=-\frac{1}{2}x+2$ $\therefore y=-\frac{1}{2}x-6$	✓ m_{LQ} ✓ substitution of Q ✓ calculation of *c* or simplification (3)
3.4	OS is the radius of circle passing through S $(x-0)^2+(y-0)^2=(16)^2$ $x^2+y^2=256$ Answer only: Full marks	✓ identifying radius = 16 ✓ Equation of circle (2)

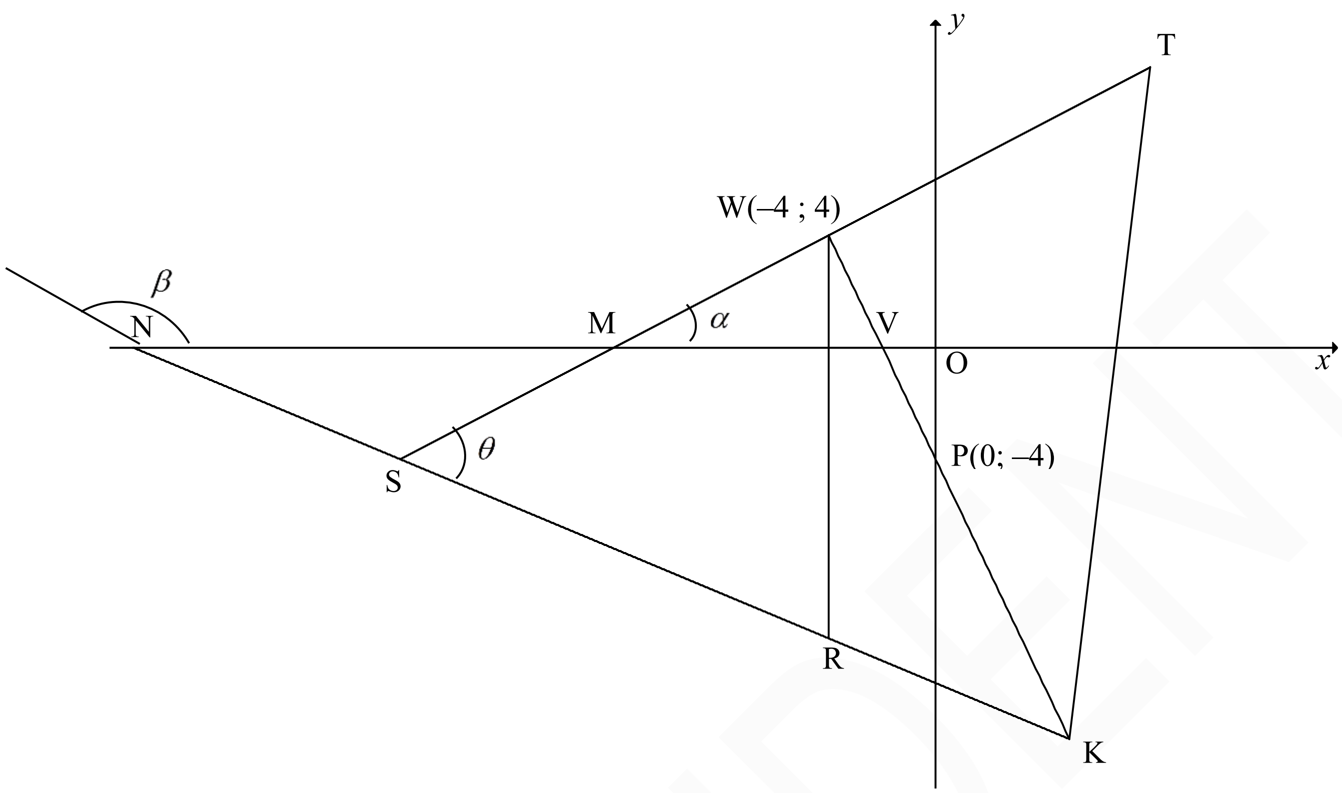
3.5	$m_{RM} = m_{LQ} = -\frac{1}{2}$ [RM ‖ LQ] $-4 = -\frac{1}{2}(6) + c$ **OR** $y + 4 = -\frac{1}{2}(x - 6)$ $c = -1$ $y + 4 = -\frac{1}{2}x + 3$ $\therefore y = -\frac{1}{2}x - 1$ T(0;−1)	✓ m_{RM} ✓ substitution of M(6;−4) ✓ coordinates of T (3)
3.6	T(0;−1), P(0;−6) and S(0;−16) ∴ PS = 10 units and TS = 15 units $\frac{LS}{RS} = \frac{PS}{TS} = \frac{2}{3}$ [prop theorem; RM ‖ LP] **OR** [line ‖ one side of Δ/*lyn* ‖ *een sy v Δ*] Answer only: Full marks **OR** M(6 ; –4), Q(4 ; –8) and S(0 ; –16) MS = $\sqrt{180} = 6\sqrt{5}$ and QS = $\sqrt{80} = 4\sqrt{5}$ $\frac{LS}{RS} = \frac{QS}{MS} = \frac{2}{3}$ [prop theorem; RM ‖ LQ] **OR** [line ‖ one side of Δ/*lyn* ‖ *een sy v Δ*] Answer only: Full marks	✓ PS = 10 units ✓ TS = 15 units ✓ answer (3) ✓ MS $= 6\sqrt{5}$ units ✓ QS $= 4\sqrt{5}$ units ✓ answer (3)
3.7	area of PTMQ = area of ΔTSM – area of ΔPSQ $= \frac{1}{2}.ST. \perp h_M - \frac{1}{2}.PS. \perp h_Q$ $= \frac{1}{2}(15)(6) - \frac{1}{2}(10)(4)$ = 45 – 20 = 25 square units **OR** $TM = \sqrt{45} = 3\sqrt{5} = 6{,}71$ $MQ = \sqrt{20} = 2\sqrt{5} = 4{,}47$ $PQ = \sqrt{20} = 2\sqrt{5} = 4{,}47$ area of trapezium PTMQ $= \frac{1}{2}\left(3\sqrt{5} + 2\sqrt{5}\right)\left(2\sqrt{5}\right)$ $= \frac{1}{2}\left(5\sqrt{5}\right)\left(2\sqrt{5}\right)$ = 25 square units	✓ area of ΔTSM – area of ΔPSQ ✓ area ΔTSM = 45 ✓ area ΔPSQ = 20 ✓ answer (4) ✓ TM $= 3\sqrt{5}$ MQ $= 2\sqrt{5}$ PQ $= 2\sqrt{5}$ ✓ area of trapezium = $\frac{1}{2}$ (sum of ‖sides)(height) ✓ substitute into formula ✓ answer (4)

	OR $MQ=\sqrt{20}=2\sqrt{5}$ $PQ=\sqrt{20}=2\sqrt{5}$ $TP=5$ area of PTMQ= area of ΔMTP+ area of ΔPQM $\text{area of PTMQ}=\frac{1}{2}TP\times\perp h_M+\frac{1}{2}MQ\times PQ$ $\text{area of PTMQ}=\frac{1}{2}(5)\times 6+\frac{1}{2}(2\sqrt{5})(2\sqrt{5})$ area of PTMQ= $10+15=25$	✓ area of ΔMTP + area of ΔPQM ✓ area ΔMTP = 10 ✓ area ΔPQM = 15 ✓ answer (4)
		[19]

QUESTION/*VRAAG* 3



3.1	$m_{WP} = \frac{4-(-4)}{-4-0} = \frac{8}{-4}$ $m_{WP} = -2$	✓ substitution of W and P ✓ m_{WP} (2)
3.2	$m_{ST} = \frac{1}{2}$ (given) $(m_{WP})(m_{ST}) = (-2)\left(\frac{1}{2}\right)$ $= -1$ $\therefore ST \perp WP$	✓ $(m_{WP})(m_{ST})$ ✓ $(m_{WP})(m_{ST}) = -1$ (2)
3.3	$5y + 2x + 60 = 0$ $\therefore y = -\frac{2}{5}x - 12$ $-\frac{2}{5}x - 12 = \frac{1}{2}x + 6$ $-4x - 120 = 5x + 60$ $9x = -180$ $x = -20$ $\therefore y = -\frac{2}{5}(-20) - 12$ $\therefore y = -4$ $\therefore$ S(–20; –4) **OR**	✓ equating ✓ x value ✓ substitution ✓ y value (4)

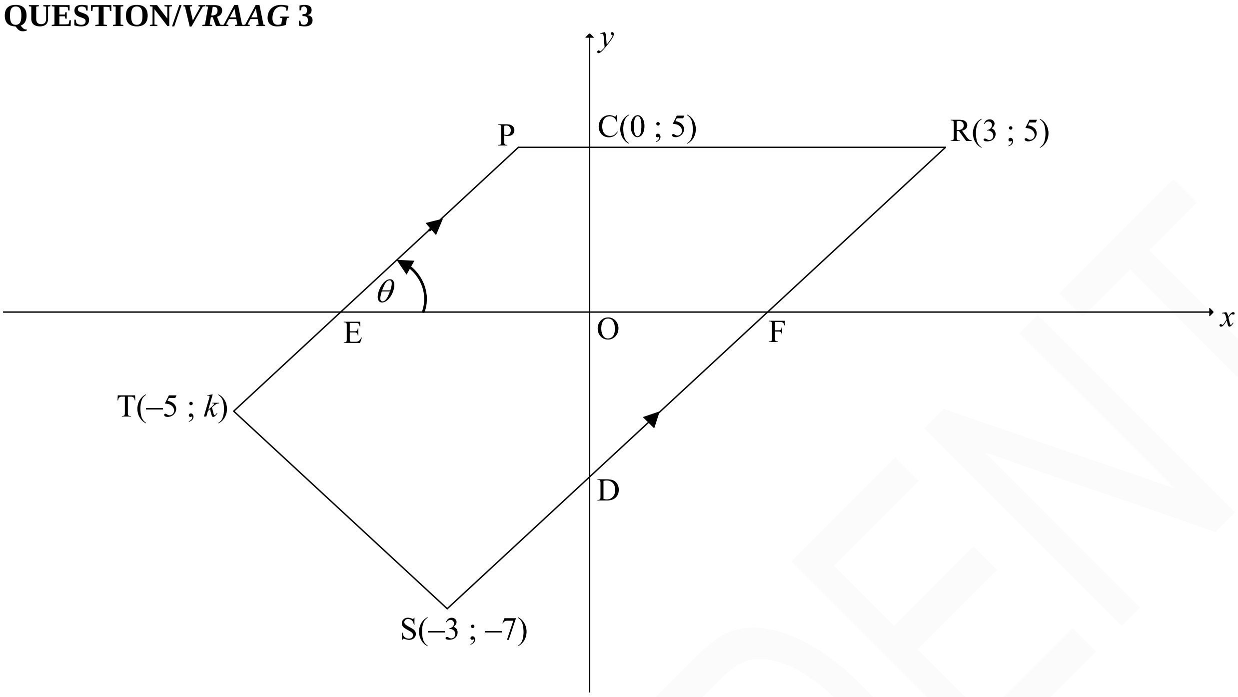


	$5y+2x+60=0$ $5\left(\frac{1}{2}x+6\right)+2x+60=0$ $\frac{5}{2}x+30+2x+60=0$ $\frac{9}{2}x=-90 \quad \therefore x=-20$ $\therefore y=-\frac{2}{5}(-20)-12$ $\therefore y=-4$ $\therefore$ S(–20; –4)	✓ substitution ✓ x value ✓ substitution ✓ y value (4)
	OR $5y+2x=-60$ ....(1) $2y-x=12$ ....(2) $(1)+2(2): 9y=-36$ $y=-4$ $2(-4)-x=12$ $x=-20$	✓ adding ✓ y value ✓ substitution ✓ x value (4)

3.4	$y=-\frac{2}{5}(-4)-12$ OR $5y+2(-4)+60=0$ $y=-\frac{52}{5}$ $\therefore R\left(-4;-\frac{52}{5}\right)$ OR R(–4 ; –10,4) $\therefore WR=4-\left(-\frac{52}{5}\right)$ OR $WR=\sqrt{(-4-(-4))^2+(4-\left(-\frac{52}{5}\right))^2}$ $\therefore WR=\frac{72}{5}$ units or $WR=14\frac{2}{5}$ units **OR** $WR=ST-SK$ $=\frac{1}{2}x+6-\left(-\frac{2}{5}x-12\right)$ $=\frac{9}{10}x+18$ $=\frac{9}{10}(-4)+18$ $=14,4$ units	✓ substitution ✓ y value ✓ method or subst into distance formula ✓ answer (4) ✓ substitution ✓ simplification ✓ subst $x=-4$ ✓ answer (4)
3.5	$m_{SK}=-\frac{2}{5}$ $\beta=158,19...^\circ$ (Ref. $\angle$ =21, 801…°) $M\hat{N}S=21,80...^\circ$ $m_{ST}=\frac{1}{2}$ $N\hat{M}S=26,56...^\circ$ $\theta=21,80...^\circ+26,56...^\circ$ [ext ∠ of Δ] $\theta=48,366...^\circ=48,37^\circ$	✓ m_{SK} ✓ size of β ✓ size of $N\hat{M}S$ ✓ method ✓ answer (5)
3.6	In ΔSRW: $\perp h=-4-(-20)$ $\perp h=16$units Area $\Delta SRW=\frac{1}{2}(\perp h)(WR)$ $=\frac{1}{2}(16)\left(\frac{72}{5}\right)$ $=115,2$ square units Area SWRL = 2Area ΔSRW =2(115,2) = 230,4square units **OR**	✓ $\perp h$ ✓ substitution ✓ area Δ ✓ answer (4)

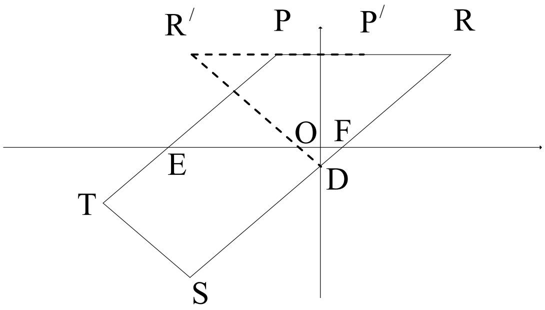
	In ΔSRW: $\perp h = -4 - (-20)$ $\perp h = 16$units Area SWRL $= 16 \times \frac{72}{5}$ $= 230,40$ square units	✓ $\perp h$ ✓ ✓ substitution ✓ answer (4)
	OR $\text{SW} = \sqrt{(-20+4)^2 + (-4-4)^2} = 8\sqrt{5} = 17,89$ $\text{SR} = \sqrt{(-20+4)^2 + \left(-4+10\frac{2}{5}\right)^2} = \frac{16\sqrt{29}}{5} = 17,23$ Area SWRL = $2\times$ Area ΔSRW $= 2\left(\frac{1}{2}\text{SW} \times \text{SR} \sin\theta\right)$ $= 2\left(\frac{1}{2} 8\sqrt{5} \times \frac{16\sqrt{29}}{5} \sin 48,37°\right)$ $= 230,41$square units	✓$\text{SW} = 8\sqrt{5}$ ✓$\text{SR} = \frac{16\sqrt{29}}{5}$ ✓substitution ✓answer (4)
		[21]

QUESTION/*VRAAG* 3

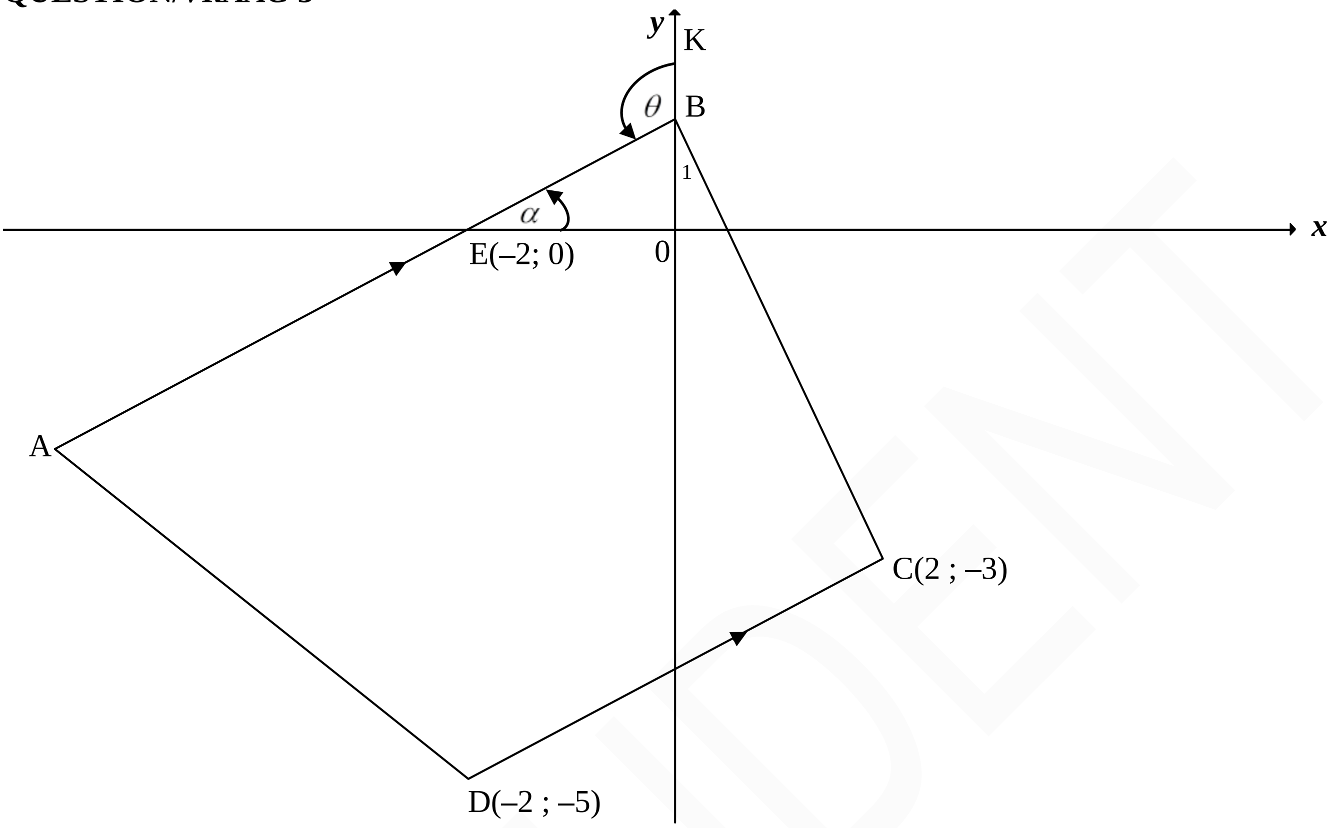


3.1	Equation of PR: $y = 5$	✓ answer (1)
3.2.1	$m_{RS} = \frac{y_2 - y_1}{x_2 - x_1}$ $m_{RS} = \frac{5-(-7)}{3-(-3)} = \frac{12}{6}$ $= 2$ Answer only: Full marks	✓ substitution of R & S into gradient formula ✓ answer (2)
3.2.2	$m_{RS} = m_{PT}$ [PT ‖ RS] $\tan\theta = 2$ $\theta = 63{,}43°$	✓ $m_{RS} = m_{PT}$ ✓ $\tan\theta = 2$ ✓ $\theta = 63{,}43°$ (3)
3.2.3	Equation of RS: $y - 5 = 2(x-3)$ or $y-(-7) = 2(x-(-3))$ or $5 = 2(3) + c$ $y - 5 = 2x - 6$ $\quad y + 7 = 2x + 6$ $\quad c = -1$ $y = 2x - 1$ $\quad y = 2x - 1$ $\quad y = 2x - 1$ $\therefore$ D(0 ; –1) **OR/OF** $m_{RS} = m_{RD} = m_{DS}$ $2 = \frac{5-y}{3-0} = \frac{y+7}{0-(-3)}$ $\therefore y = -1$ $\therefore$ D(0 ; –1) Answer only: Full marks	✓ substitution ✓ equation of RS ✓ coordinates of D (3) ✓ equating gradients ✓ value of y ✓ coordinates of D (3)

3.3	$ST = 2\sqrt{5} = \sqrt{[-5-(-3)]^2 + (k-(-7))^2}$ $20 = 4 + (k+7)^2$ $(k+7)^2 = 16$ $k + 7 = \pm 4$ $k = -11$ or $k = -3$ $\therefore k = -3$ **OR** $ST = 2\sqrt{5} = \sqrt{[-5-(-3)]^2 + (k-(-7))^2}$ $20 = 4 + k^2 + 14k + 49$ $k^2 + 14k + 33 = 0$ $(k+11)(k+3) = 0$ $k = -11$ or $k = -3$ $\therefore k = -3$	✓ substitute S and T into distance formula ✓ isolate square ✓ square root both sides ✓ answer (4) ✓ substitute S and T into distance formula ✓ standard form ✓ factors ✓ answer (4)
3.4	Method: translation T→S: $(x\,;y) \rightarrow (x+2\,;y-4)$ ∴ by symmetry: D→N: D(0 ; –1) → N(0 + 2 ; –1 – 4) ∴ N(2 ; –5) Answer only: Full marks **OR** Midpoint of TN = Midpoint of SD $\frac{x+(-5)}{2} = \frac{-3+0}{2}$ and $\frac{y+(-3)}{2} = -\frac{-7+(-1)}{2}$ $x = 2$ and $y = -5$ ∴ N(2 ; – 5) Answer only: Full marks	✓ method ✓ *x*-coordinate ✓ *y*-coordinate (3) ✓ method: midpoint of diagonals ✓ *x*-coordinate ✓ *y*-coordinate (3)

3.5		
	β is the inclination of RS $\therefore\ \beta = 63{,}434...°$	✓ $\beta = 63{,}43°$
	$O\hat{F}D = 63{,}434...°$ [vert opp ∠s]	
	$O\hat{D}F = 90° - 63{,}434...° = 26{,}565...°$	✓ $O\hat{D}F = 26{,}57°$
	$R\hat{D}R^/ = 2(26{,}565...°) = 53{,}13°$	✓ answer (3)
	OR	
	PEFR is a ‖m [both pairs of opp sides ‖]	
	$\therefore \hat{R} = \theta = 63{,}434...°$ [opp ∠s of ‖m]	✓ $\hat{R} = 63{,}43°$
	$R\hat{R}^/D = 63{,}434...°$ [∠s opp = sides: $RD = R^/D$]	✓ $R\hat{R}^/D = 63{,}43°$
	$R\hat{D}R^/ = 180° - (63{,}43° + 63{,}43°)$ [sum of ∠s in Δ]	
	$R\hat{D}R^/ = 53{,}13°$	✓ answer (3)
	OR	
	$\tan O\hat{D}F = \frac{3}{6}$	✓ trig ratio
	$O\hat{D}F = 26{,}565..°$	✓ $O\hat{D}F = 26{,}565..°$
	$R\hat{D}R^/ = 2(26{,}565...°) = 53{,}13°$	✓ answer (3)
	OR	
	$R^/(-3\,;5)$ [reflection of R(3 ; 5) about the *y*-axis]	
	$RD = \sqrt{(3-0)^2 + (5-(-1))^2}$	✓ $R^/(-3\,;5)$ **OR** $RD = \sqrt{45} = R^/D$
	$RD = \sqrt{45} = R^/D$ or $3\sqrt{5}$ or $6{,}71$	
	$(RR^/)^2 = (\sqrt{45})^2 + (\sqrt{45})^2 - 2(\sqrt{45})(\sqrt{45})(\cos R\hat{D}R^/)$	✓ substitution into cosine rule
	$6^2 = 45 + 45 - 2(45)(\cos R\hat{D}R^/)$	
	$\cos R\hat{D}R^/ = \frac{45+45-36}{2(45)}$	
	$\cos R\hat{D}R^/ = \frac{3}{5}$	
	$\therefore\ R\hat{D}R^/ = 53{,}13°$	✓ answer (3)
		[19]

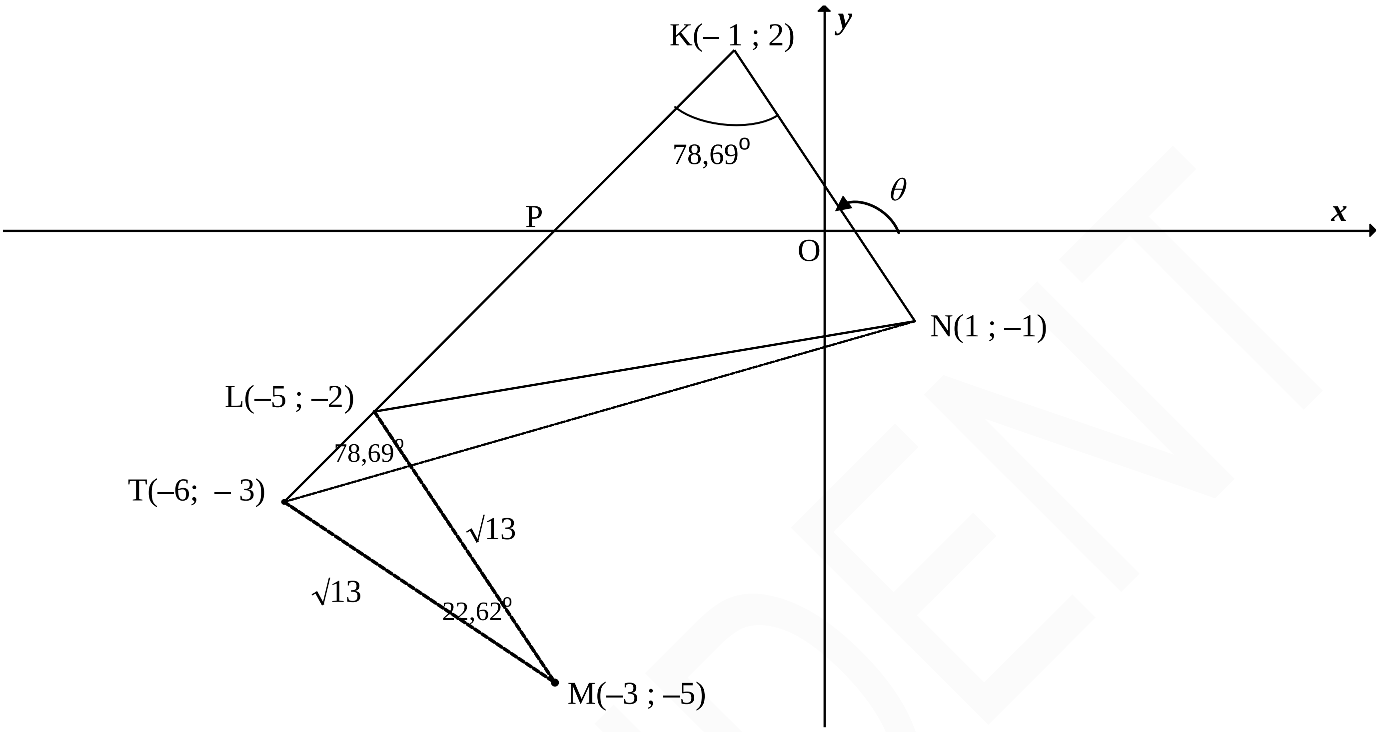
QUESTION/*VRAAG* 3



3.1.1	Midpoint of EC: $=\left(\frac{-2+2}{2}\ ;\ \frac{0+(-3)}{2}\right)=\left(0\ ;\ \frac{-3}{2}\right)$	✓ x value ✓ y value (2)
3.1.2	$m_{DC}=\frac{-3-(-5)}{2-(-2)}$ OR $\frac{-5-(-3)}{-2-2}$ $=\frac{2}{4}=\frac{1}{2}$ Answer only: full marks	✓ substitution ✓ answer (2)
3.1.3	$m_{AB}=\frac{1}{2}$ [AB ǁ DC] $y=\frac{1}{2}x+c$ $0=\frac{1}{2}(-2)+c$ $c=1$ $\therefore y=\frac{1}{2}x+1$ **OR** $y-y_1=\frac{1}{2}(x-x_1)$ $y-0=\frac{1}{2}(x-(-2))$	✓ $m_{AB}=\frac{1}{2}$ ✓ substitution of $(-2;0)$ ✓equation (3)
3.1.4	$\tan\alpha=m_{AB}=\frac{1}{2}$ $\alpha=26,57°$ $\theta=90°+26,57°$ [ext ∠of Δ] $=116,57°$	✓ $\tan\alpha=\frac{1}{2}$ ✓ value of α ✓ value of θ (3)

3.2	B(0 ; 1) $m_{BC} = \frac{1-(-3)}{0-2}$ **OR** $m_{BC} = \frac{(-3)-1}{2-0}$ $= -2$ $= -2$ $m_{AB} \times m_{BC} = \frac{1}{2} \times -2$ $= -1$ $\therefore AB \perp BC$	✓ coordinates of B ✓ $m_{BC} = -2$ ✓ product of gradients = –1 (3)
3.3.1	$A\hat{B}C = 90°$ $\therefore$ EC is diameter [converse: $\angle$ in semi circle] $\therefore$ centre of circle $= \left(0 ; -\frac{3}{2}\right)$	✓ answer (1)
3.3.2	$(x-0)^2 + \left(y+\frac{3}{2}\right)^2 = r^2$ $(-2-0)^2 + \left(0+\frac{3}{2}\right)^2 = r^2$ **OR** $(2-0)^2 + \left(-3-\left(\frac{-3}{2}\right)\right)^2 = r^2$ **OR** $(0-0)^2 + \left(1-\left(\frac{-3}{2}\right)\right)^2 = r^2$ **OR** $r = \frac{EC}{2} = \frac{\sqrt{(-2-2)^2 + (0-(-3))^2}}{2}$ **OR** $r = 1-(-\frac{3}{2})$ $\therefore r^2 = \frac{25}{4}$ or $r = \frac{5}{2}$ $x^2 + \left(y+\frac{3}{2}\right)^2 = \frac{25}{4}$	✓ substitution of centre ✓ correct substitution of E(–1 ; 0), B(0 ; 1) or C(2 ; –3) to calculate r^2 or r ✓ value of r^2 or r ✓ equation (4)
		[18]

QUESTION/*VRAAG* 3



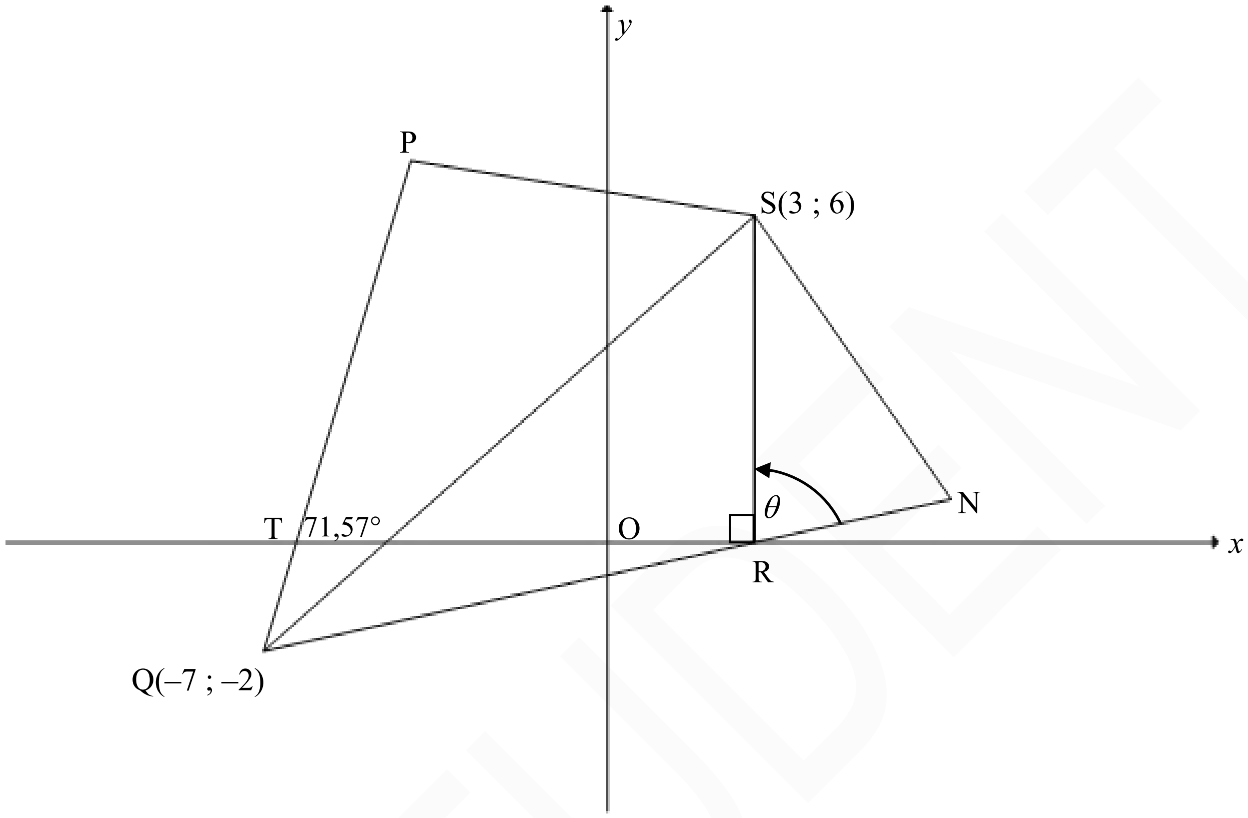
3.1.1	$m_{KN} = \frac{y_2 - y_1}{x_2 - x_1}$ $m_{KN} = \frac{2-(-1)}{-1-1}$ $= -\frac{3}{2}$ Answer only: Full marks	✓ correct substitution ✓ answer (2)
3.1.2	$\tan\theta = m_{KN} = -\frac{3}{2}$ $\theta = 180° - 56,31°$ $\theta = 123,69°$ Answer only: Full marks	✓ $\tan\theta = m_{KN} = -\frac{3}{2}$ ✓ answer (2)
3.2	Inclination KL = 123,69° – 78,69° = 45° [ext ∠Δ] $\tan 45° = m_{KL} = 1$	✓ S ✓ $\tan 45° = m_{KL} = 1$ (2)
3.3	$y = x + c$ $2 = -1 + c$ $c = 3$ $y = x + 3$ **OR/*OF*** $y - y_1 = 1(x - x_1)$ $y - 2 = 1(x - (-1))$ $y = x + 3$	✓ substitute (– 1 ; 2) and *m* ✓ equation (2) ✓ substitute (– 1 ; 2) and *m* ✓ equation (2)

3.4	$KN = \sqrt{(1+1)^2 + (-1-2)^2}$ $KN = \sqrt{13}$ or 3,61 Answer only: Full marks	✓ substitute K and N into distance formula ✓ answer (2)
3.5.1	$(x+3)^2 + (y+5)^2 = 13$ ...(1) L is a point on KL $y = x + 3$ …(2) (2) in (1): $(x+3)^2 + (x+3+5)^2 = 13$ $x^2 + 6x + 9 + x^2 + 16x + 64 = 13$ $2x^2 + 22x + 60 = 0$ $x^2 + 11x + 30 = 0$ $(x+5)(x+6) = 0$ $x = -5$ or $x = -6$ $y = -2$ or $y = -3$ L(–5 ; –2) or (–6 ; –3)	✓ equation (1) ✓ substituting eq (2) ✓ standard form ✓ *x*-values ✓ *y*-values (5)
	OR/OF	
	$(x+3)^2 + (y+5)^2 = 13$ ...(1) L is a point on KL $y = x + 3$ $\therefore x = y - 3$ …(2) (2) in (1): $(y-3+3)^2 + (y+5)^2 = 13$ $y^2 + y^2 + 10y + 25 = 13$ $2y^2 + 10y + 12 = 0$ $y^2 + 5y + 6 = 0$ $(y+2)(y+3) = 0$ $y = -2$ or $y = -3$ $x = -5$ or $x = -6$ L(–5 ; –2) or (–6 ; –3)	✓ equation (1) ✓ substituting eq (2) ✓ standard form ✓ *y*-values (both) ✓ *x*-values (both) (5)
3.5.2	Midpoint of KM: (– 2 ; – 1,5) $\therefore \frac{x_L + 1}{2} = -2$ and $\frac{y_L - 1}{2} = -\frac{3}{2}$ $\therefore$ L(– 5 ; – 2)	✓ midpoint of KM ✓*x* value ✓ *y* value (3)
	OR/*OF*	
	$m_{KN} = m_{LM}$ $\frac{y-(-5)}{x-(-3)} = -\frac{3}{2}$ $2(x+3+5) = -3(x+3)$ $2x + 16 = -3x - 9$ $5x = -25$ $x = -5$ $\therefore$ L(– 5 ; – 2) Answer only: Full marks	✓ $m_{LM} = m_{KN}$ ✓*x* value ✓ *y* value (3)

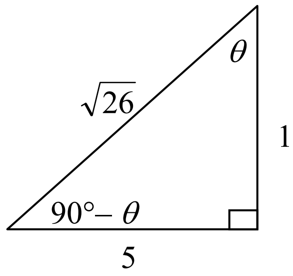
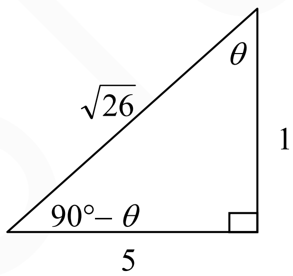
	OR/*OF* N→M: $(x;y)\rightarrow(x-4;y-4)$ $\therefore$ L(– 1 – 4 ; 2 – 4) $\therefore$ L(– 5 ; – 2) **OR/OF** N→K: $(x;y)\rightarrow(x-2;y+3)$ $\therefore$ L(– 3 – 2 ; – 5 + 3) $\therefore$ L(– 5 ; – 2)	
	OR/*OF* N→M: $(x;y)\rightarrow(x-4;y-4)$ $\therefore$ L(– 1 – 4 ; 2 – 4) $\therefore$ L(– 5 ; – 2) **OR/OF** N→K: $(x;y)\rightarrow(x-2;y+3)$ $\therefore$ L(– 3 – 2 ; – 5 + 3) $\therefore$ L(– 5 ; – 2)	
	OR/*OF* N→M: $(x;y)\rightarrow(x-4;y-4)$ $\therefore$ L(– 1 – 4 ; 2 – 4) $\therefore$ L(– 5 ; – 2) **OR/OF** N→K: $(x;y)\rightarrow(x-2;y+3)$ $\therefore$ L(– 3 – 2 ; – 5 + 3) $\therefore$ L(– 5 ; – 2)	
	OR/*OF* N→M: $(x;y)\rightarrow(x-4;y-4)$ $\therefore$ L(– 1 – 4 ; 2 – 4) $\therefore$ L(– 5 ; – 2) **OR/OF** N→K: $(x;y)\rightarrow(x-2;y+3)$ $\therefore$ L(– 3 – 2 ; – 5 + 3) $\therefore$ L(– 5 ; – 2)	
	OR/*OF* N→M: $(x;y)\rightarrow(x-4;y-4)$ $\therefore$ L(– 1 – 4 ; 2 – 4) $\therefore$ L(– 5 ; – 2) **OR/OF** N→K: $(x;y)\rightarrow(x-2;y+3)$ $\therefore$ L(– 3 – 2 ; – 5 + 3) $\therefore$ L(– 5 ; – 2)	✓ transformation ✓*x* value ✓ *y* value (3)
3.6	T(–6 ; –3) (from Question 3.5.1) $KT=\sqrt{(-1-(-6))^2+(2-(-3))^2}$ $=\sqrt{50}$ KN = $\sqrt{13}$ (CA from 3.4) Area of $\Delta KTN=\frac{1}{2}KT.KN\sin L\hat{K}N$ $=\frac{1}{2}\sqrt{50}.\sqrt{13}\sin 78{,}69°$ = 12,50 square units	✓ coordinates of T ✓ length of KT ✓ substitution into area rule ✓ answer (4)

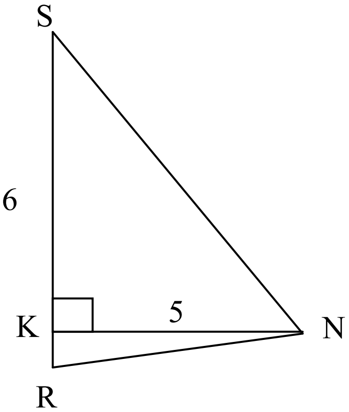
	OR/*OF* In ΔKLM: $\frac{TL}{\sin 22,62°} = \frac{\sqrt{13}}{\sin 78,69°}$ $TL = 1,414..$ $KL = \sqrt{(-1-(-5))^2 + (2-(-2))^2}$ $= \sqrt{32}$ $\therefore$ KT = 7,0708… Area of $\Delta KTN = \frac{1}{2} KT.KN \sin L\hat{K}N$ $= \frac{1}{2}(7,0708).\sqrt{13} \sin 78,69°$ = 12,50 square units	✓ length of TL ✓ length of KT ✓ substitution into area rule ✓ answer (4)
		[22]

QUESTION/*VRAAG* 3



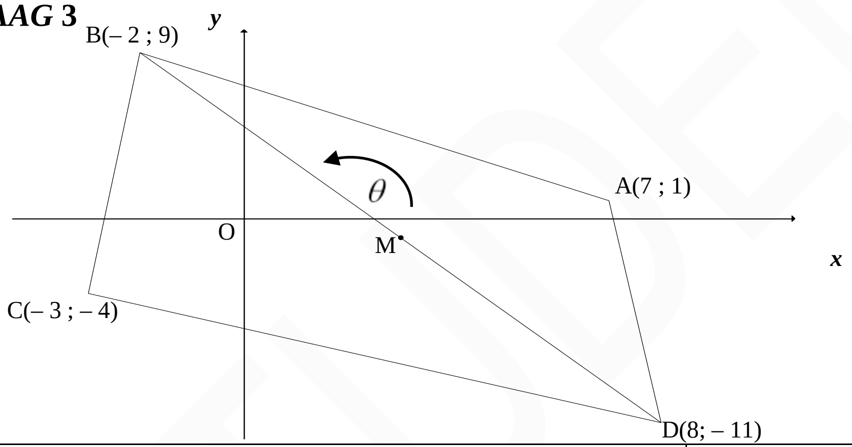
3.1	$x = 3$	✓ answer (1)
3.2	$m_{QP} = \tan 71{,}57°$ $= 3$ Answer only: full marks	✓ $m_{QP} = \tan 71{,}57°$ ✓ answer (2)
3.3	$y = mx + c$ $-2 = 3(-7) + c$ $y = 3x + 19$ or $y - y_1 = m(x - x_1)$ $y + 2 = 3(x + 7)$	(m CA from 3.2 if > 0) ✓ substitution of m & Q ✓ equation (2)
3.4	R(3 ; 0) $QR = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{(-7-3)^2 + (-2-0)^2}$ $= \sqrt{104}$ or $2\sqrt{26}$	(wrong R: CA if $x > 0$) ✓ substitution ✓ answer (in surd form) (2)

3.5	$\tan(90° - \theta) = m_{QR}$ $= \dfrac{0-(-2)}{3-(-7)}$ $= \dfrac{1}{5}$ Answer only: full $\tan\theta = \frac{1}{5}$: 1/3	(wrong R: CA if $x > 0$) ✓ gradient of QR/RN/QN ✓ substitution of Q & R ✓ answer (3)
3.6 **using calculator: max 4 marks**	$RN = \frac{1}{2}.2\sqrt{26} = \sqrt{26}$ SR = 6  Area ΔRSN = $\frac{1}{2}$ SR . RN. $\sin\theta$ $= \frac{1}{2} \times 6 \times \sqrt{26} \times \frac{5}{\sqrt{26}}$ = 15 square units **OR/*OF*** $RN = \frac{1}{2}.2\sqrt{26} = \sqrt{26}$ SR = 6  Area ΔRSN = $\frac{1}{2}$ SR . RN. $\sin\theta$ $= \frac{1}{2}(6)(\frac{1}{2}QP).\sin\theta$ $= \frac{3}{2}(\sqrt{104}).\sin\theta$ $= \frac{3}{2}(\sqrt{104})\left(\frac{5}{\sqrt{26}}\right)$ $= 15$ square units	✓ RN ✓ SR ✓ diagram (5 & $\sqrt{26}$) ✓ use of correct area rule ✓ substitution of $\sin\theta$ ✓ answer (6) ✓ RN ✓ SR ✓ diagram ✓ use of correct area rule ✓ substitution of $\sin\theta$ ✓ answer (6)

	OR/*OF*	
	SR = 6 $\perp$height = 5	✓ SR ✓✓ $\perp$ height
		
	$A = \frac{1}{2} SR \times \perp h$ $= \frac{1}{2}(6)(5)$ = 30 square units	✓ use of correct area formula ✓ substitution of $\sin\theta$ ✓ answer (6)
	Using A = $\frac{1}{2}$ b×⊥h incorrectly: max 1/6	
		[16]

2.3	$a = 3{,}97$ $b = 0{,}15$ $\hat{y} = 3{,}97 + 0{,}15x$	✓ $a = 3{,}97$ ✓ $b = 0{,}15$ ✓ equation (3)
2.4	Air temperature $\approx$ 15,67°C (calculator) **OR** $\hat{y} \approx 3{,}97 + 0{,}15(80)$ $\approx$ 15,97°C **OR** Air temperature $\approx$ 16°C (graph: Accept between 15°C and 17°C)	✓✓ answer (2) ✓ substitution ✓ answer (2) ✓✓ answer (2)
		[9]

QUESTION/*VRAAG* 3

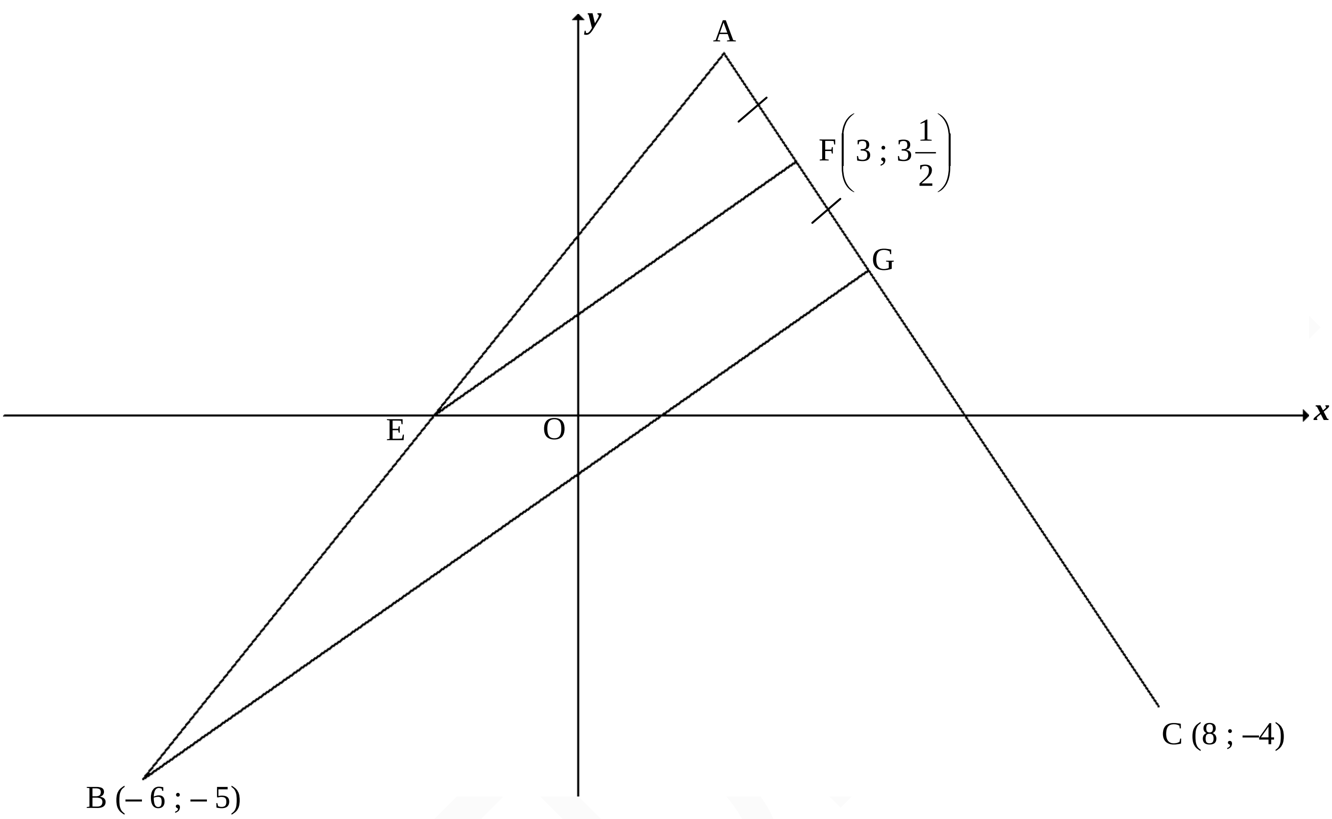


3.1	$m_{AC} = \frac{1-(-4)}{7-(-3)}$ *OR* $\frac{-4-1}{-3-7}$ $= \frac{5}{10} = \frac{1}{2}$	✓ substitution ✓answer (2)
3.2.1	$y = \frac{1}{2}x + c$ $y - y_1 = \frac{1}{2}(x - x_1)$ $1 = \frac{1}{2}(7) + c$ $y - 1 = \frac{1}{2}(x - 7)$ $c = -\frac{5}{2}$ **OR/*OF*** $y - 1 = \frac{1}{2}x - \frac{7}{2}$ $y = \frac{1}{2}x - 2\frac{1}{2}$ $y = \frac{1}{2}x - 2\frac{1}{2}$ **OR/*OF*** $y = \frac{1}{2}x + c$ $y - y_1 = \frac{1}{2}(x - x_1)$ $-4 = \frac{1}{2}(-3) + c$ $y - (-4) = \frac{1}{2}(x - (-3))$ $c = -\frac{5}{2}$ **OR/*OF*** $y + 4 = \frac{1}{2}x + \frac{3}{2}$ $y = \frac{1}{2}x - 2\frac{1}{2}$ $y = \frac{1}{2}x - 2\frac{1}{2}$	✓ substitution M and A(7 ; 1) ✓equation (2) ✓ substitution M and C(–3 ; –4) ✓equation (2)

3.2.2	$M\left(\frac{-2+8}{2}\ ;\ \frac{9+(-11)}{2}\right)$ $\therefore M(3;-1)$ Equation of AC: $y=\frac{1}{2}x-2\frac{1}{2}$ **OR/OF** $y=\frac{1}{2}x-2\frac{1}{2}$ $y=\frac{1}{2}(3)-2\frac{1}{2}$ $-1=\frac{1}{2}x-2\frac{1}{2}$ $y=-1$ $x=3$ $\therefore$ M lies on AC **OR/OF** $M\left(\frac{-2+8}{2}\ ;\ \frac{9+(-11)}{2}\right)$ $\therefore M(3;-1)$ $m_{CM}=\frac{-4+1}{-3-3}=\frac{1}{2}$ $\therefore$ $m_{CM}=m_{AC}$ and C a common point $\therefore$ M lies on AC	✓x coordinate ✓y coordinate ✓ substitution of x ✓ conclusion (4) ✓ x coordinate ✓ y coordinate ✓ gradient of CM ✓ reasoning & conclusion (4)
3.3	$m_{BD}=\frac{9-(-11)}{-2-8}$ OR $\frac{(-11)-9}{8-(-2)}$ $=-2$ $m_{BD}\times m_{AC}=\frac{1}{2}\times -2$ $=-1$ $\therefore BD\perp AC$	✓ correct substitution ✓ m_{BD} ✓ product of gradients = –1 (3)
3.4.1	$\tan\theta=m_{BD}=-2$ $\therefore \theta=116,57°$	✓ $\tan\theta=m_{BD}$ ✓ answer (2)
3.4.2	$\tan\beta=m_{BC}$ $m_{BC}=\frac{9-(-4)}{-2-(-3)}$ *OR* $\frac{-4-9}{-3-(-2)}$ $=13$ $\beta=85,6°$ $\therefore C\hat{B}D=116,57°-85,60°$ [ext ∠ of Δ] $=30,97°$ **OR/OF** BD = $\sqrt{500}$; BC = $\sqrt{170}$ & CD = $\sqrt{170}$ $CD^2=BD^2+BC^2-2BD.BC.\cos C\hat{B}D$ $170=500+170-2\sqrt{500}.\sqrt{170}.\cos C\hat{B}D$ $\cos C\hat{B}D=\frac{\sqrt{500}}{2\sqrt{170}}=0,85749...$ $C\hat{B}D=30,96°$	✓ $m_{BC}=13$ ✓ value of β ✓ answer (3) ✓ subst into cos rule ✓ value of $\cos C\hat{B}D$ ✓ answer (3)

3.4.3	$AC=\sqrt{(x_1-x_2)^2+(y_1-y_2)^2}$ $=\sqrt{(7-(-3))^2+(1-(-4))^2}$ *OR* $\sqrt{((-3)-7)^2+((-4)-1)^2}$ $=\sqrt{100+25}$ $=\sqrt{125}=5\sqrt{5}=11,58$	✓ correct substitution into distance formula ✓ answer (2)
3.4.4	$BM=\sqrt{((-2)-3)^2+(9-(-1)^2}$ *OR* $\sqrt{(3-(-2))^2+((-1)-9)^2}$ $=\sqrt{125}=5\sqrt{5}$ Area of $\Delta ABC=\frac{1}{2}\text{base}\times\perp\text{ height}$ $=\frac{1}{2}(\sqrt{125})(\sqrt{125})$ = 62,5 square units Area of ABCD = 2 × 62,5 = 125 square units	✓ correct substitution into distance formula ✓ BM ✓ substitution into area formula ✓ 62,5 ✓ 2 × ΔABC (5)
		[23]

QUESTION/*VRAAG* 3



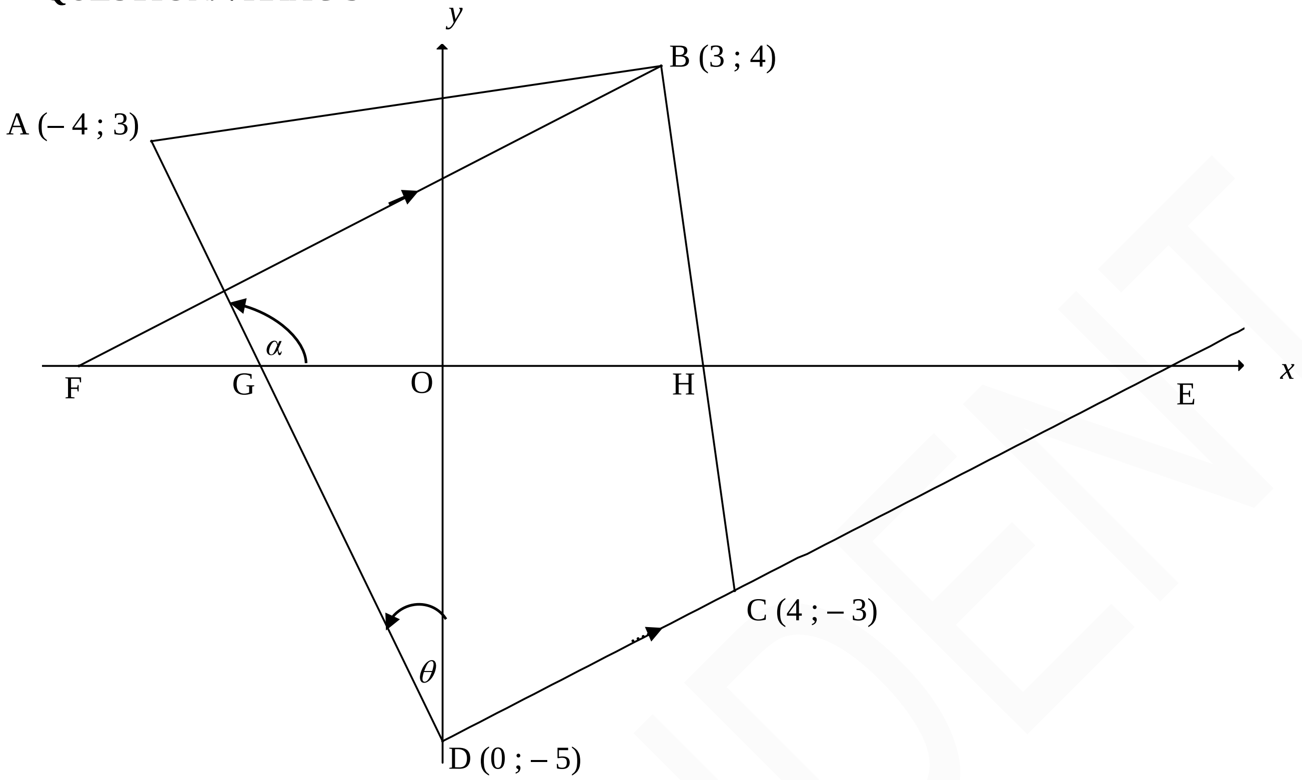
3.1.1	$m_{FC} = \dfrac{y_2 - y_1}{x_2 - x_1}$ $= \dfrac{3\frac{1}{2} - (-4)}{3 - 8}$ $= -\dfrac{3}{2}$ $y = mx + c$ $y - y_1 = m(x - x_1)$ $y = -\dfrac{3}{2}x + c$ $-4 = -\dfrac{3}{2}(8) + c$ **OR/*OF*** $(y - (-4)) = -\dfrac{3}{2}(x - 8)$ $c = 8$ $y + 4 = -\dfrac{3}{2}x + 12$ $y = -\dfrac{3}{2}x + 8$ $y = -\dfrac{3}{2}x + 8$ **OR/*OF***	✓ substitution of (8 ; –4) & $\left(3\,;3\frac{1}{2}\right)$ ✓ gradient ✓ substitution of *m* and (8 ; –4) ✓ equation of AC (4)

	$m_{FC} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{(-4)-\left(3\frac{1}{2}\right)}{8-3}$ $= -\frac{3}{2}$ $y = mx + c$ **OR/*OF*** $y - y_1 = m(x - x_1)$ $3\frac{1}{2} = -\frac{3}{2}(3) + c$; $\left(y - 3\frac{1}{2}\right) = -\frac{3}{2}(x-3)$ $c = 8$; $\left(y - 3\frac{1}{2}\right) = -\frac{3}{2}x + \frac{9}{2}$ $y = -\frac{3}{2}x + 8$; $y = -\frac{3}{2}x + 8$	✓ substitution of (8 ; –4) & $\left(3;3\frac{1}{2}\right)$ ✓ gradient ✓ substitution of *m* and $\left(3;3\frac{1}{2}\right)$ ✓ equation of AC (4)
3.1.2	AC: $3x + 2y = 16$ and BG: $7x - 10y = 8$ $15x + 10y = 80$ $\underline{7x - 10y = 8}$ $22x = 88$ $x = 4$ $3(4) + 2y = 16$ $y = 2$ $\therefore G(4 ; 2)$ **OR/*OF*** BG: $7x - 10y = 8$ $\therefore y = \frac{7}{10}x - \frac{8}{10}$ $\therefore \frac{7}{10}x - \frac{8}{10} = -\frac{3}{2}x + 8$ [CA from 3.1.1] $\frac{11}{5}x = \frac{44}{5}$ $x = 4$ $3(4) + 2y = 16$ $y = 2$ $\therefore G(4 ; 2)$	✓ method /*metode*: solving simultaneously / *los gelyktydig op* ✓ *x* coordinate ($x > 0$) ✓ *y* coordinate (3) ✓ method: equating *metode: stel vgls gelyk* ✓ *x* coordinate ($x > 0$) ✓ *y* coordinate (3)
3.2	$\frac{x_A + 4}{2} = 3$ and $\frac{y_A + 2}{2} = 3\frac{1}{2}$ $\therefore A(2 ; 5)$ **OR/*OF*** by translation/*deur translasie*: $x_A = 3 - (4-3) = 2$ $y_A = 3\frac{1}{2} + (3\frac{1}{2} - 2) = 5$ $\therefore A(2 ; 5)$	✓ equation ito *x* ✓ equation ito *y* (2) ✓ equation ito *x* ✓ equation ito *y* (2)

3.3	The coordinates of the midpt of AB / *Die koordinaat van midpt van AB is*: $\left(\frac{2+(-6)}{2};\frac{5+(-5)}{2}\right)=(-2\ ;\ 0)$ **But the *y*-coordinate of E is 0** **∴ E(–2 ; 0) is the midpoint of AB** ∴ EF ∥ BG [midpoint theorem/*middelpuntst* ***OR/OF*** line divides 2 sides of Δ in prop/*lyn verdeel 2 sye van Δ in dies verh*] **OR/*OF*** The coordinates of the midpt of AB / *Die koordinaat van midpt van AB is*: $\left(\frac{2+(-6)}{2};\frac{5+(-5)}{2}\right)=(-2\ ;\ 0)$ $AE=\sqrt{(-2-2)^2+(0-5)^2}=\sqrt{41}$ $EB=\sqrt{(-2-(-6))^2+(0-(-5))^2}=\sqrt{41}$ ∴ In ΔABG: **AE = EB** and AF = FG ∴ EF ∥ BG [midpoint theorem/*middelpuntst*] **OR/*OF*** Equation of AB: $y-(-5)=\left(\frac{5-(-5)}{2-(-6)}\right)(x-(-6))$ $y+5=\frac{10}{8}x+\frac{15}{2}\qquad \therefore y=\frac{5}{4}x+\frac{5}{2}$ x-intercept of AB: $0=\frac{5}{4}x+\frac{5}{2}\quad \therefore x=-2$ ∴ E(–2 ; 0) $m_{EF}=\frac{3\frac{1}{2}-0}{3-(-2)}=\frac{7}{10}$ $m_{EF}=m_{BG}=\frac{7}{10}$ ∴ EF ∥ BG BG: 7*x* – 10*y* = 8 $\therefore\ y=\frac{7}{10}x-\frac{8}{10}$ $\therefore\ m_{BG}=\frac{7}{10}$	✓ subst A & B into midpt formula ✓ *y* coordinate = 0 ✓ E = midpt ✓ Reason (4) ✓ subst A & B into midpt formula ✓ lengths of AE & EB ✓ AE = EB or E = midpt ✓ Reason (4) ✓ equation of AB ✓ coordinates of E ✓ gradient of EF ✓ gradient EF = gradient BG (4)

3.4	Midpoint of AC = $\left(5\ ;\ \frac{1}{2}\right)$ $\frac{x_D + (-6)}{2} = 5$ and $\frac{y_D + (-5)}{2} = \frac{1}{2}$ $\therefore$ D(16 ; 6)	✓✓ $\left(5\ ;\ \frac{1}{2}\right)$ ✓ *x* value ✓ *y* value (4)
	OR/*OF* by translation/*dmv translasie*: D(16 ; 6)	✓ method finding *x* ✓ method finding *y* ✓ *x* value ✓ *y* value (4)
	OR/*OF* $m_{BC} = \frac{-5-(-4)}{-6-8} = \frac{1}{14}$ and $m_{AB} = \frac{5-(-5)}{2-(-6)} = \frac{5}{4}$ AD: $y - 5 = \frac{1}{14}(x-2) \Rightarrow y = \frac{1}{14}x + \frac{34}{7}$ CD: $y + 4 = \frac{5}{4}(x-8) \Rightarrow y = \frac{5}{4}x - 14$ $\frac{5}{4}x - 14 = \frac{1}{14}x + \frac{34}{7}$ $\therefore$ $x = 16$ $y = 6$	✓✓ equating ✓ *x* value ✓ *y* value (4) **[17]**

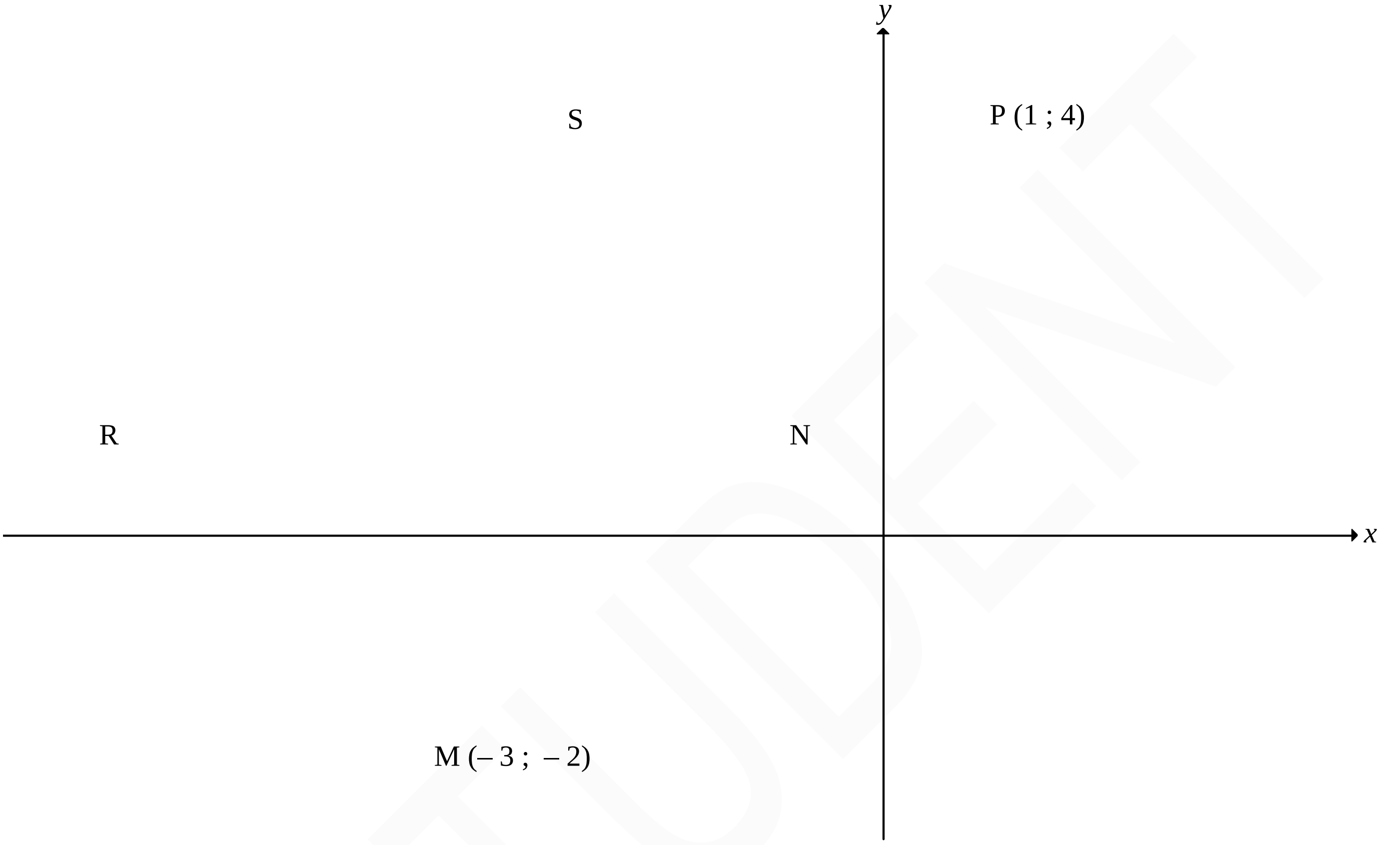
QUESTION/VRAAG 3



3.1	$m_{CD}=\frac{-3-(-5)}{4-0}$ $=\frac{-3+5}{4-0}$ $=\frac{1}{2}$	✓ substitution of C & D ✓answer (2)
3.2	$m_{AD}=\frac{-5-3}{0-(-4)}$ $=-2$ $m_{CD}\times m_{AD}=\frac{1}{2}\times -2$ $=-1$ $\therefore AD\perp DC$	✓ substitution of A & D ✓ $m_{AD}=-2$ ✓ product = –1 (3)
3.3	$AB=\sqrt{(3+4)^2+(4-3)^2}=\sqrt{50}=5\sqrt{2}$ $BC=\sqrt{(4-3)^2+(-3-4)^2}=5\sqrt{2}$ $AB=BC$ $\therefore \Delta ABC$ is an iscosceles triangle/'*n gelykbenige driehoek*	✓ correct substitution ✓ length of AB ✓ correct substitution ✓ length of BC (4)

3 .4	$m_{CD} = m_{BF} = \frac{1}{2}$ [BF ∥ DC] $4 = \frac{1}{2}(3) + c$ $c = \frac{5}{2}$ $y = \frac{1}{2}x + \frac{5}{2}$ **OR/*OF*** $y - 4 = \frac{1}{2}(x - 3)$ $y - 4 = \frac{1}{2}x - 1\frac{1}{2}$ $y = \frac{1}{2}x + 2\frac{1}{2}$	✓ $m_{BF} = \frac{1}{2}$ ✓ substitution of B(3 ; 4) ✓equation (3)
3.5	$\tan\alpha = -2$ $\therefore \alpha = 116.57°$ $\alpha = 90° + \theta$ [ext ∠Δ] $\therefore \theta = 26,57°$ **OR/*OF*** $\tan\alpha = -2$ OR $m_{AD} = -2$ $\therefore \tan\theta = \frac{1}{2}$ $\therefore \theta = 26,57°$ **OR/*OF*** Inclination of DE is β: $\tan\beta = \frac{1}{2}$ $\therefore \beta = 26,57°$ $\therefore O\hat{D}E = 63,43°$ $\therefore \theta = 90° - 63,43°$ $= 26,57°$	✓ $\tan\alpha = -2$ ✓ $\alpha = 116.57°$ ✓ $\theta = 26,57°$ (3) ✓ $\tan\alpha = -2$ ✓ $\tan\theta = \frac{1}{2}$ ✓ $\theta = 26,57°$ (3) ✓ $\beta = 26,57°$ ✓ $O\hat{D}E = 63,43°$ ✓ $\theta = 26,57°$ (3)
3.6	$x^2 + y^2 = r^2$ $(4)^2 + (-3)^2 = 25$ $x^2 + y^2 = 25$	✓ $r^2 = 25$ ✓ equation (2) **[17]**

QUESTION/VRAAG 4



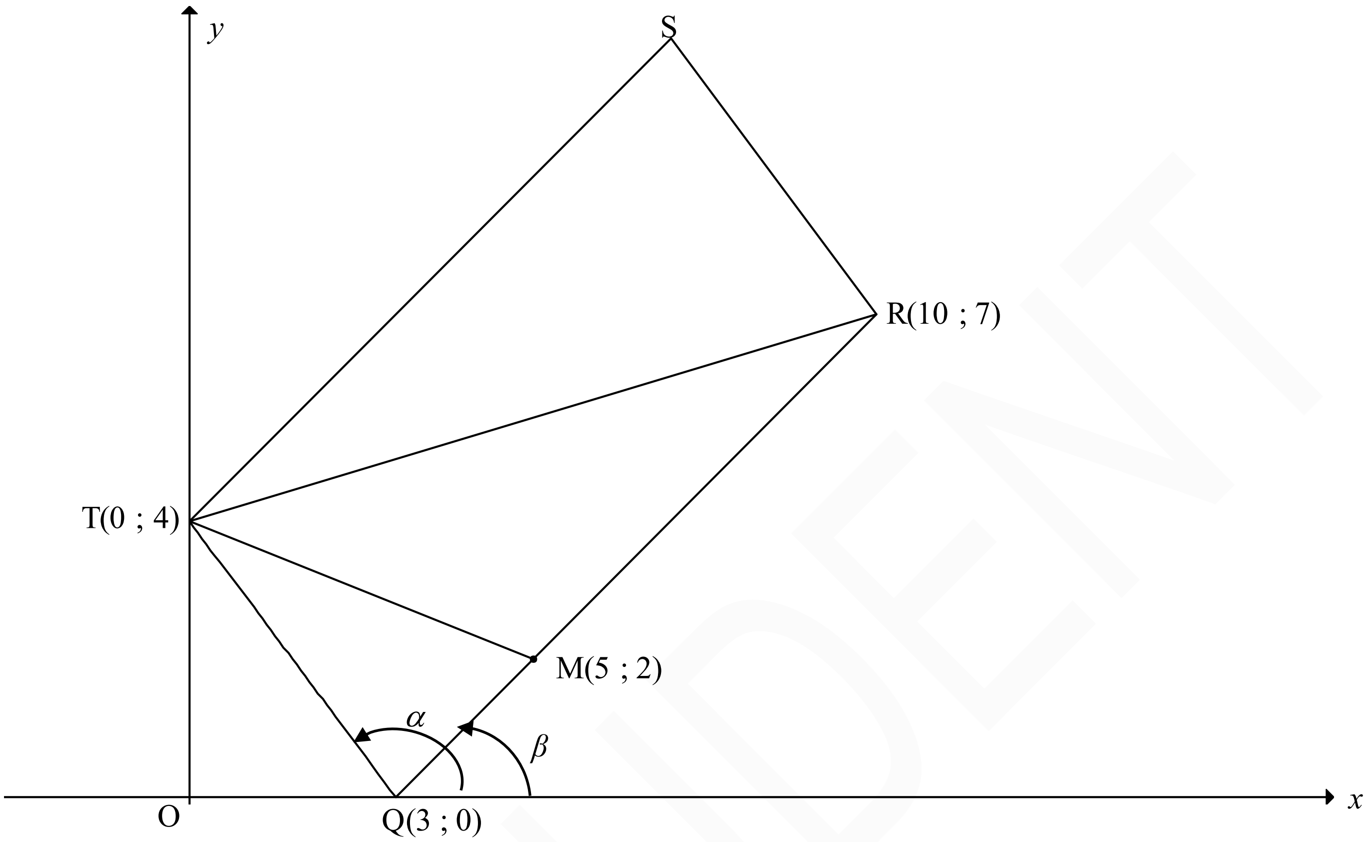
4.1	$N\left(\frac{1+(-3)}{2}\ ;\ \frac{4+(-2)}{2}\right)$ $N(-1\ ;\ 1)$ is the centre of the circle	✓ substitution M & P ✓ x-value of N ✓ y-value of N (3)
4.2	$r=\sqrt{(1-(-1))^2+(4-1)^2}$ $r=\sqrt{13}$ = radius $(x+1)^2+(y-1)^2=13$ **OR/*OR*** $r=\sqrt{(-3-(-1))^2+(-2-1)^2}$ $r=\sqrt{13}$ = radius $(x+1)^2+(y-1)^2=13$	✓ substitution N & P ✓ $r=\sqrt{13}$ ✓ LHS of eq ✓ RHS of eq (4) ✓ substitution N & M ✓ $r=\sqrt{13}$ ✓ LHS of eq ✓ RHS of eq (4)

4.3	$m_{NM} \times m_{MR} = -1$ [radius ⊥ tangent/*raakklyn*] $m_{NM} = \frac{1-(-2)}{-1-(-3)}$ *OR* $m_{PM} = \frac{4-(-2)}{1-(-3)}$ $= \frac{3}{2}$ $= \frac{3}{2}$ $m_{MR} = -\frac{2}{3}$ $y - y_1 = -\frac{2}{3}(x - x_1)$ **OR/*OF*** $y = -\frac{2}{3}x + c$ $y + 2 = -\frac{2}{3}(x+3)$ **OR/*OF*** $-2 = -\frac{2}{3}(-3) + c$ $y = -\frac{2}{3}x - 4$	✓ correct substitution ✓ m_{NM} ✓ m_{MR} ✓substitution of m_{MR} &(–3 ;–2) ✓ equation (5)
4.4	Symmetry of a kite: S(–3 ; 4) **OR/*OF*** $P\hat{S}M = 90°$ [∠ in semi circle] PS ⊥ SM ∴ S(–3 ; 4) **OR/*OF*** $(NS)^2 = (\text{radius})^2$ $(-3+1)^2 + (y-1)^2 = 13$ $(y-1)^2 = 9$ $y - 1 = \pm 3$ $y = 4$ *OR* $y \neq -2$ ∴ S(–3 ; 4)	✓ *x*-value of S ✓ *y*-value of S (2) ✓ *x*-value of S ✓ *y*-value of S (2) ✓ *x*-value of S ✓ *y*-value of S (2)
4.5	$(SR)^2 = (RM)^2$...Tangents from common pt/*rklyne v dies punt* $(x+3)^2 + (y-4)^2 = (x+3)^2 + (y+2)^2$ $y^2 - 8y + 16 = y^2 + 4y + 4$ $-12y = -12$ $y = 1$ $\frac{2}{3}x = -4 - 1$ or $1 = -\frac{2}{3}x - 4$ $x = -\frac{15}{2}$ $x = -7\frac{1}{2}$ ∴ $R\left(-7\frac{1}{2};1\right)$ **OR/*OF***	✓ equating lengths ✓ simplification ✓ *y*-value of R ✓ *x*-value of R (4)

	R$(x;1)$ [RN is a horizontal line] $\therefore 1 = -\frac{2}{3}x - 4$ $5 = -\frac{2}{3}x$ $x = -\frac{15}{2}$ $\therefore R\left(-\frac{15}{2};1\right)$	✓ $y_R = 1$ ✓ horizontal line OR R lies on $y = 1$ ✓ equating ✓ x-value of R ($x < -4,6$) (4)
	OR/*OF* $m_{NS} = \frac{1-4}{-1+3} = -\frac{3}{2}$ $\therefore\ m_{RS} = \frac{2}{3}$ $y - 4 = \frac{2}{3}(x+3)$ $y = \frac{2}{3}x + 6$ $-\frac{2}{3}x - 4 = \frac{2}{3}x + 6$ $x = -7\frac{1}{2}$ $y = \frac{2}{3}(-\frac{15}{2}) + 6 = 1$ $\therefore R\left(-\frac{15}{2};1\right)$	✓ $y = \frac{2}{3}x + 6$ ✓ equating ✓ x-value of R ($x < -4,6$) ✓ y-value of R (4)
4.6	$RS = \sqrt{(-3+7,5)^2 + (4-1)^2}$ OR/OF $RM = \sqrt{(-3+7,5)^2 + (-2-1)^2}$ $RS = \frac{3\sqrt{13}}{2} = 5,41$ area of RSNM = 2area of ΔRSN $= 2\left(\frac{1}{2}\right)(\sqrt{13})\left(\frac{3\sqrt{13}}{2}\right)$ $= \frac{39}{2}$ **OR/*OF*** 19,5 square units	✓ RS **OR** RM ✓ method ✓ $\sqrt{13}$ and $\left(\frac{3\sqrt{13}}{2}\right)$ ✓ answer (4)
	OR/*OF*	✓ method ✓ MS = 6 ✓ RN = 6,5 ✓ answer

	area RSNM $= \frac{1}{2}(\text{MS} \times \text{RN})$ (area of a kite/*opp v vlieër*) $= \frac{1}{2}(6)(6{,}5)$ $= \frac{39}{2}$ OR 19,5 square units	(4) ✓ RS **OR** RM ✓ $\left(\frac{1}{2}\right)\sqrt{13}\left(\frac{3\sqrt{13}}{2}\right)$
	OR/*OF* RS $= \sqrt{(-3+7{,}5)^2 + (4-1)^2}$ OR/OF RM $= \sqrt{(-3+7{,}5)^2 + (-2-1)^2}$ RS $= \frac{3\sqrt{13}}{2}$ *or* 5,41 area of ΔRSN $= \left(\frac{1}{2}\right)(\sqrt{13})\left(\frac{3\sqrt{13}}{2}\right)$ $= \frac{39}{4}$ **OR/*OF*** 9,75 square units area of RSNM = 2area of ΔRSN $= \frac{39}{2}$ **OR/*OF*** 19,5 square units	✓ method ✓ answer (4)
	OR/*OF* SM = 6 area of RSNM = Area of ΔSMN + Area of ΔRSM $= \frac{1}{2}(6)(1) + \frac{1}{2}(6)(5\frac{1}{2})$ $= 3 + 16\frac{1}{2}$ $= 19\frac{1}{2}$	✓ method ✓ MS = 6 ✓ $h = 1$ & $5\frac{1}{2}$ ✓ answer (4)
		[22]

QUESTION/*VRAAG* 3



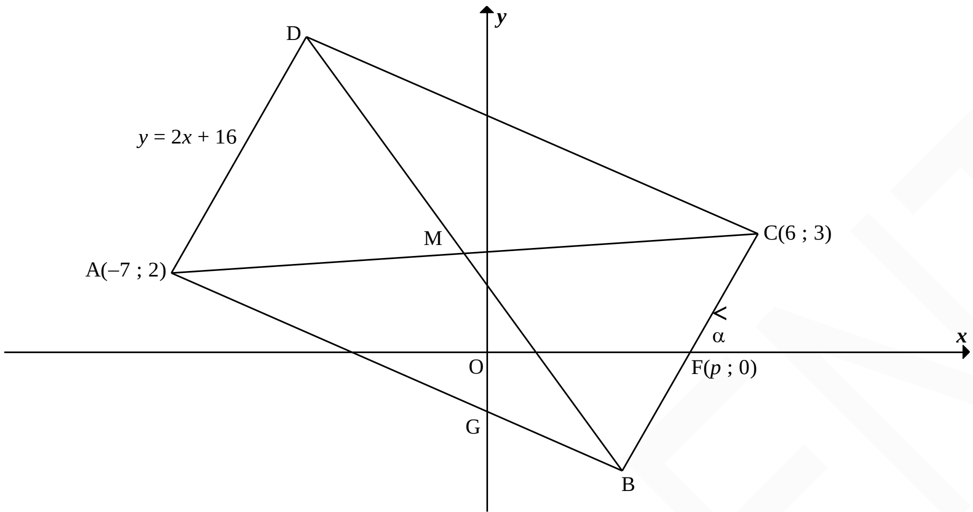
3.1	$m_{TQ} = \frac{4-0}{0-3}$ $= -\frac{4}{3}$	✓ answer (1)
3.2	$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $RQ = \sqrt{(10-3)^2 + (7-0)^2}$ $RQ = \sqrt{98} = 7\sqrt{2}$	✓substitution/*substitusie* ✓ answer in surd form (2)
3.3	$m_{FQ} = m_{TQ}$ $\frac{-8}{k-3} = -\frac{4}{3}$ $4k - 12 = 24$ $k = 9$ **OR/*OF*** $m_{FT} = m_{QT}$ $\frac{-8-4}{k-0} = -\frac{4}{3}$ $-36 = -4k$ $k = 9$ **OR/*OF*** Equation of TQ: $y = -\frac{4}{3}x + 4$ $-8 = -\frac{4}{3}k + 4$ $k = 9$	✓ equating gradients/*stel gradient gelyk* ✓ $m_{FQ} = \frac{-8}{k-3}$ ✓ simplification/*vereenvoudig* ✓ answer (4) ✓ gradient ✓ equation of TQ/*vgl van TQ* ✓ substitution of $(k ; -8)$ /*substitusie van* $(k ; -8)$ ✓ answer (4)

3.4	Using transformation/*Gebruik transformasie*: $\therefore S(7\ ;\ 11)$	✓✓ x–value/*waarde* ✓✓ y–value/*waarde* (4)
	OR/*OF* Midpoint of TR = midpoint of SQ [diag ||m/*hkle*||*m*] Midpoint of TR = $(5\ ;\ \frac{11}{2})$ $\frac{x_S+3}{2}=5$ and $\frac{y_S+0}{2}=\frac{11}{2}$ $\therefore x_S=7$ and $y_S=11$ $\therefore S(7\ ;\ 11)$	✓ x–value/*waarde* of/*van* T ✓ y–value/*waarde* of/*van* T ✓ x–value/*waarde* of/*van* S ✓ y–value/*waarde* of/*van* S (4)
	OR/*OF* Equation of TS: $y=\left(\frac{7-2}{10-5}\right)x+4=x+4$ Equation of RS: $y-7=-\frac{4}{3}(x-10)$ $y=-\frac{4}{3}x+\frac{61}{3}$ $x+4=-\frac{4}{3}x+\frac{61}{3}$ $7x=49$ $x=7$ $\therefore\ y=11$ $\therefore S(7\ ;\ 11)$	✓ equations of TS and RS/*vgls van TS en RS* ✓ equating / *gelykstel* ✓ x–value/*waarde* ✓ y–value/*waarde* (4)
3.5	$T\hat{S}R=T\hat{Q}R$ [opp ∠s of ||m/*teenoorst ∠e* ||*m*] $T\hat{Q}R=\alpha-\beta$ $\tan\alpha=m_{TQ}=-\frac{4}{3}$ $\therefore\ \alpha=180°-53{,}13°=126{,}87°$ $\tan\beta=m_{RQ}=\frac{7}{7}=1$ $\therefore\beta=45°$ $T\hat{Q}R=126{,}87°-45°$ $=81{,}87°$ $T\hat{S}R=81{,}87°$ **OR/*OF***	✓ $T\hat{Q}R=\alpha-\beta$ ✓ $\tan\alpha=m_{TQ}$ ✓ α ✓ $\tan\beta=m_{RQ}$ ✓ β ✓ answer (6)

	TQ = SR = 5 TR = $\sqrt{100+9}=\sqrt{109}$ RQ = TS = $\sqrt{49+49}=\sqrt{98}$ $\cos R\hat{Q}T = \cos T\hat{S}R = \dfrac{TQ^2+RQ^2-TR^2}{2.TQ.RQ}$ $= \dfrac{25+98-109}{2(5)(\sqrt{98})}$ $= 0{,}141...$ $R\hat{Q}T = T\hat{S}R = 81{,}87°$	✓ length of TQ **OR** SR ✓ length of TR ✓ length of RQ **OR** TS ✓ correct subst into cosine rule ✓ simplification ✓ answer (6)
3.6.1	$MQ=\sqrt{(5-3)^2+(2-0)^2}$ $MQ=\sqrt{8}$ $\dfrac{MQ}{RQ}=\dfrac{\sqrt{8}}{\sqrt{98}}$ $=\dfrac{2}{7}$ or 0,29 Answer only: full marks	✓substitution/*substitusie* ✓ $MQ=\sqrt{8}=2\sqrt{2}$ ✓ answer (3)
3.6.2	$\dfrac{\text{area of }\Delta TQM}{\text{area of }\Delta TQR}=\dfrac{\frac{1}{2}.QM.\perp h}{\frac{1}{2}.QR.\perp h}$ [$\perp$h same/*dieselfde*] $=\dfrac{QM}{QR}=\dfrac{2}{7}$ $\dfrac{\text{area of }\Delta TQM}{\text{area of parm }RQTS}=\dfrac{\text{area of }\Delta TQM}{2\times\text{area of }\Delta TQR}$ $=\dfrac{1}{2}\left(\dfrac{2}{7}\right)=\dfrac{1}{7}$	✓ $\dfrac{\text{area of }\Delta TQM}{\text{area of }\Delta TQR}=\dfrac{2}{7}$ ✓ area parm RQTS = 2area ΔTQR ✓ answer (3)
	OR/*OF*	
	$\dfrac{\text{area of }\Delta TQM}{\text{area of }\Delta TQR}=\dfrac{QM}{QR}$ $=\dfrac{2}{7}$ $\dfrac{\text{area of }\Delta TQM}{\text{area of parm }RQTS}=\dfrac{\text{area of }\Delta TQM}{2\text{area of }\Delta TQR}$ $=\dfrac{1}{2}\left(\dfrac{2}{7}\right)=\dfrac{1}{7}$	✓ $\dfrac{\text{area of }\Delta TQM}{\text{area of }\Delta TQR}=\dfrac{2}{7}$ ✓ area parm RQTS = 2area ΔTQR ✓ answer (3)
	OR/*OF*	

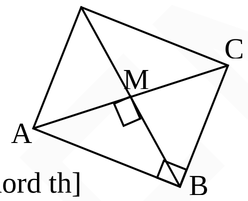
	$\dfrac{\text{area of } \Delta TQM}{\text{area of parm RQTS}} = \dfrac{\frac{1}{2}QM.\perp h}{RQ.\perp h}$ $= \dfrac{1}{2}\left(\dfrac{2}{7}\right)$ $= \dfrac{1}{7}$	✓ $\dfrac{\frac{1}{2}QM.\perp h}{RQ.\perp h}$ ✓ $\dfrac{1}{2}\left(\dfrac{2}{7}\right)$ ✓ answer (3)
	OR/*OF*	
	$\dfrac{\text{area of } \Delta TQM}{\text{area of parm RQTS}} = \dfrac{\frac{1}{2}QT.QM.\sin(\alpha-\beta)}{2\text{area of } \Delta QTR}$ $= \dfrac{\frac{1}{2}QT.QM.\sin(\alpha-\beta)}{2[\frac{1}{2}.QT.QR.\sin(\alpha-\beta)]}$ $= \dfrac{1}{2}\left(\dfrac{2}{7}\right)$ $= \dfrac{1}{7}$	✓ area parm RQTS = 2area ΔTQR ✓ $\dfrac{\frac{1}{2}QT.QM.\sin(\alpha-\beta)}{2[\frac{1}{2}.QT.QR.\sin(\alpha-\beta)]}$ ✓ answer (3) **[23]**

QUESTION/*VRAAG* 3

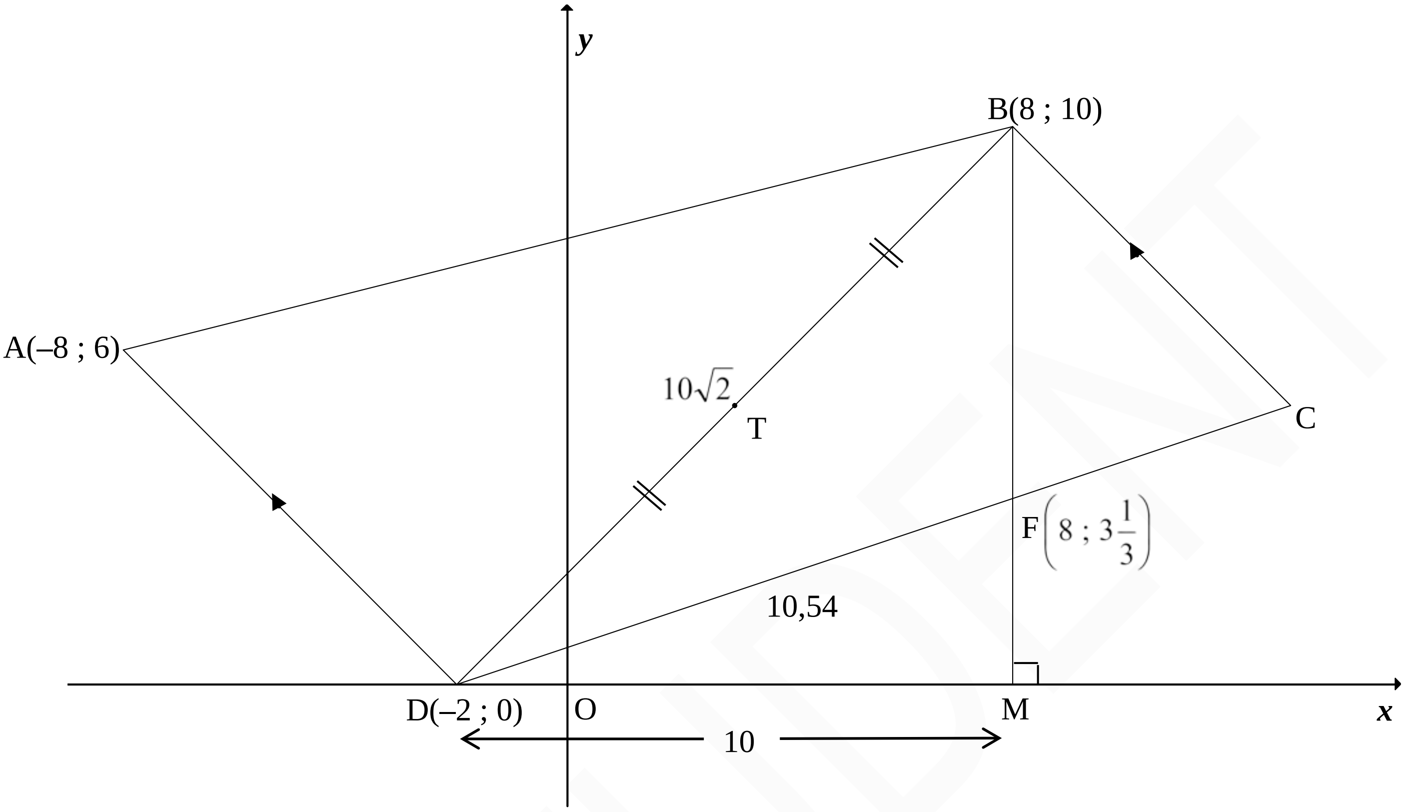


3.1	M = Midpt of AC [diags of rectangle bisect/ *hoekl v reghoek halveer*] $= M\left(\frac{-7+6}{2} ; \frac{2+3}{2}\right)$ $= M\left(-\frac{1}{2} ; \frac{5}{2}\right)$	✓ x-value of M ✓ y-value of M (2)
3.2	$m_{BC} = \frac{3-0}{6-p} = \frac{3}{6-p}$ **OR/*OF*** $m_{BC} = \frac{0-3}{p-6} = \frac{-3}{p-6}$	✓answer (1) ✓answer (1)
3.3	$m_{AD} = m_{BC}$ [AD | | BC] $m_{BC} = 2$ $\frac{3}{6-p} = 2$ $3 = 12 - 2p$ $p = 4\frac{1}{2}$ **OR/OF** $y - y_1 = 2(x - x_1)$ $C(6;3)$ $y - 3 = 2(x-6)$ $\therefore y = 2x - 9$ $but\ y = 0$ $\therefore x = 4\frac{1}{2} = p$ **OR/OF**	✓ $m_{BC} = 2$ ✓ equating ✓answer (3) ✓ $m_{BC} = 2$ ✓ substituting (6 ; 3) ✓answer (3)

	$y = 2x + c$ $3 = 12 + c$ $-9 = c$ $y = 2x - 9$ $0 = 2x - 9$ $x = \frac{9}{2} \quad \therefore\ p = \frac{9}{2}$	✓ $m_{BC} = 2$ ✓ substituting ✓answer (3)
3.4	DB =AC [diag of rectangle = / *hoekl v reghoek* =] $AC = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $AC = \sqrt{(6+7)^2 + (3-2)^2}$ $AC = \sqrt{13^2 + 1^2}$ $AC = \sqrt{170}$ $\therefore$ DB = $\sqrt{170}$ or 13,04	✓ substitution ✓ length of AC ✓ AC = BD (3)
3.5	$\tan\alpha = m_{BC} = 2$ $\therefore \alpha = 63{,}43°$	✓ $\tan\alpha = m_{BC}$ ✓ $\alpha = 63{,}43°$ (2)
3.6	In quadrilateral OFBG: $O\hat{F}B = 63{,}43°$ [vert opp ∠s/*regoorst* ∠*e*] $F\hat{O}G = G\hat{B}F = 90°$ $\therefore\ O\hat{G}B = 360° - [90° + 90° + 63{,}43°]$ [sum ∠s quad/*som* ∠*e vierh* = 360°] $\therefore\ O\hat{G}B = 116{,}57°$ **OR/*OF*** $m_{AB} = -\frac{1}{2}$ 90° + $O\hat{G}A$ = 153,43° $\therefore\ O\hat{G}A = 63{,}43°$ $O\hat{G}B = 180° - 63{,}43°$ = 116,57° **OR/*OF*** $F\hat{O}G = G\hat{B}F = 90°$ ∴GOFB is cyc quad $O\hat{G}B = 180° - 63{,}43°$ [∠s of cyc quad = 180°] = 116,57° **OR/OF** $O\hat{F}B = 63{,}43°$ $X\hat{O}G = F\hat{B}G = 90°$ ∴ OGBF is a cyclic quad $\therefore O\hat{G}B = 180° - 63{,}43°$ $O\hat{G}B = 116{,}57°$	✓ size of $O\hat{F}B$ ✓ S ✓ answer (3) ✓ $m_{AB} = -\frac{1}{2}$ ✓ S ✓ answer (3) ✓ S ✓ S ✓ answer (3) ✓ S ✓ S ✓ answer (3)

3.7	$M\left(-\frac{1}{2}\,;\,\frac{5}{2}\right)$ is the centre/*is die middelpunt* $r=\frac{\sqrt{170}}{2}$ = radius [BD is diameter/*middellyn*] $\left(x+\frac{1}{2}\right)^2+\left(y-\frac{5}{2}\right)^2=\left(\frac{\sqrt{170}}{2}\right)^2=\frac{85}{2}=42,5$	✓ M is centre ✓ $r=\frac{\sqrt{170}}{2}$ ✓ equation (3)
3.8	$C\hat{B}M = B\hat{A}M = 45°$ [diag of square bisect ∠s/*hoekl v vierk halv ∠e*] ∴ BC will be a tangent [converse tan chord th/*omgekeerde raakl-koordst*] **OR/*OF***  $A\hat{M}B = 90°$ [diag of square bisect ⊥] ∴ AB is diameter BC ⊥ AB ∴ BC is tangent [line ⊥ radius *or* converse tan-chord th]	✓S ✓ R (2) ✓S ✓ R (2) **[19]**

QUESTION/*VRAAG* 3



3.1	$m_{AD} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{0-6}{-2+8}$ $= \frac{-6}{6} = -1$	✓substitution ✓–1 (2)
3.2	$m_{BC} = -1$ [BC || AD] $y = -x + c$ $10 = -8 + c$ $c = 18$ $y = -x + 18$ **OR/*OF*** $m_{BC} = -1$ [BC || AD] $y - y_1 = m(x - x_1)$ $y - 10 = -(x - 8)$ $y = -x + 18$	✓ gradient ✓substitute *m* and (8 ; 10) ✓ equation (3) ✓ gradient ✓substitute *m* and (8 ; 10) ✓ equation (3)

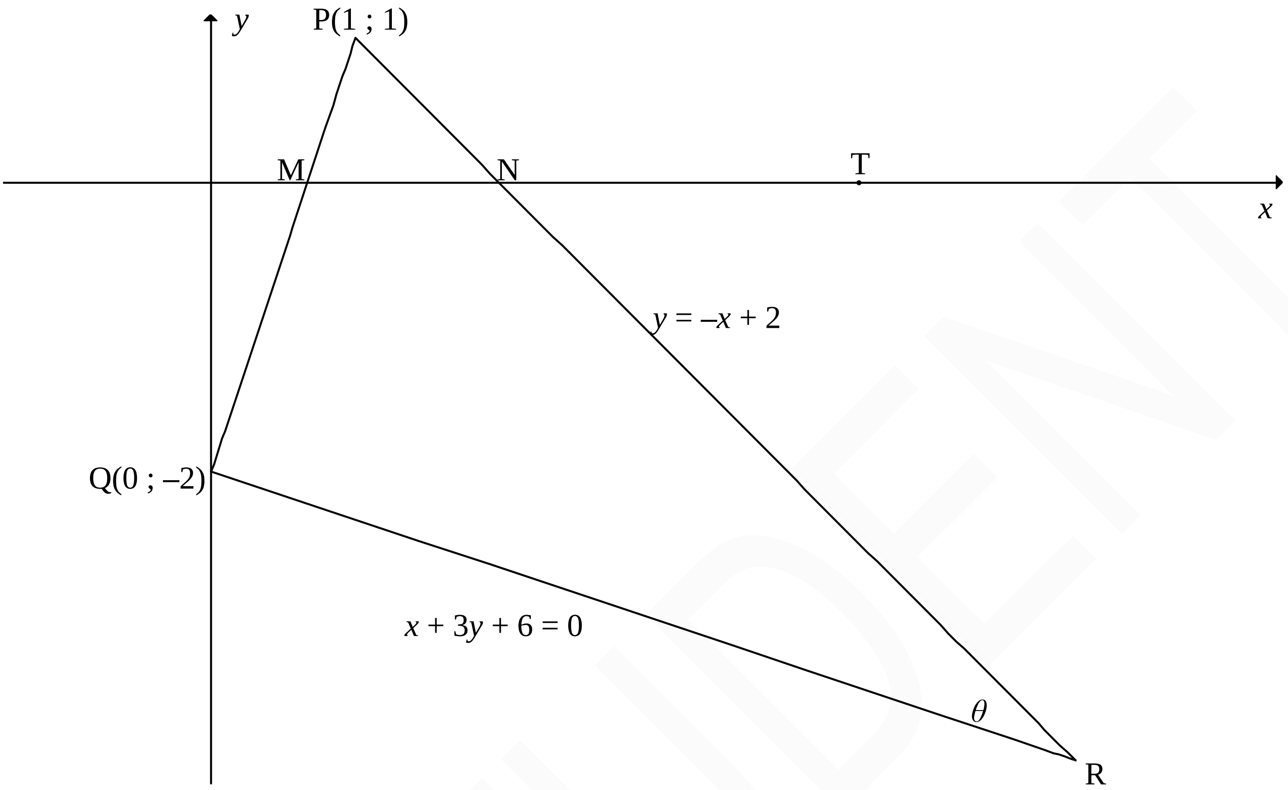
3.3	$m_{BD} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{10-0}{8+2} = 1$ $m_{BD} \times m_{AD} = 1 \times -1 = -1$ $\therefore DB \perp AD$ **OR** $AD^2 = 72$ *or* $AD = \sqrt{72}$ *or* $6\sqrt{2}$ $AB^2 = 272$ *or* $AB = \sqrt{272}$ *or* $4\sqrt{17}$ $BD^2 = 200$ *or* $BD = \sqrt{200}$ *or* $10\sqrt{2}$ $\therefore AB^2 = AD^2 + BD^2$ $\therefore A\hat{D}B = 90°$ [converse Pyth th/ *omgekeerde Pyth st*]	✓substitution ✓ answer ✓ $m_{BD} \times m_{AD} = -1$ (3) ✓✓ calculating all 3 sides ✓ $AB^2 = AD^2 + BD^2$ (3)
3.4	$\tan B\hat{D}M = m_{BD} = 1$ $\therefore B\hat{D}M = 45°$ **OR** $\sin B\hat{D}M = \frac{BM}{BD} = \frac{10}{10\sqrt{2}} = \frac{1}{\sqrt{2}}$ $\therefore B\hat{D}M = 45°$	✓ $\tan B\hat{D}M = m_{BD}$ ✓ answer (2) ✓ $\sin B\hat{D}M = \frac{1}{\sqrt{2}}$ ✓ answer (2)
3.5	$T(x\,;y) = \left(\frac{x_1 + x_2}{2}\,;\frac{y_1 + y_2}{2}\right)$ $= \left(\frac{-2+8}{2}\,;\frac{0+10}{2}\right)$ $= (3\,;\,5)$ T symmetrical about BM/*T is simmetries om BM* ∴ distance of T to BM = 5 units = distance from BM to C ∴ C(13 ; 5) **OR/*OF***	✓T(3 ; 5) ✓value of *x* ✓ value of *y* (3)

	$m_{DF} = \frac{3\frac{1}{3} - 0}{8-(-2)} = \frac{1}{3}$ Equation of DF: $y - y_1 = m(x - x_1)$ $y - 0 = \frac{1}{3}(x+2)$ $y = \frac{1}{3}x + \frac{2}{3}$ Equation of BC: $y = -x + 18$ $\frac{1}{3}x + \frac{2}{3} = -x + 18$ $4x = 52$ $x = 13$ $\therefore y = -13 + 18 = 5$ $\therefore$ C(13 ; 5)	✓eq of DF ✓value of x ✓ value of y (3)
3.6	area/*opp* ΔBDF = area/*opp* ΔBDM – area/*opp* ΔDFM $= \frac{1}{2}(10)(10) - \frac{1}{2}(10)\left(\frac{10}{3}\right)$ $= \frac{100}{3}$ or $33\frac{1}{3}$ or 33,3 square units/*vk eenh* **OR/*OF*** area/*opp* ΔBDF $= \frac{1}{2}$.BF.DM $= \frac{1}{2}\left(\frac{20}{3}\right)(10)$ $= \frac{100}{3}$ or $33\frac{1}{3}$ or 33,3 square units/*vk eenh* **OR/*OF***	✓ formula/method ✓ 10 (DM) ✓ 10 (BM) ✓ $\frac{10}{3}$ or $3\frac{1}{3}$ (⊥h) ✓ answer (5) ✓ formula/method ✓ BF ✓✓ DM ✓ answer (5)

	$\tan F\hat{D}M = m_{DC} = \frac{5-0}{13+2} = \frac{1}{3}$ or $\tan F\hat{D}M = \frac{FM}{DM} = \frac{\frac{10}{3}}{10} = \frac{1}{3}$	✓ gradient/ratio
	$F\hat{D}M = 18{,}43°$ $\therefore B\hat{F}D = 108{,}43°$ [ext ∠ Δ]	✓ $B\hat{F}D$
	$BF = \frac{20}{3}$ or $6\frac{2}{3}$ $DF^2 = (10)^2 + \left(3\frac{1}{3}\right)^2$ [Pyth ΔDFM]	✓ DF
	$DF = 10{,}54$ or $\frac{\sqrt{1000}}{3}$ or $\frac{10\sqrt{10}}{3}$ $BD = \sqrt{(10-0)^2 + (8+2)^2} = \sqrt{200}$ *or* $10\sqrt{2}$ $\therefore$ area/*opp* $\Delta BDF = \frac{1}{2}.BF.FD.\sin B\hat{F}D$ $= \frac{1}{2}\left(\frac{20}{3}\right)\left(\frac{10\sqrt{10}}{3}\right)(\sin 108{,}43)$ $= \frac{100}{3}$ or $33\frac{1}{3}$ or 33,33 square units/*vk eenh*	✓correct substitution into area rule ✓ answer (5)
	OR/*OF* $BF = \frac{20}{3}$ or $6\frac{2}{3}$	✓ BF
	$BD = \sqrt{(10-0)^2 + (8+2)^2}$ $= \sqrt{200}$ *or* $10\sqrt{2}$ area/*opp* $\Delta BDF = \frac{1}{2}.BF.BD.\sin D\hat{B}F$	✓ BD ✓ formula/method
	$= \frac{1}{2}\left(\frac{20}{3}\right)\left(\sqrt{200}\right)(\sin 45°)$ $= \frac{100}{3}$ or $33\frac{1}{3}$ or 33,33 square units/*vk eenh*	✓correct substitution into area rule ✓ answer (5)
	OR/*OF* area/*opp* ΔBDF = area/*opp* ΔBCD – area/*opp* ΔBCF $= \frac{1}{2}(10\sqrt{2})(5\sqrt{2}) - \frac{1}{2}\left(\frac{20}{3}\right)(5)$ $= \frac{100}{3}$ or $33\frac{1}{3}$ or 33,33 square units/*vk eenh*	✓ formula/method ✓ $BD = 10\sqrt{2}$ ✓ $BC = 5\sqrt{2}$ ✓ $BF = \frac{20}{3}$ ✓ answer (5)
	OR/*OF*	

	$\tan F\hat{D}M = m_{DC} = \frac{5-0}{13+2} = \frac{1}{3}$ or $\tan F\hat{D}M = \frac{FM}{DM} = \frac{\frac{10}{3}}{10} = \frac{1}{3}$ $F\hat{D}M = 18{,}43°$ $B\hat{D}F = 26{,}56°$ area / *opp* ΔBDF $= \frac{1}{2}.BD.DF.\sin B\hat{D}F$ $= \frac{1}{2}.(10\sqrt{2}).\left(\frac{10\sqrt{10}}{3}\right).\sin 26{,}56°$ $= \frac{100}{3}$ or $33\frac{1}{3}$ or $33{,}33$ square units/*vk eenh*	✓ gradient/ratio ✓ $B\hat{D}F$ ✓ DF **OR/*OF*** BD ✓correct substitution into area rule ✓ answer (5) **[18]**

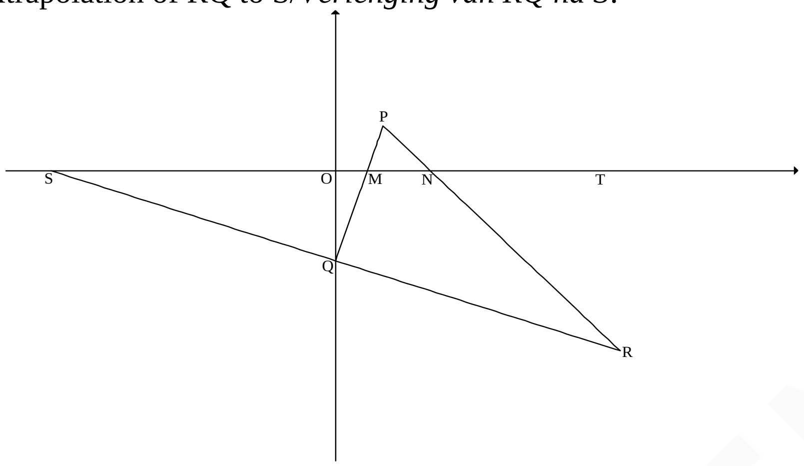
QUESTION/*VRAAG* 3



3.1	$m_{PQ} = \dfrac{1-(-2)}{1-0}$ $= 3$	✓subst (1 ; 1) & (0 ; –2) ✓answ/*antw* (2)
3.2	QR: $y = -\dfrac{1}{3}x - 2$ $\therefore m_{QR} = -\dfrac{1}{3}$ $m_{PQ} \times m_{QR} = 3 \times -\dfrac{1}{3}$ $= -1$ $\therefore PQ \perp QR \quad \therefore P\hat{Q}R = 90°$	✓ $m_{QR} = -\dfrac{1}{3}$ ✓ $m_{PQ} \times m_{QR} = -1$ (2)

3.3	$-\frac{1}{3}x-2=-x+2$ $\frac{2}{3}x=4$ $x=6$ $y=-4$ $\therefore$ R(6 ; –4)	✓equating/*gelyk stel* ✓x-value/*waarde* ✓y-value/*waarde* (3)
3.4	$\text{PR}=\sqrt{(1-6)^2+(1-(-4))^2}$ $=\sqrt{50}=5\sqrt{2}$ **OR/*OF*** $\text{PR}^2=(1-6)^2+(1-(-4))^2$ $=50$ $\therefore \text{PR}=\sqrt{50}=5\sqrt{2}$	✓subst into/*in* distance formula/ *afstandsformule* ✓answ/*antw* in surd form/ *wortelvorm* (2) ✓subst into/*in* distance formula/ *afstandsformule* ✓answ/*antw* in surd form/ *wortelvorm* (2)
3.5	PR is a diameter/*'n middellyn* [chord subtends/*kd onderspan* 90°] Centre of circle/*Midpt v sirkel*: $\left(\frac{1+6}{2};\frac{1-4}{2}\right)$ $=\left(3\frac{1}{2};-1\frac{1}{2}\right)$ $r=\frac{\sqrt{50}}{2}$ OR $\frac{5\sqrt{2}}{2}$ OR 3,54 $\therefore \left(x-\frac{7}{2}\right)^2+\left(y+\frac{3}{2}\right)^2=\frac{50}{4}$ OR $\frac{25}{2}$ OR 12,5	✓✓S ✓✓ $\left(3\frac{1}{2};-1\frac{1}{2}\right)$ ✓r-value/*waarde* ✓answ/*antw* (6)
3.6	m of/*van* radius = –1 $\therefore m$ of/*van* tangent/*raaklyn* = 1 Equation of tangent/*Vgl van raaklyn*: $y-y_1=(x-x_1)$ $y-1=x-1$ $\therefore y=x$ **OR/*OF*** $y=x+c$ $1=1+c$ $y=x$	✓m of tang/*rkl* ✓subst m & P(1 ; 1) into/*in* eq of line/*vgl v lyn* ✓answ/*antw* (3)
3.7	$\tan \hat{PNT}=m_{PR}=-1$ $\therefore \hat{PNT}=135°$ $\tan \hat{PMT}=m_{PQ}=3$ $\therefore \hat{PMT}=71{,}57°$ $\hat{P}=63{,}43°$ [ext ∠ of Δ/*buite ∠ v Δ*] $\therefore \theta=26{,}57°$ [sum of ∠s in Δ/*som v ∠e in Δ*] **OR/*OF***	✓ $\tan \hat{PNT}=-1$ ✓ $\hat{PNT}=135°$ ✓ $\hat{PMT}=71{,}57°$ ✓ $\hat{P}=63{,}43°$ ✓answ/*antw* (5)

Extrapolation of RQ to S/*Verlenging van RQ na S*:



$\tan P\hat{N}T = m_{PR} = -1$	✓ $\tan P\hat{N}T = -1$
$\therefore S\hat{N}R = 135°$	✓ $S\hat{N}R = 135°$
$\tan N\hat{S}R = m_{RS} = -\frac{1}{3}$	✓ $\tan N\hat{S}R = -\frac{1}{3}$
$\therefore N\hat{S}R = 18{,}43°$	✓ $N\hat{S}R = 18{,}43°$
$\theta = 180° - (135° + 18{,}43°)$ [sum of ∠s in Δ/*som v ∠e in Δ*]	
$= 26{,}57°$	✓answ/*antw* (5)

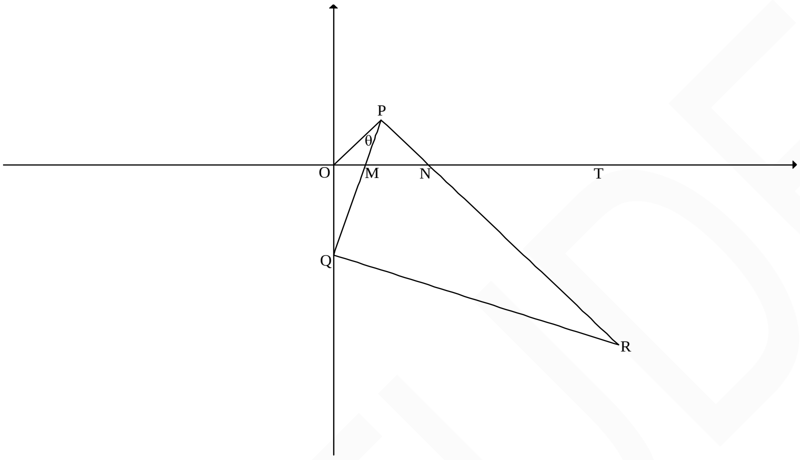
OR/*OF*

$PQ^2 = 1^2 + 3^2 = 10$	✓subst into/*in* distance formula/ *afstandsformule*
$PQ = \sqrt{10}$	✓distance/*afst* PQ
$\therefore \sin\theta = \frac{PQ}{PR} = \frac{\sqrt{10}}{\sqrt{50}} = \frac{1}{\sqrt{5}}$	✓correct trig ratio/ *korrekte trig vh* ✓correct trig eq/ *korrekte trig vgl*
$\therefore \theta = 26{,}57°$	✓answ/*antw* (5)

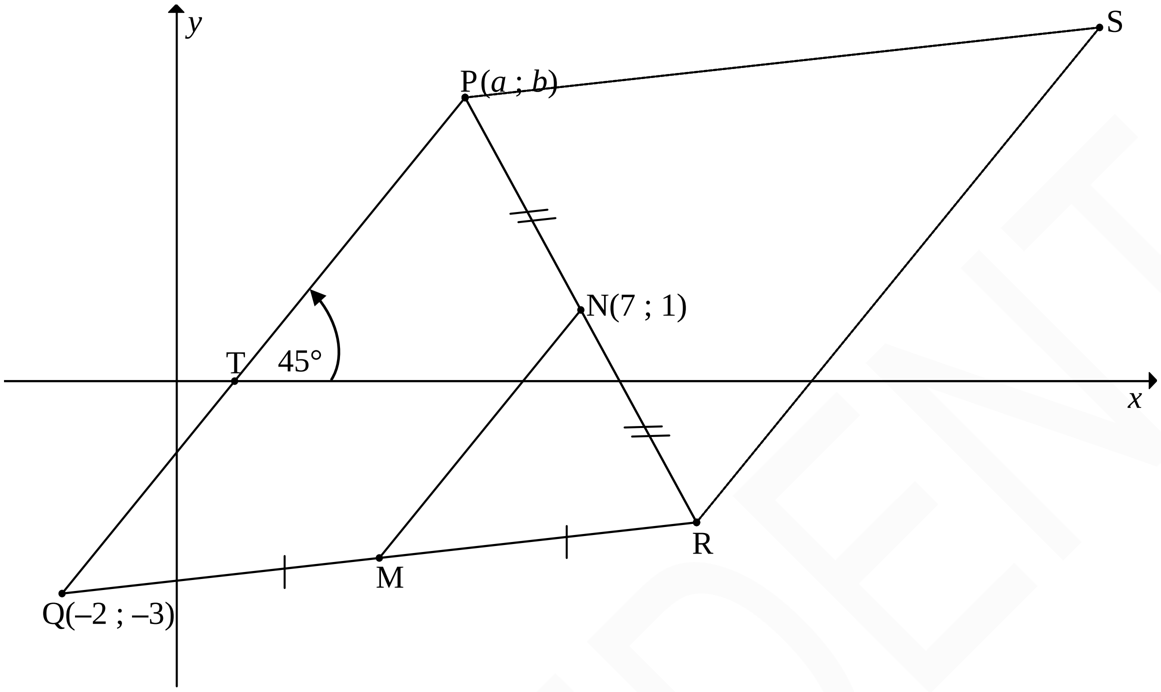
OR/*OF*

$QR^2 = 6^2 + 2^2 = 40$	✓subst into/*in* distance formula/ *afstandsformule*
$QR = 2\sqrt{10}$	✓distance/*afst* PQ
$\therefore \cos\theta = \frac{2\sqrt{10}}{\sqrt{50}} = \frac{2}{\sqrt{5}}$	✓correct trig ratio/ *korrekte trig vh* ✓correct trig eq/ *korrekte trig vgl*
$\therefore \theta = 26{,}57°$	✓answ/*antw* (5)

OR/*OF*

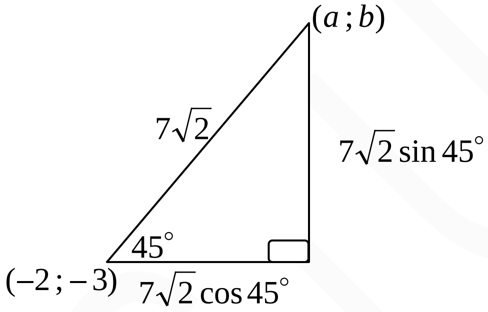
	$\tan\theta = \dfrac{m_{RQ} - m_{PR}}{1 + m_{RQ}.m_{PR}}$ $= \dfrac{-\frac{1}{3} - (-1)}{1 + (-\frac{1}{3})(-1)}$ $= \dfrac{1}{2}$ $\therefore\ \theta = 26{,}57°$	✓correct formula/ *korrekte formule* ✓ $m_{RQ} = -\frac{1}{3}$ ✓correct subst/ *subst korrek* ✓$\tan\theta = \dfrac{1}{2}$ ✓ $\theta = 26{,}57°$ (5)
	 tangent OP goes through the origin/*raakl OP gaan deur oorsprong* $\hat{POM} = 45°$ $\hat{OPM} = \theta = \hat{P}$ [tan-chord theorem/*raakl-kdst*] $\tan \hat{PMT} = m_{PQ} = 3$ $\therefore \hat{PMT} = 71{,}57°$ $\therefore\ \theta + 45° = 71{,}57°$ [ext ∠ of Δ/*buite-∠ v* Δ] $\therefore\ \theta = 26{,}57°$	✓ $\hat{POM} = 45°$ ✓R ✓ $\hat{PMT} = 71{,}57°$ ✓S ✓ $\theta = 26{,}57°$ (5) **[23]**

QUESTION/*VRAAG* 3

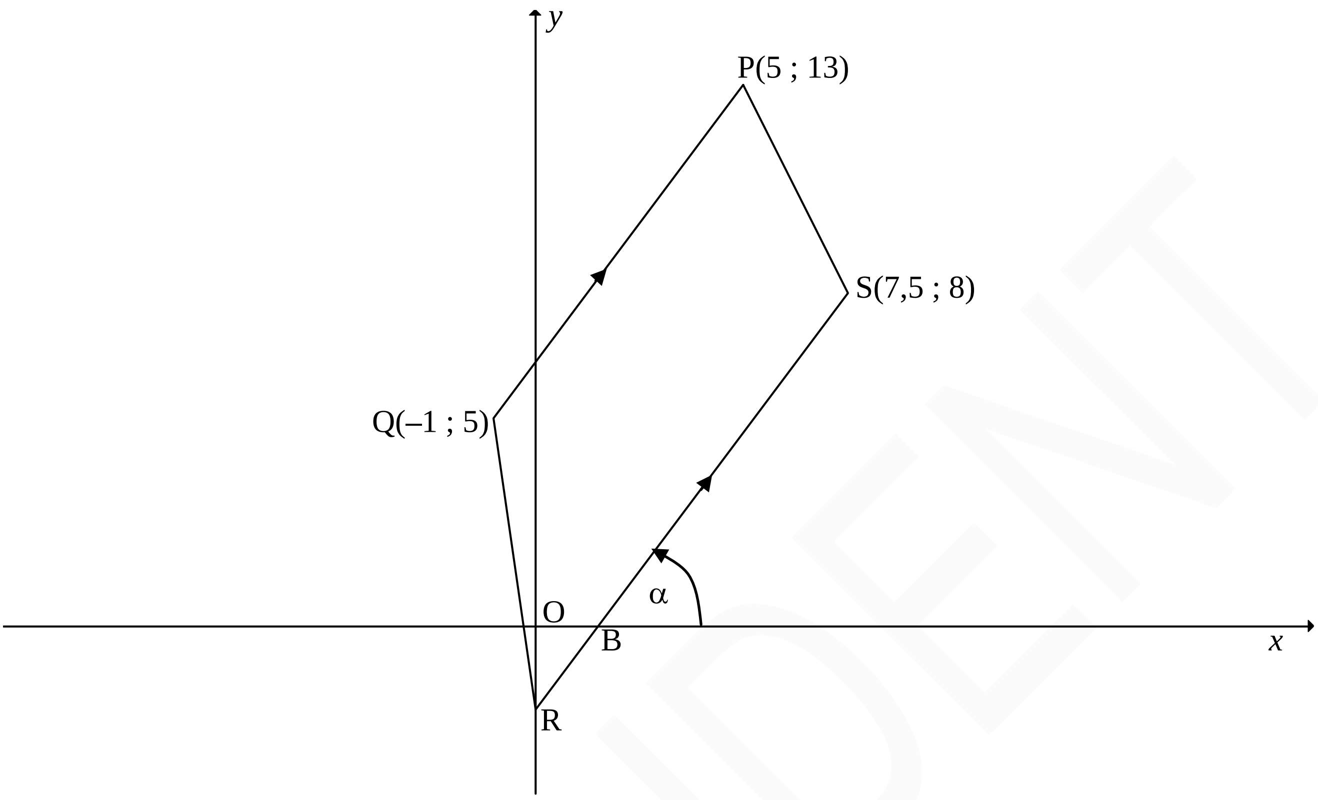


3.1	$m_{PQ} = \tan 45°$ $= 1$	✓ $m = \tan 45°$ ✓ answ/*antw* (2)
3.2	MN | | QP [midpt theorem/*midpt-stelling*] $\therefore m_{MN} = 1$ $\therefore y - y_1 = m(x - x_1)$ $\therefore y - 1 = 1(x - 7)$ $\therefore \quad y = x - 6$ **OR/*OF*** MN | | PQ [midpt theorem/*midpt-stelling*] $\therefore m_{MN} = 1$ $\therefore y = mx + c$ $\therefore 1 = 1(7) + c$ $-6 = c$ $\therefore \quad y = x - 6$	✓ S **OR** R ✓ m_{MN} ✓ subst *m* and/*en* N(7 ; 1) ✓ equation/*vgl* (4) ✓ S **OR** R ✓ m_{MN} ✓ subst *m* and/*en* N(7 ; 1) ✓ equation/*vgl* (4)
3.3	MN = $\frac{1}{2}$PQ [midpoint theorem/midp stelling] $\therefore$ MN = $\frac{7\sqrt{2}}{2} \approx 4{,}95$	✓ S ✓ answ/antw (2)

3.5	QN = NS [diag of ||m/hoekl van ||m] $\frac{-2+x_S}{2}=7$ and/en $\frac{-3+y_S}{2}=1$ $\therefore\ x_S=16$ $\therefore\ y_S=5$ **OR/*OF*** QN = NS [diag of ||m/hoekl van ||m] ∴ by inspection/deur inspeksie: S(16 ; 5)	✓ method/metode ✓ *x*-value/waarde ✓ *y*-value/waarde (3) ✓ method/metode ✓ *x*-value/waarde ✓ *y*-value/waarde (3)
3.6	Equation of/*Vgl van PQ*: $y = x + c$ $-3 = -2 + c$ $y = x - 1$ $\therefore a = b + 1$ .....(1) From distance formula/*Van afstandsformule*: $PQ=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ $7\sqrt{2}=\sqrt{(a-(-2))^2+(b-(-3))^2}$ $\therefore 98=(a+2)^2+(b+3)^2$ .....(2) Subst (1) into (2): $98=(b+1+2)^2+(b+3)^2$ $98=b^2+6b+9+b^2+6b+9$ $0=2b^2+12b-80$ $0=b^2+6b-40$ $\therefore 0=(b+10)(b-4)$ $\therefore\ b=4$ (since $b>0$) Subst $b = 4$ into (1): $\therefore a = 4 + 1 = 5$ ∴ P(5 ; 4) **OR/*OF*** Equation of/*Vgl van PQ*: $y = x + c$ $-3 = -2 + c$ $y = x - 1$ $\therefore a = b + 1$ .....(1) From distance formula/*Van afstandsformule*: $7\sqrt{2}=\sqrt{(a-(-2))^2+(b-(-3))^2}$ $\therefore 98=(a+2)^2+(b+3)^2$ .....(2) Subst (1) into (2): $98=(b+1+2)^2+(b+3)^2$ $98=2(b+3)^2$ $49=(b+3)^2$ $\pm 7=b+3$ $\pm 7-3=b$ $\therefore\ b=4$ (since $b>0$) Subst $b = 4$ into (1): $\therefore a = 4 + 1 = 5$ ∴ P(5 ; 4)	✓ eq of/*vgl van* PQ ✓ subst Q & $7\sqrt{2}$ into/*in* distance formula/*afstandsformule* ✓ subst eq of/*vgl v.* PQ ✓ st form/*st vorm* ✓ value of/*waarde van b* ✓ value of/*waarde van a* (6) ✓ eq of/*vgl van* PQ ✓ subst Q & $7\sqrt{2}$ into/*in* distance formula/*afstandsformule* ✓ subst eq of/*vgl v.* PQ ✓ simplification/*vereenvoudig* ✓ value of/*waarde van b* ✓ value of/*waarde van a* (6)

	OR/*OF*	
	Equation of/*Vgl van PQ*: $y = x + c$ $-3 = -2 + c$ $y = x - 1 \qquad \therefore a = b + 1 \quad .....(1)$	✓ eq of/*vgl van* PQ
	From distance formula/*Van afstandsformule*: $7\sqrt{2} = \sqrt{(a-(-2))^2 + (b-(-3))^2}$	✓ subst Q & $7\sqrt{2}$ into/*in* distance formula/ *afstandsformule*
	$98 = (a+2)^2 + (a-1+3)^2$	✓ subst eq of/*vgl v.* PQ
	$= 2(a+2)^2$	✓ simplification/ *vereenvoudig*
	$\therefore a + 2 = 7$ (since/*aangesien* $a > 0$) $\therefore a = 5$	✓ value of/*waarde van a*
	Subst $a = 4$ into (1): $\therefore b = 5 - 1 = 4$ $\therefore$ P(5 ; 4)	✓ value of/*waarde van b* (6)
	OR/*OF*	
		✓✓✓✓
	$a = -2 + 7\sqrt{2}\cos 45^\circ = 5$	✓
	$b = -3 + 7\sqrt{2}\sin 45^\circ = 4$	✓ (6) **[17]**

QUESTION/VRAAG 3

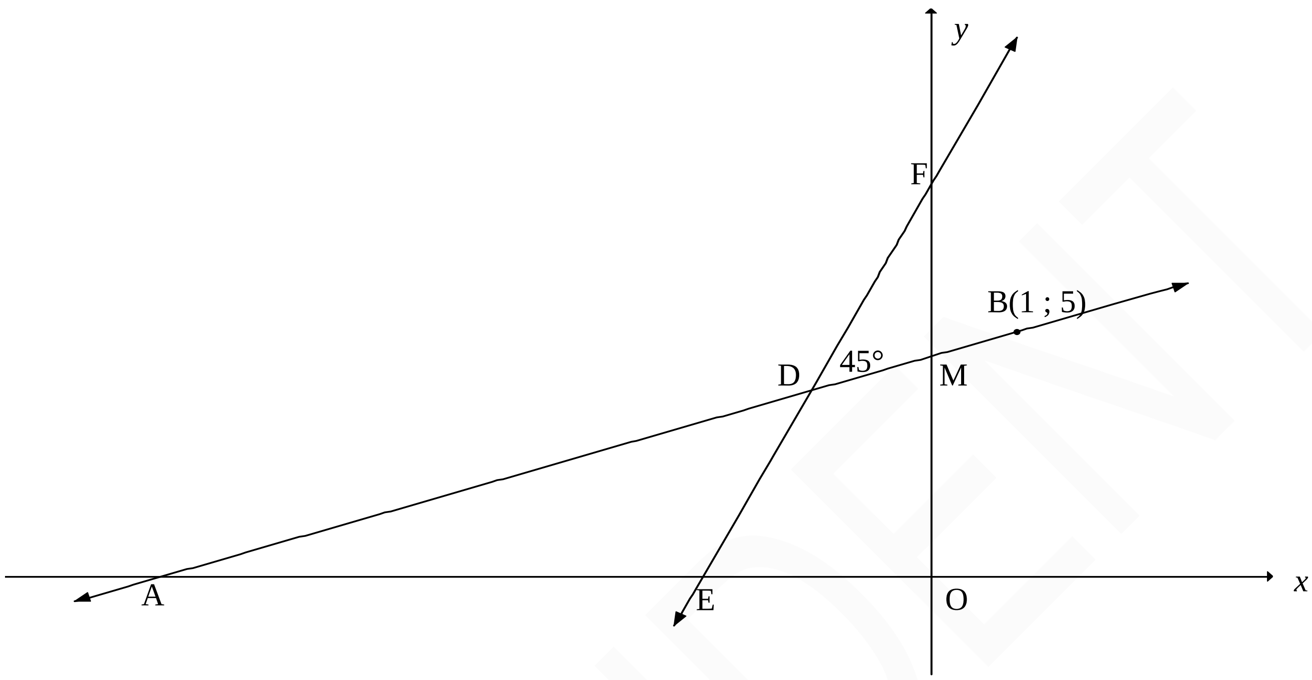


3.1	$PQ = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{(5+1)^2 + (13-5)^2}$ $= 10$	✓ use of distance formula/*gebruik afstandformule* ✓ correct subst into form/*korrekte subst in formule* ✓ 10 (3)
3.2	$m_{PQ} = \dfrac{y_2 - y_1}{x_2 - x_1}$ $= \dfrac{13-5}{5-(-1)}$ $= \dfrac{8}{6} = \dfrac{4}{3}$ Answer only: Full marks *slegs antw: volpunte*	✓ correct subst into gradient formula/ *korrekte subst in gradiëntformule* ✓ gradient/*gradiënt* (2)

3.3	Equation of line RS/*Vgl van lyn RS*: $m_{RS} = m_{PQ} = \frac{4}{3}$ (= gradients, | | lines/=*gradiënte, | | lyne*) $y = mx + c$ $8 = \frac{4}{3}\left(\frac{15}{2}\right) + c$ $c = -2$ $y = \frac{4}{3}x - 2$ $\therefore 4x - 3y - 6 = 0$ **OR/*OF*** $y - y_1 = m(x - x_1)$ $y - 8 = \frac{4}{3}\left(x - \frac{15}{2}\right)$ $y = \frac{4}{3}x - 2$ $\therefore 4x - 3y - 6 = 0$	✓ $m_{RS} = \frac{4}{3}$ ✓ subst of S(7,5 ; 8) and *m* into eq /*subst van S(7,5 ; 8) en m in vgl* ✓ value of *c* /*waarde van c* or/of st form/*st vorm* ✓ equation/*vgl* (4)
3.4	B is the *x*-intercept of/*is die x-afsnit van* $y = \frac{4}{3}x - 2$ $0 = \frac{4}{3}x - 2$ $4x - 6 = 0$ $x = \frac{3}{2}$ **OR/*OF*** $4x - 3(0) - 6 = 0$ $4x - 6 = 0$ $x = \frac{3}{2}$	✓ $y = 0$ ✓ $x = \frac{3}{2}$ (2)
3.5	$\tan \alpha = \frac{4}{3}$ $\alpha = 53{,}13° = O\hat{B}R$ (vert opp ∠s/*regoorst ∠e*) $O\hat{R}B = 180° - (90° + 53{,}13°)$ (∠s of Δ/*∠e van Δ*) $= 36{,}87°$	✓ $\tan \alpha = \frac{4}{3}$ ✓ 53,13° ✓ 36,87° (3)
3.6	$BS = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{\left(\frac{15}{2} - \frac{3}{2}\right)^2 + (8 - 0)^2}$ $= 10$ PQ || BS and/*en* PQ = BS PQBS = parallelogram (1 pair opp sides = and ||/*1 pr tos sye =en* ||) **OR/*OF*** midpoint of/*midpt van* QS: $\left(\frac{-1 + 7.5}{2}; \frac{5 + 8}{2}\right) = \left(\frac{13}{4}; \frac{13}{2}\right)$ midpoint of/*midpt van* PB: $\left(\frac{5 + 1.5}{2}; \frac{13 + 0}{2}\right) = \left(\frac{13}{4}; \frac{13}{2}\right)$ PQBS = parallelogram (diags bisect each other/*hoekl halv mekaar)* **OR/*OF***	✓ correct subst into form/*korrekte subst in formule* ✓ BS = 10 ✓ BS = PQ ✓ reason/*rede* (4) ✓ $\left(\frac{-1 + 7.5}{2}; \frac{5 + 8}{2}\right)$ ✓ $\left(\frac{5 + 1.5}{2}; \frac{13 + 0}{2}\right)$ ✓ $\left(\frac{13}{4}; \frac{13}{2}\right)$ ✓ reason/*rede* (4)

	$m_{QB} = \frac{5-0}{-1-1,5} = \frac{5}{-2,5} = -2$ $m_{PS} = \frac{13-8}{5-7,5} = \frac{5}{-2,5} = -2$ $m_{QB} = m_{PS}$ $\therefore$ QB || PS PQ || BS PQBS = parallelogram (both pairs opp sides ||/*beide pr tos sye* ||) **OR/*OF*** $BS = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ $= \sqrt{\left(\frac{15}{2}-\frac{3}{2}\right)^2+(8-0)^2}$ $\therefore$ PQ = BS $= 10$ $QB = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ $= \sqrt{(-1-1,5)^2+(5-0)^2} = \sqrt{(2,5)^2+(5)^2} = \frac{5\sqrt{5}}{2}$ or 5,59 $PS = \sqrt{(5-7,5)^2+(13-8)^2} = \sqrt{(2,5)^2+(5)^2} = \frac{\sqrt{125}}{2}$ or 5,59 QB = PS PQBS = parallelogram (both pairs opp sides =/ *beide pr tos sye* =)	✓ m_{QB} ✓ m_{PS} ✓ QB || PS ✓ reason/*rede* (4) ✓ correct subst into form/*korrekte subst in formule* ✓ PQ = 10 ✓ QB = PS ✓ reason/*rede* (4) **[18]**

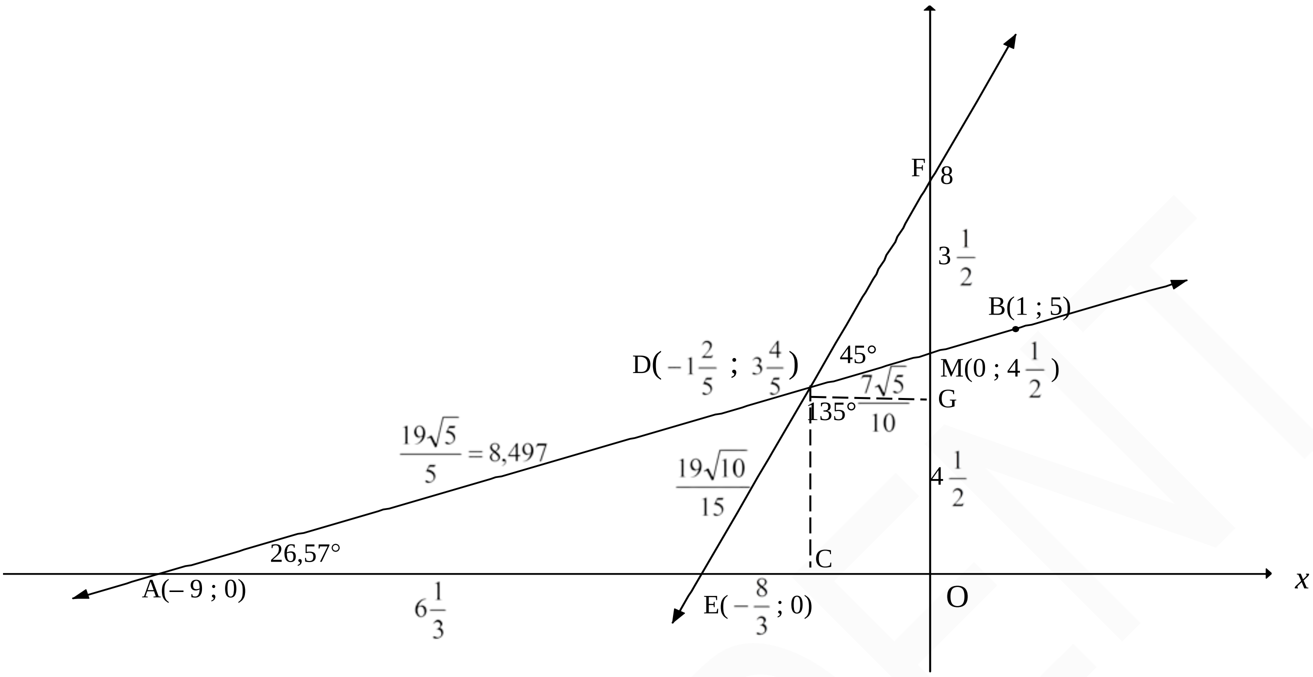
QUESTION/VRAAG 4



4.1	$y = 0$: $3x + 8 = 0$ $x = -\frac{8}{3}$ $\therefore$ E$\left(-2\frac{2}{3};0\right)$ **OR/*OF*** E$\left(-\frac{8}{3};0\right)$	✓ *y*-value/*waarde* ✓ *x*-value/*waarde* (2)
4.2	$\tan D\hat{E}O = m_{DE} = 3$ $\therefore D\hat{E}O = 71,565... = 71,57°$ $D\hat{A}E = 71,565...° - 45°$ $= 26,57°$	✓ $\tan D\hat{E}O = 3$ ✓ 71,565…° ✓ 26,57° (3)
4.3	$m_{AB} = \tan 26,57°$ $= \frac{1}{2}$ $y = \frac{1}{2}x + c$ **OR/*OF*** $y - y_1 = \frac{1}{2}(x - x_1)$ $5 = \frac{1}{2}(1) + c$ $y - 5 = \frac{1}{2}(x - 1)$ $y = \frac{1}{2}x + 4\frac{1}{2}$ $y = \frac{1}{2}x + \frac{9}{2}$	✓ $m_{AB} = \tan 26,57°$ ✓ $m_{AB} = \frac{1}{2}$ ✓ subst of *m* and (1 ; 5)into formula/ *subst m en (1 ; 5) in formule* ✓ equation/*vgl* (4)

4.4	Solve $x - 2y + 9 = 0$ and $y = 3x + 8$ simultaneously: $x - 2(3x+8) + 9 = 0$ $x - 6x - 16 + 9 = 0$ $-5x = 7$ $x = -1\frac{2}{5}$ $\therefore y = 3(-1\frac{2}{5}) + 8$ **OR/*OF*** $-1\frac{2}{5} - 2y + 9 = 0$ $y = 3\frac{4}{5}$ $y = 3\frac{4}{5}$ $\therefore D(-1\frac{2}{5}\ ;\ 3\frac{4}{5})$	✓ subst/*vervang* ✓ x-value/*waarde* ✓ subst/*vervang* ✓ y-value/*waarde* (4)
	OR/OF $x = 2y - 9$ $y = 3(2y - 9) + 8$ $y = 6y - 27 + 8$ $\therefore y = 3\frac{4}{5}$ $x = 2(3\frac{4}{5}) - 9$ **OR/OF** $3\frac{4}{5} = 3x + 8$ $x = -1\frac{2}{5}$ $x = -1\frac{2}{5}$ $\therefore D(-1\frac{2}{5}\ ;\ 3\frac{4}{5})$	✓ subst/*vervang* ✓ y value/*waarde* ✓ subst/*vervang* ✓ x-value/*waarde* (4)
	OR/*OF* $3x + 8 = \frac{1}{2}x + 4\frac{1}{2}$ $6x + 16 = x + 9$ $5x = -7$ $\therefore x = -1\frac{2}{5}$ $\therefore y = 3(-1\frac{2}{5}) + 8$ **OR/*OF*** $y = \frac{1}{2}(-1\frac{2}{5}) + 4\frac{1}{2}$ $y = 3\frac{4}{5}$ $y = 3\frac{4}{5}$ $\therefore D(-1\frac{2}{5}\ ;\ 3\frac{4}{5})$	✓ equating/*gelyk stel* ✓ x value/*waarde* ✓ subst/*vervang* ✓ y-value/*waarde* (4)
	OR/*OF*	

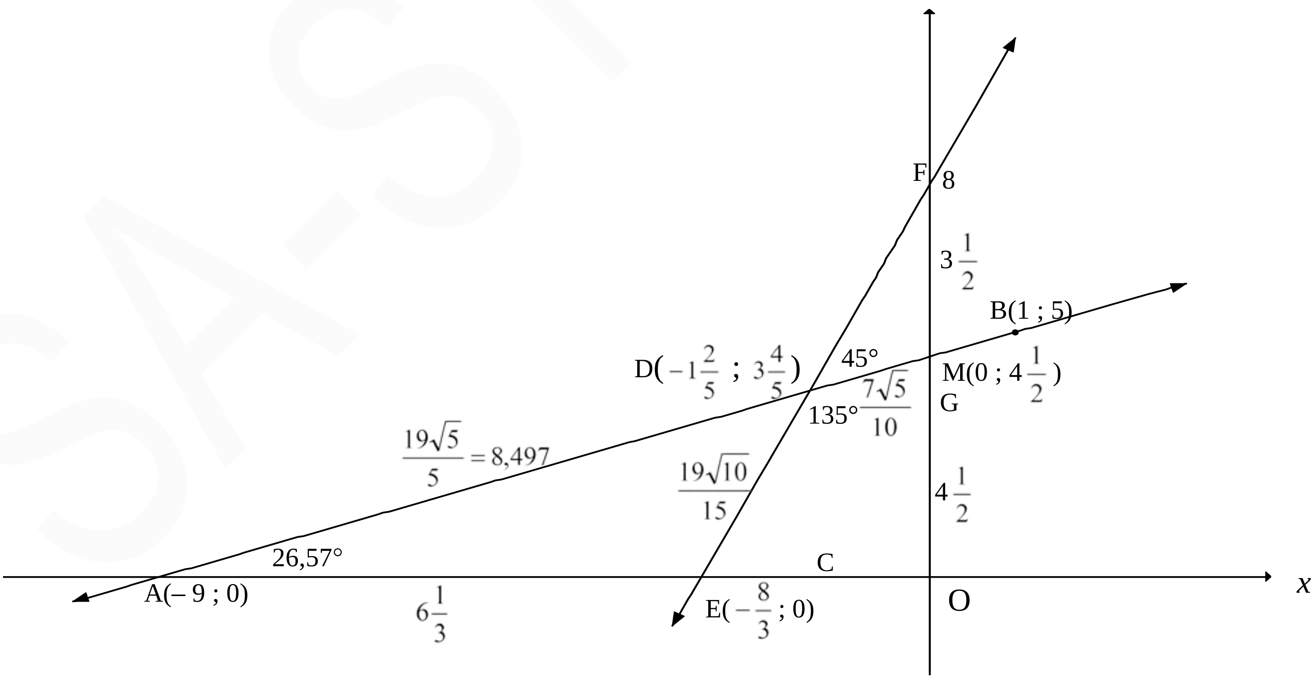
	$x - 2y = -9$ ……(1) $-6x + 2y = 16$ …...(2) (1) + (2): $-5x = 7$ $\therefore x = -1\frac{2}{5}$ $\therefore -1\frac{2}{5} - 2y = -9$ **OR/*OF*** $y = 3(-1\frac{2}{5}) + 8$ $y = 3\frac{4}{5}$ $y = 3\frac{4}{5}$ $\therefore$ D$(-1\frac{2}{5}\ ;\ 3\frac{4}{5})$	✓ adding/*optelling* ✓ x-value/*waarde* ✓ subst/*vervang* ✓ y-value/*waarde* (4)
	OR/*OF*	
	$y = 3x + 8$ ……….(1) $6y = 3x + 27$ …….(2) (1) – (2): $-5y = -19$ $\therefore y = 3\frac{4}{5}$ $3\frac{4}{5} = 3x + 8$ **OR/*OF*** $x = 2(3\frac{4}{5}) - 9$ $x = -1\frac{2}{5}$ $x = -1\frac{2}{5}$ $\therefore$ D$(-1\frac{2}{5}\ ;\ 3\frac{4}{5})$	✓ subtracting/*aftrekking* ✓ y-value/*waarde* ✓ subst/*vervang* ✓ x-value/*waarde* (4)



4.5	area DMOE = area ΔAMO – area ΔADE $x_A = 2(0) - 9 \quad \therefore$ A(–9 ; 0) area ΔAMO $= \frac{1}{2}$. AO. OM $= \frac{1}{2}(9)(4\frac{1}{2})$ = 20,25 area ΔADE $= \frac{1}{2}$. AE . y_D $= \frac{1}{2}$. (AO – EO). y_D $= \frac{1}{2}\left(9 - 2\frac{2}{3}\right)\left(3\frac{4}{5}\right)$ = 12,03 **OR/OF** area ΔADE $= \frac{1}{2}$AD.AE.sin $D\hat{A}E$ $= \frac{1}{2}\left(\frac{19\sqrt{5}}{5}\right).6\frac{1}{3}$.sin 26,57° = 12,03 ∴ area DMOE = 8,22 square units/*vk eenh* **OR/*OF***	✓ correct method/ *korrekte metode* ✓ $x_A = -9$ ✓ $\frac{1}{2}(9)(4\frac{1}{2})$ ✓ AE = $9 - 2\frac{2}{3} = 6\frac{1}{3}$ ✓ $y_D = 3\frac{4}{5}$ **OR/OF** ✓ AD = $\frac{19\sqrt{5}}{5}$ ✓ AE = $6\frac{1}{3}$ ✓ answer/*antw* (6)

	area DMOE = area rectangle DCOG + area ΔDMG + area ΔDEC $= (1\frac{2}{5} \times 3\frac{4}{5}) + \frac{1}{2}\left(1\frac{2}{5}\right)(\frac{7}{10}) + \frac{1}{2}(3\frac{4}{5})(\frac{19}{15})$ = 8,22 square units/*vk eenh*	✓ correct method/ *korrekte metode* ✓ $3\frac{4}{5}$ ✓ $1\frac{2}{5}$ ✓ 0,7 ✓ $\frac{19}{15}$ ✓ answer (6)
	OR/*OF*	
	area DMOE = area ΔEDO + area ΔODM $= \frac{1}{2}(EO \times y_D) + \frac{1}{2}(OM \times -x_D)$ $= \frac{1}{2}\left[\left(\frac{8}{3} \times \frac{19}{5}\right) + \left(\frac{9}{2} \times \frac{7}{5}\right)\right]$ $= \frac{1}{2}\left(\frac{304+189}{30}\right)$ $= \frac{493}{60}$ or/*of* $8\frac{13}{60}$ or/*of* 8,22 square units/*vk eenh*	✓ correct method/ *korrekte metode* ✓ $y_D = \frac{19}{5}$ or $3\frac{4}{5}$ ✓ EO = $\frac{8}{3}$ ✓ $-x_D = \frac{7}{5}$ ✓ OM = $\frac{9}{2}$ or $4\frac{1}{2}$ ✓ answer/*antw* (6)
	OR/*OF*	
	area DMOE = area ΔEOF – area ΔDMF $= \frac{1}{2}(EO \times OF) - \frac{1}{2}(OF - OM)(-x_D)$ $= \frac{1}{2}\left[\left(\frac{8}{3} \times 8\right) + \left(\frac{7}{2} \times \frac{7}{5}\right)\right]$ $= \frac{1}{2}\left(\frac{640-147}{30}\right)$ $= \frac{493}{60}$ or $8\frac{13}{60}$ or 8,22 square units/*vk eenh*	✓ correct method/ *korrekte metode* ✓ $y_F = 8$ ✓ EO = $\frac{8}{3}$ ✓ $-x_D = \frac{7}{5}$ ✓ FM = $3\frac{1}{2}$ ✓ answer/*antw* (6)
	OR/*OF*	

	area $\Delta EOM = \frac{1}{2}(EO \times OM)$ $= \frac{1}{2}\left(\frac{8}{3} \times \frac{9}{2}\right)$ $= 6$ sq units/*vk eenh*	✓ area ΔEOM
	$ED = \sqrt{\left(-\frac{7}{5}+\frac{8}{3}\right)^2+\left(\frac{19}{5}\right)^2}$ and $DM = \sqrt{\left(\frac{7}{5}\right)^2+\left(\frac{9}{2}-\frac{19}{5}\right)^2}$ $= \frac{19\sqrt{10}}{15}$ or 4,005... $= \frac{7\sqrt{5}}{10}$ or 1,565..	✓ $ED = \frac{19\sqrt{10}}{15}$ ✓ $DM = \frac{7\sqrt{5}}{10}$
	area $\Delta EDM = \frac{1}{2}(ED \times DM \times \sin E\hat{D}M)$ $= \frac{1}{2}\left(\frac{19\sqrt{10}}{15}\right)\left(\frac{7\sqrt{5}}{10}\right)\sin 135°$ $= \frac{133}{60}$ or 2,216...	✓ area ΔEDM
	$\therefore$ area DMOE = area ΔEOM + area ΔEDM $= 6 + 2{,}216...$ $= \frac{493}{60}$ or/*of* $8\frac{13}{60}$ or/*of* 8,22 square units/*eenh*^{2}	✓ correct method/ *korrekte metode* ✓ answer/*antw* (6) **[19]**



APPARENTLY, THERE ISN'T A MEMO FOR THE 2014 EXEMPLAR, DON'T ASK WHY, I'M CERTAIN IT EXISTS SOMEWHERE JUST CAN'T FIND IT. BUT IF YOU'VE DONE ALL THE PAPERS THUS FAR YOU SHOULD BE GOOD WITHOUT THIS MEMO. (TRUST ME BRO) :)