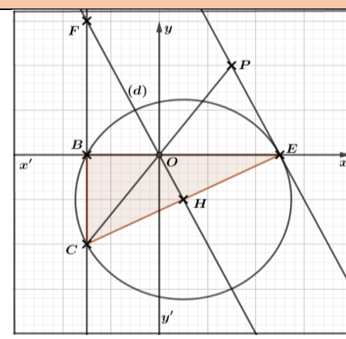
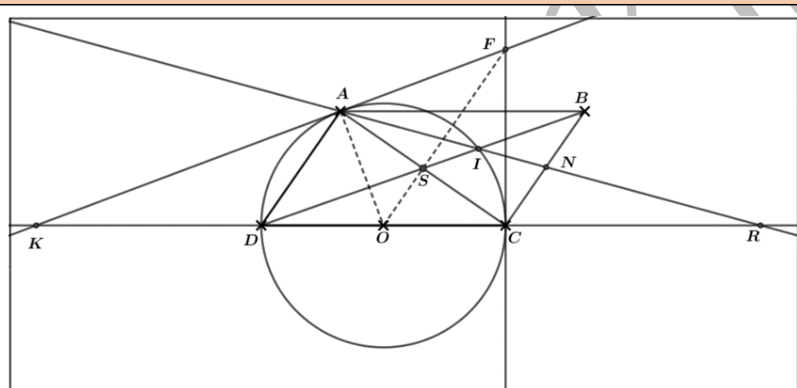
Correction Standards

Parts	*Elements of answer*		*Notes*
	1^{st} - Exercise		
1)	Given table is a table of proportionality (given) So, $\frac{2^n}{2^n-2^{n+1}}=\frac{1}{a}$ then, $a=\frac{2^n-2^{n+1}}{2^n}$ (reciprocal of equals are equal)	$a=\frac{2^n(1-2)}{2^n}$ Thus, $a=-1$ Choice, C	1^-
2)	$\frac{a^3b-ab^3}{a-b}=\frac{ab(a^2-b^2)}{a-b}$ $=\frac{ab(a-b)(a+b)}{a-b}$ $(a\neq b)$ $=ab(a+b)$	$=\frac{-8}{5}\left(\frac{-6}{5}\right)$ $\frac{a^3b-ab^3}{a-b}=\frac{48}{25}$ Choice, A	1^-
3)	The straight line $(d)\&(d')$ are parallel (given) So, slope of $(d)=$ slope of (d') But, $(d): 4y+2mx=1$ So, $(d): 4y=-2mx+1$ then, $y=\frac{-2m}{4}x+1$ hence, slope of $(d)=-\frac{m}{2}$	but, $(d'): y=\frac{(n-1)}{2}x+3$ so, slope of $(d')=\frac{n-1}{2}$ then, $-\frac{m}{2}=\frac{n-1}{2}$ $(\times 2)$ thus, $m+n=1$ Choice, B	1^-
4)	Points $A\&B$ are symmetric w. r.t I (given) So, I is the midpoint of $[AB]$ Then, $x_I=\frac{x_A+x_B}{2}$ and $y_I=\frac{y_A+y_B}{2}$ So, $-1=\frac{r-2+2p+3}{2}$ and $2=\frac{p+1+r-3}{2}$ then, $r+2p=-3$ and $p+r=6$ To find $r\&p$ we solve, $\begin{cases} r+2p=-3.......(1) \\ (r+p=6)\times(-1)............(2) \end{cases}$	$\begin{cases} r+2p=-3 \\ -r-p=-6 \end{cases}$ $_{add}$ then, $p=-9$ replace to get: $r=15$ Choice, B	1^-
5)	$y=2x+4s^2-49$ is a linear function (given) so, it is of the from $y=ax$ $where, b=0$ so, $4s^2-49=0$ $(2s-3)(2s+3)=0$ If product of two or more factors is null, then at least one of them is zero. Thus, $s=\frac{3}{2}$ or $s=-\frac{3}{2}$	Choice, C	1^-

		2nd - Exercise		
1		$EF=\dfrac{\frac{2}{1}-\frac{2}{7}}{\frac{2}{7}-\frac{1}{\frac{2}{1}-\frac{3}{5}}}\times\left(-\frac{12}{9}\right)^{-1}$ $=\dfrac{\frac{14-2}{7}}{\frac{2}{7}-\frac{1}{\frac{10-3}{5}}}\times\left(-\frac{4}{3}\right)^{-1}$ $=\dfrac{\frac{12}{7}}{\frac{2}{7}-\frac{5}{7}}\times\left(-\frac{3}{4}\right)$	$=\frac{12}{-3}\times\left(-\frac{3}{4}\right)$ hence, $EF=3cm$ $EK=\frac{3\sqrt{2}\times(\sqrt{2}-1)}{(\sqrt{2}+1)(\sqrt{2}-1)}-(2-\sqrt{2})^2$ $=\frac{3\times 2-3\sqrt{2}}{\sqrt{2}^2-1^2}-(4-4\sqrt{2}+2)$ $=6-3\sqrt{2}-6+4\sqrt{2}$ hence, $EK=\sqrt{2}cm$	1.5
2		In $\Delta s\ EKP$ & EFG sharing same vertex E we have: $\left.\begin{matrix}E, K \& F\\ E, P \& G\end{matrix}\right\}$ are collinear in this order. $\frac{EP}{EG}=\frac{\sqrt{2}}{3}$ (given) and, $\frac{EK}{EF}=\frac{\sqrt{2}}{3}$	hence, by converse of Thales' property: If a line cuts the sides of a triangle proportionally, then it is parallel to the third side. Thus, (KP) parallel to (FG)	1^{-}
		3rd - Exercise		
1		$(r): my-2mx=x+m$ (given) then, $my=2mx+x+m$ $my=(2m+1)x+m$ so, $y=\frac{(2m+1)}{m}x+\frac{m}{m}$ $m\neq 0$ thus, slope of $(r)=\frac{2m+1}{m}$		1
2	a	Let $M(x;y)$ be a point on (CH) so, $a_{(CM)}=a_{(CH)}$ then, (CH): $\frac{y-y_C}{x-x_C}=\frac{y_H-y_C}{x_H-x_C}$ $\frac{y+4}{x+3}=\frac{-2+4}{1+3}$	Then, $\frac{y+4}{x+3}=\frac{1}{2}$ $y+4=\frac{1}{2}(x+3)$ Thus, $(CH): y=\frac{1}{2}x-\frac{5}{2}$	1^{-}
	b	Q belongs to (CH) (given) so, coordinates of Q satisfies equation of (CH). so, $4a^2-12=\frac{1}{2}(-1)-\frac{5}{2}$ $4a^2-12=-3$	$4a^2-9=0$ $(2a-3)(2a+3)=0$ Thus, $a=\frac{3}{2}$ or $a=-\frac{3}{2}$ Q is quadrant III.	1

	c	$(r)\&(CH)$ are parallel (given) so, slope of $(r)=$ slope of (CH)	so, $\frac{2m+1}{m}=\frac{1}{2}$ $4m+2=m$ Thus, $m=-\frac{3}{2}$	0.5
3	a.	E is on $x-axis$ so, $y_E=0$ and E is on (CH) so, its coordinates satisfy equation of (CH)	so, $0=\frac{x}{2}-\frac{5}{2}$ hence, $x=5$ thus, $E(5;0)$	0.5
	b.	For H to be the midpoint of $[AB]$ then, $x_H\overset{?}{=}\frac{x_C+x_E}{2}$ and $y_H\overset{?}{=}\frac{y_C+y_E}{2}$ $1\overset{?}{=}\frac{-3+5}{2}$ and $-2\overset{?}{=}\frac{-4+0}{2}$	$1=1$ *and* $-2=-2$ Thus, H is the midpoint of $[CE]$	0.5
	c	Points $C\ \&\ B$ have same abscissas So, (CB) is parallel to $y-axis$	Of form, $(CB): x=cst$ Thus, $(CB): x=-3$	1^-
	d	In ΔCBE we have: (CB) is parallel to $y-axis$ $y_B=y_E=0$ so, (BE) is on $x-axis$ But, system is orthonormal.	so, $(CB)\perp(BE)$ (2 lines parallel to 2 perp. lines are perp) then, ΔCBE is right at B Thus, the center of (S) is, H is the midpoint of $[CE]$ and its diameter is $[CE]$.	0.5
4	a	(d) is perpendicular bisector of $[CE]$ (given) So, $(d)\perp(CE)$ $a_{(d)}\times a_{(CE)}=-1$ But, $a_{(CE)}=\frac{y_C-y_E}{x_C-x_E}$ $=\frac{1}{2}$	Hence, $a_{(d)}=-2$ and , H is on (d) $(d): \frac{y-y_H}{x-x_H}=a_{(d)}$ $\frac{y+2}{x-1}=-2$ $y+2=-2(x-1)$ Thus, $(d): y=-2x$	1^-
	b	F is intersection point of $(d)\&(BC)$ so, to find its coordinates we solve: $\begin{cases}(d): y=-2x\\(BC): x=-3\end{cases}$	Thus, $F(-3;6)$	1^-

5	a	In ΔCPE we have: P is the symmetric of C w.r.t O (given) then, O is the midpoint of $[CP]$ and, H is the midpoint of $[CE]$ (Proved)	then, (OH) is parallel to (EP) (midpoint theorem in a triangle) but, (d) is (OH) Thus, (d) is parallel to (EP)	0.5
	b	(EP) is parallel to (d) (proved) So, $a_{(PE)} = a_{(d)} = -2$ And E is on (EP) So, $(EP): \frac{y - y_E}{x - x_E} = a_{(PE)}$ $\frac{y-0}{x-5} = -2$ Thus, $(EP): y = -2x + 10$	$(d) \perp (CE)$ (given) $[CE]$ is a diameter of (S) (proved) (EP) is parallel to (d) (proved) so, $(EP) \perp (CE)$ at E thus, (EP) is tangent to (S) at E (Tangent theorem: tangent & radius are perp.)	1
4th- Exercise				
1		 		0.25
2	a	Drawn.		0.25
	b	In quadrilateral $ABCD$ we have: B is the symmetric of D w.r.t. S (given) so, S is the midpoint of $[BD]$ and, S is the midpoint of $[AC]$ (given)	thus, $ABCD$ is a parallelogram (having its diagonals bisect each other at same midpoint)	0.5
3	a	In $\Delta s\ IBN$ & IDA we have: $ABCD$ is a parallelogram (proved) $(AD) \parallel (NB)$ (Opp. sides of a parallelogram) $\left.\begin{matrix} A, I \& N \\ D, I \& B \end{matrix}\right\}$ are collinear in this order Then, by Thales' Property:	If a st. line is parallel to a side of a triangle then, it cuts other sides proportionally. Ratios: $\frac{IB}{ID} = \frac{IN}{IA} = \frac{BN}{DA}$ Thus, $\frac{IN}{IA} = \frac{x+1}{x+3}$	1^-
	b	From above ratios: $\frac{IB}{ID} = \frac{IN}{IA} = \frac{BN}{DA}$ and, $\frac{IB}{ID} = \frac{2}{3}$ (given)	so, $\frac{x+1}{x+3} = \frac{2}{3}$ $3x + 3 = 2x + 6$ thus, $x = 3$	0.5
	c	For, $x = 3$ (proved) and, $AD = x + 3$ & $CD = 5x - 3$ (given)	$AD = 3 + 3$ & $CD = 5(3) - 2$ Thus, $AD = 6cm$ & $CD = 12cm$	0.5

4		In ΔCDA we have: A is a point on (C) of diameter $[DC]$ so, $D\hat{A}C = 90^0$ (inscribed angle facing diameter) and, $AD = \frac{1}{2}DC$	thus, ΔCDA is semi-equilateral at A (having 90^o & $hyp = 2 smallest\ side$) $AC = \frac{hyp\sqrt{3}}{2}$ $AC = 6\sqrt{3}cm$ Thus, $AC \approx 10.4cm$	1
5	a	Drawn		0.25
	b	$[FA)$ & $[FC)$ are tangents to (C) of center O, at A & C respectively. (given) Then, (FO) is the perpendicular bisector of $[AC]$ (Tangent theorem: line joining center and exterior point from which tangents	are drawn is perp. bisector to chord formed by points of tangencies) But, S is the midpoint of $[AC]$ Thus, the points F, S & O are collinear.	1^-
	c	In quadrilateral $OAFC$ we have: $[FA)$ is tangent to (C) of center O, at A. (given) Then, $O\hat{A}F = 90^0$ (Tangent theorem: tangent and radius are perp. at point of tangency) Then, ΔOAF is right of hyp. $[OF]$ $[FC)$ is tangent to (C) of center O, at C. (given)	Then, $O\hat{C}F = 90^0$ (Tangent theorem: tangent and radius are perp. at point of tangency) Then, ΔOCF is right of hyp. $[OF]$ Thus, $OAFC$ is inscribed in a circle whose center is L, the midpoint of $[OF]$ and diameter $[OF]$ (quadrilateral formed of 2 right triangles sharing same hypotenuse)	1^-