

KCSE 2022 PAPER 1

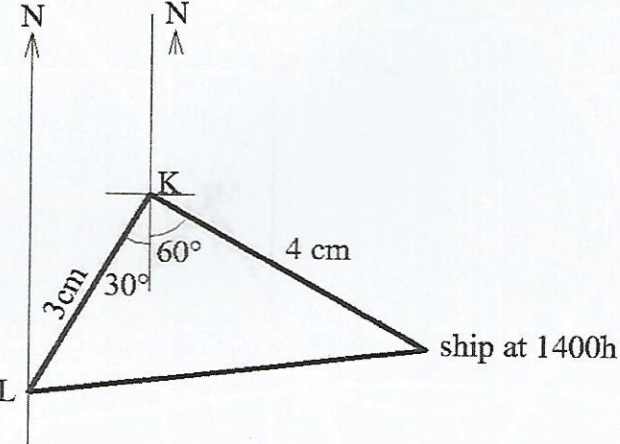
5.0 2022 KCSE MARKING SCHEMES

5.1 MATHEMATICS ALT. A (121)

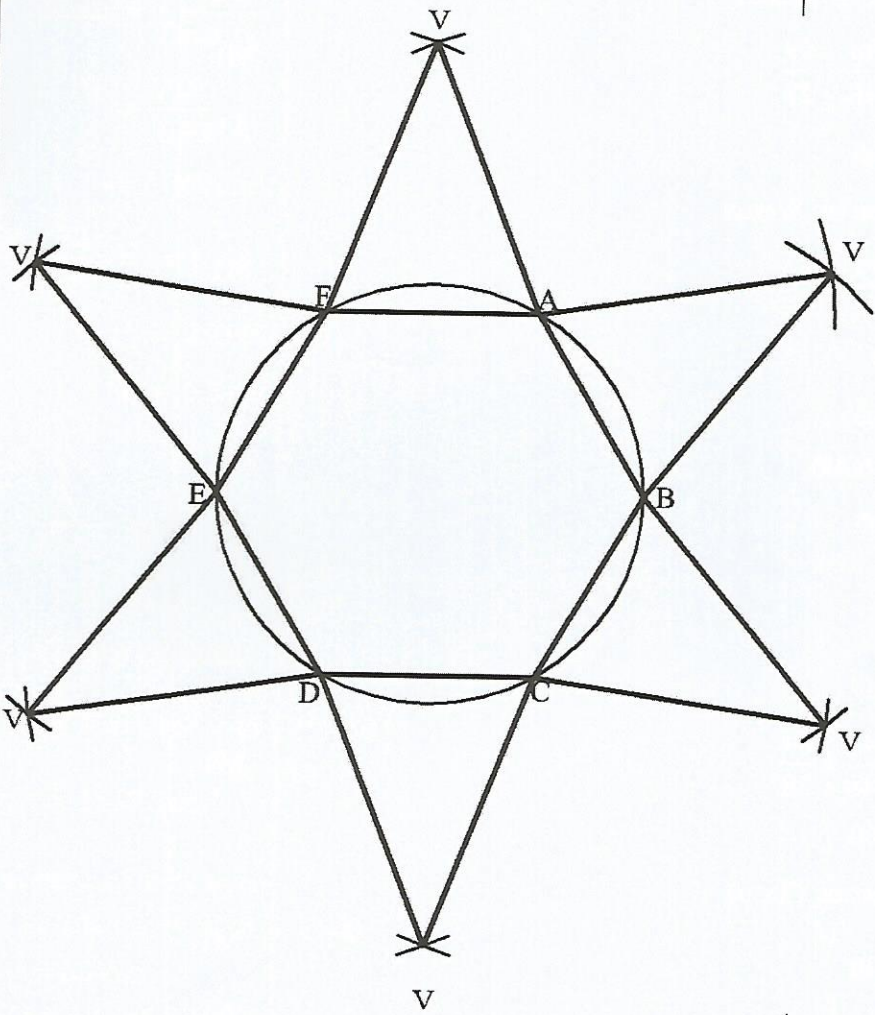
5.1.1 Mathematics Alt A Paper 1 (121/1)

No.	Marking Scheme	Marks	Comments
1.	$6n^2 = 25(n - 1)$ $6n^2 - 25n + 25 = 0$ $6n^2 - 10n - 15n + 25 = 0$ $2n(3n - 5) - 5(3n - 5) = 0$ $(2n - 5)(3n - 5) = 0$ $n = 2\frac{1}{2}$ or $n = 1\frac{2}{3}$	<p>M1</p> <p>M1</p> <p>A1</p> <p>3</p>	
2.	<p>School fees = $\frac{2}{5}$</p> <p>Family upkeep = $\frac{3}{4}$ of $\frac{3}{5} = \frac{9}{10}$</p> <p>Invested = $\frac{1}{4}$ of $\frac{3}{5} = \frac{3}{20}$ or $1 - \left(\frac{2}{5} + \frac{9}{10}\right)$</p> <p>$\frac{3}{20} \rightarrow 13500$</p> <p>$1 \rightarrow 13500 \times \frac{20}{3}$</p> <p>Amount spent on school fees</p> <p>$= \frac{2}{5} \times 13500 \times \frac{20}{3}$</p> <p>$= \text{Sh. } 36000$</p>	<p>B1</p> <p>M1</p> <p>M1</p> <p>A1</p> <p>4</p>	$13500 \times \frac{20}{3}$ $= 90,000$
3.	$5^{2x+1} - 5^{2x} = 500$ $5^{2x} \times 5 - 5^{2x} = 500$ $5^{2x}(5 - 1) = 500$ $5^{2x} = \frac{500}{(5 - 1)}$ $5^{2x} = 125 = 5^3$ $2x = 3$ $x = 1.5$	<p>M1</p> <p>M1</p> <p>A1</p> <p>3</p>	
4.	<p>LCM (72, 80)</p> <p>$= 720$ sec</p> <p>They will be at the starting line again after 720 sec.</p> <p>No. of laps remaining</p> <p>$= \frac{5000}{400} - \frac{720}{80}$</p> <p>$= 12.5 - 9$</p> <p>$= 3\frac{1}{2}$</p>	<p>B1</p> <p>M1</p> <p>A1</p> <p>3</p>	or equivalent

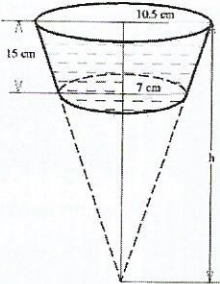
No.	Marking Scheme	Marks	Comments
5.	$\text{Num} = 18ax - (9a^2 - 16x^2)$ $= 16x^2 + 18ax - 9a^2$ $= (2x + 3a)(8x - 3a)$ $\frac{\text{Num}}{\text{Den}} = \frac{(2x + 3a)(8x - 3a)}{-(8x - 3a)}$ $= -2x - 3a$	M1 M1 A1 3	Factors 24, -6
6.	<p>For isosceles ΔABC</p> $h^2 + 3^2 = 12^2$ $h = \sqrt{135}$ <p>Area of ΔABC</p> $= \frac{1}{2} \times 6 \times \sqrt{135}$ $= 34.86 \text{ cm}$ <p>Area of ΔADC</p> $= \frac{1}{2} \times 6 \times 6 \times \sin 60$ $= 15.59$ <p>Area of quadrilateral</p> $= 34.86 - 15.59$ $= 19.27 \text{ cm}^2$	M1 M1 M1 A1 4	<p>or equivalent</p> <p>Area of ΔABC</p> $s = \frac{12 + 12 + 6}{2}$ $= 15$ $A = \sqrt{15 \times 3 \times 3 \times 9}$ $= 9\sqrt{15}$
7.	<p>Time from Sun 1100 h to Thur 0500 h</p> $= 24 \times 4 - (11 - 5)$ $= 90 \text{ h}$ <p>Time lost</p> $= (90 \times 8) \text{ sec}$ $= 12 \text{ min}$ <p>Time on faulty clock</p> $= 0500 \text{ h} - 12 \text{ min}$ $= 4.48 \text{ am}$	B1 B1 B1 3	
8.	<p>distance moved by lorry in 42 min = $50 \times \frac{42}{60}$</p> $= 35 \text{ km}$ <p>Let distance AB = x km</p> $\frac{x}{80} = \frac{x - 60}{50}$ $80x - 4800 = 50x$ $30x = 4800$ $x = 160 \text{ km}$	B1 M1 A1 3	

No.	Marking Scheme	Marks	Comments
9.	<p>Time taken by boat = 14 h – 10 h = 4h distance sailed by ship in 4 h = 40 × 4 = 160 km Using 1 cm to represent 40 km 160 km → 4 cm 120 km → 3 cm</p>  <p>Bearing of ship from port L = N 83° E ± 1°</p>	<p>B1 B1 B1 B1 4</p>	<p> √ distance and bearing of port L from K √ distance and bearing of ship from K at 1400 h Accept 083° ± 1°</p>
10.	$\begin{pmatrix} -2 \\ 5 \end{pmatrix} + \begin{pmatrix} a \\ b \end{pmatrix} = \begin{pmatrix} 2 \\ 2 \end{pmatrix}$ $a = 4, b = -3$ $T = \begin{pmatrix} 4 \\ -3 \end{pmatrix}$ $\begin{pmatrix} x \\ y \end{pmatrix} + \begin{pmatrix} 4 \\ -3 \end{pmatrix} = \begin{pmatrix} 9 \\ -5 \end{pmatrix}$ $x = 5 \quad y = -2$ $Q(5, -2)$	<p>B1 M1 A1 3</p>	
11.	$\frac{130050}{28.90} = 4500 \text{ Dirhams}$ $4500 - 3520 = 980 \text{ Dirhams}$ <p>Amount received from the bank = 980 × 28.00 = Ksh 27 440</p>	<p>M1 M1 A1 3</p>	

No.	Marking Scheme	Marks	Comments
12.	$\tan 30 = \frac{2h}{20}$ $h = 10 \tan 30$ $= 5.77$ $\tan \theta = \frac{5.77}{20}$ $\theta = 16.1^\circ$	<p>M1</p> <p>M1</p> <p>A1</p> <p>3</p>	
13.	$\begin{pmatrix} 7 & -3 \\ -u & 5 \end{pmatrix} \begin{pmatrix} 2 & 6 \\ 2u & 5 \end{pmatrix} = \begin{pmatrix} 2 & v \\ 16 & w \end{pmatrix}$ $\begin{pmatrix} 7 \times 2 + (-3) \times 2u & 7 \times 6 + (-3) \times 5 \\ -u \times 2 + 5 \times 2u & -u \times 6 + 5 \times 5 \end{pmatrix} = \begin{pmatrix} 2 & v \\ 16 & w \end{pmatrix}$ $\left. \begin{array}{l} 14 - 6u = 2 \\ 42 - 15 = v \\ -6u + 25 = w \end{array} \right\}$ $u = 2, v = 27, w = 13$	<p>M1</p> <p>M1</p> <p>A1</p> <p>3</p>	<p>For evidence of matrix multiplication</p> <p>For $\sqrt{\quad}$ extraction of any equation</p> <p>$\sqrt{\quad}$ values of u, v and w</p>
14.	<p>V.S.F = 54 : 250</p> <p>= 27 : 125</p> <p>L.S.F = 3 : 5</p> $\frac{h}{h + 4} = \frac{3}{5}$ $5h = 3h + 12$ $2h = 12$ $h = 6$ $h + 4 = 10 \text{ cm}$	<p>B1</p> <p>M1</p> <p>A1</p> <p>3</p>	
15.	$\bar{x} = \frac{43 \times 65 + 45 \times 62}{43 + 45}$ $= \frac{5585}{88}$ $= 63.47$	<p>M1</p> <p>A1</p> <p>2</p>	

No.	Marking Scheme	Marks	Comments
16.		<p>B1 $\sqrt{\text{hexagon}} \pm 0.1 \text{ cm}$</p> <p>B1 $\sqrt{\text{triangles}}$</p> <p>B1 $\sqrt{\text{labelled net}}$</p>	
		3	

No.	Marking Scheme	Marks	Comments
17. (a)	<p>(i) Amount paid to Wema</p> $= 24000 \times \frac{96}{48} \times \frac{49}{28}$ $= \text{Ksh } 84000$ <p>(ii) Amount spent by Wema</p> $= 3000 \times \frac{96}{8}$ $= \text{Sh. } 36000$ <p>Profit (Wema)</p> $= 84000 - 36000$ $= \text{Ksh } 48000$ <p>(b) Amount to Tatu</p> $= 24000 \times \frac{48}{48} \times \frac{84}{28}$ $= \text{Ksh } 72000$ <p>Cost of transporting (Tatu)</p> $= \frac{100}{144} \times 72000$ $= \text{Ksh } 50,000$ <p>(c) Profit (Tatu) = 72000 - 50000</p> $= \text{Sh. } 22000$ <p>Ratio of profit</p> <p>Wema : Tatu = 48000 : 22000</p> $= 24 : 11$	<p>M1</p> <p>A1</p> <p>M1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>M1</p> <p>A1</p> <p>B1</p> <p>B1</p> <p>10</p>	<p>Follow thro</p>

No.	Marking Scheme	Marks	Comments
18. (a)	$\text{Volume} = \frac{\text{Mass}}{\text{Density}}$ $= \frac{7260}{6.93}$ $= 1048 \text{ cm}^3$ $\frac{4}{3} \times \frac{22}{7} \times r^3 = 1048$ $r^3 = 250.0909091$ $r = 6.3 \text{ cm}$	<p>M1</p> <p>M1</p> <p>A1</p>	
(b) (i)	$\frac{h}{h-15} = \frac{3}{2}$ $h = 45$ <p>Volume of water</p> $= \frac{1}{3} \pi [10.5^2 \times 45 - 7^2 \times 30]$ $= 3657.5 \text{ cm}^3$	<p>M1</p> <p>M1</p> <p>A1</p>	
(ii)	<p>Volume of new cone</p> $= 1048 + 3657.5 + 1540$ $= 6245.5$ <p>V.S.F = 6245.5 : 1540</p> $\frac{H}{30} = \sqrt[3]{\frac{6245.5}{1540}}$ $= 47.85$ <p>Height = 47.85 - 30</p> $= 17.85 \text{ cm}$	<p>M1</p> <p>M1</p> <p>M1</p> <p>A1</p>	
		10	

No.	Marking Scheme	Marks	Comments
19. (a)(i)	$m_{AB} = \frac{4 - (-2)}{5 - 1}$	B1	
	$= \frac{3}{2}$		
	$m_{AB} \times m_{AC} = -1$		
	$m_{AC} = -\frac{2}{3}$	B1	
	Equation of AC		
	$\frac{y - (-2)}{x - 1} = \frac{-2}{3}$	M1	
	$2x + 3y + 4 = 0$	A1	
(ii)	$\left. \begin{array}{l} -x + 5y = 15 \\ 2x + 3y = -4 \end{array} \right\}$		For both
	$\left. \begin{array}{l} 2x + 3y = -4 \\ -2x + 10y = 30 \end{array} \right\}$		
	$13y = 26$	M1	
	$y = 2$		For $m = \frac{1}{5}$
	$-x + 10 = 15$		
	$x = -5$	A1	
	$C(-5, 2)$	B1	
(b)	$5y = x + 15$		
	$y = \frac{1}{5}x + 3$		
	$m = \frac{1}{5}$	B1	
	$\frac{0 - (-2)}{a - 1} = \frac{1}{5}$	M1	
	$a = 11$	A1	
		10	

No.	Marking Scheme	Marks	Comments
20.			
(a) (i)	<ul style="list-style-type: none"> • \checkmark \perp bisector to AX • \checkmark \perp bisector to upper line segment • Point D correctly identified and labelled 	<p>B1 B1 B1</p>	<p>Accept proportional division of lines</p>
(ii)	<ul style="list-style-type: none"> \checkmark construction of $\angle 67.5^\circ$ at B \checkmark construction of line $DC \parallel AB$ \checkmark Trapezium ABCD drawn and labelled 	<p>B1 B1 B1</p>	
(iii)	<p>\checkmark perpendicular dropped from D and meeting AB at E DE = 4.1 cm</p>	<p>B1 B1</p>	
(b)	<p>Area of trapezium ABCD</p> $= \frac{1}{2} \times 4.1 \times (10 + 4)$ $= 28.7 \text{ cm}^2$	<p>M1 A1 10</p>	<p>$4.0 \leq h = 4.1 \leq 4.2$ $3.85 \leq DC = 3.95 \leq 4.05$</p>

No.	Marking Scheme	Marks	Comments
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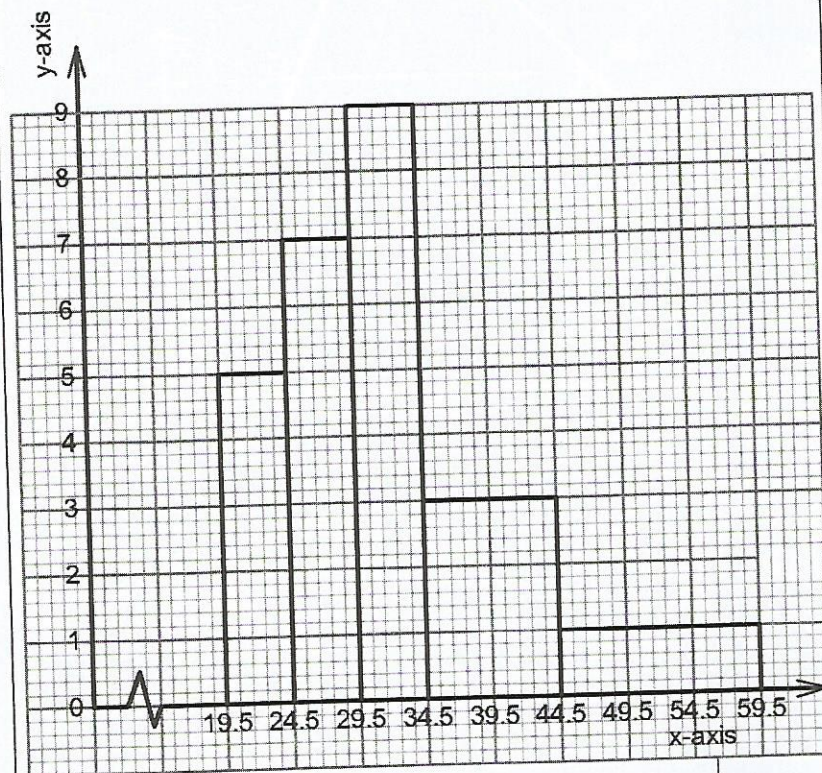
21. (a)

Amount (Ksh)	20 - 24	25 - 29	30 - 34	35 - 44	45 - 59
Frequency	5	7	9	6	3

B2

Allow B1 for any 3 frequencies ✓

(b)



(c)

(i) Median

$$\text{Total area} = 25 + 35 + 45 + 30 + 15 = 150$$

$$\text{Half of area} = \frac{1}{2} \times 150 = 75$$

$$25 + 35 + 9x = 75$$

$$x = 1\frac{2}{3}$$

$$\text{Median} = 29.5 + 1\frac{2}{3}$$

$$= \text{Ksh}31.17$$

(ii)

$$\text{Area above Sh } 41.50 = 3 \times 3 + 15 = 24$$

No of workers represented by the area

$$= \frac{24 \times 30}{150}$$

$$= 4.84 \text{ workers}$$

$$\square 4 \text{ workers}$$

S1

B1

B1

✓ scale

1st 3 bars ✓

Bars 4 and 5 both ✓

M1

(falls in 3rd bar)

M1

A1

M1

Follow thro question

A1

10

No.	Marking Scheme	Marks	Comments
23.	<p>(a)</p> <p>(i) Price after increase $= 50 + 4n$</p> <p>(ii) No. of pks sold after price change $= 530 - 20n$</p> <p>(iii) Total sales (s) $= (50 + 4n)(530 - 20n)$ $= 26500 + 1120n - 80n^2$</p> <p>(b)</p> <p>(i) For max sales $\frac{ds}{dn} = 1120 - 160n$ $1120 - 160n = 0$ $n = 7$</p> <p>(ii) Price after increases $= 50 + 4 \times 7$ $= \text{Ksh. } 78$</p> <p>(iii) Total sales (max) $= 78 \times (530 - 20 \times 7)$ $= 78 \times 390$ $= \text{Ksh } 30\,420$</p>	<p>B1</p> <p>B1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>M1</p> <p>A1</p> <p>B1</p> <p>M1</p> <p>A1</p>	
		10	

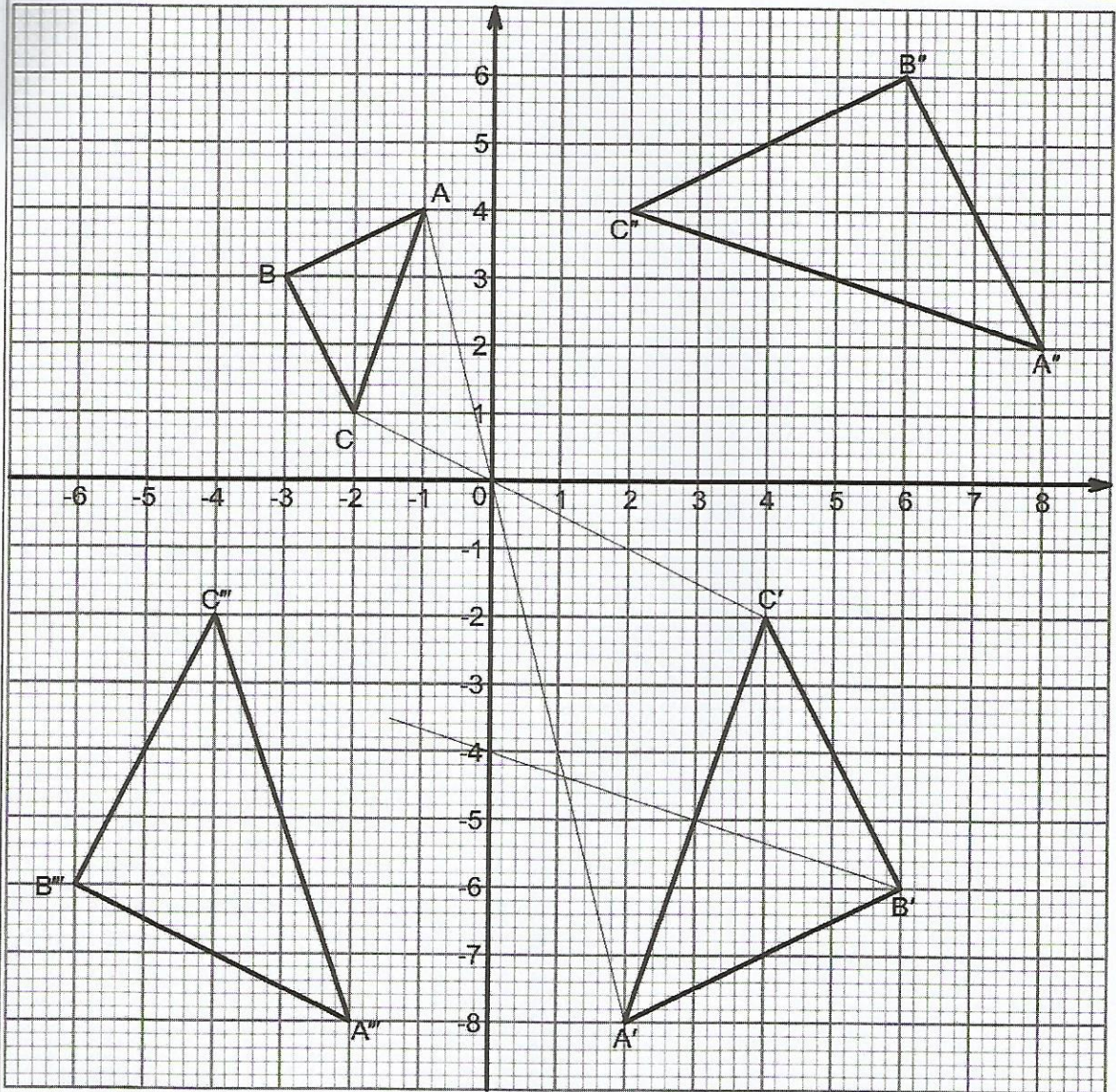
No.

Marking Scheme

Marks

Comments

24.



No.	Marking Scheme	Marks	Comments
	(a) Enlargement	B1	
	Centre $O(0,0)$ and $SF = -2$	B1	
	(b) (i) Any \surd vertex of $\Delta A''B''C''$	B1	
	\surd complete and labelled $\Delta A''B''C''$	B1	
	(ii) Any \surd vertices of $\Delta A'''B'''C'''$	B1	
	\surd complete and labelled $\Delta A'''B'''C'''$	B1	
	(c) \surd Line symmetry seen	B1	
	$m = \frac{(-6) - (-4)}{6 - 0}$	M1	
	$\frac{y - (-4)}{x - 0} = -\frac{1}{3}$	M1	
	$y = -\frac{1}{3}x - 4$	A1	
		10	