4.4 MATHEMATICS ALTERNATIVE B (122)

4.4.1 Mathematics Alternative B (122/1)

No	Marking scheme	Marks	Comments
1	(a) $4732 = 2^2 \times 7 \times 13^2$ (b) $2^2 \times 7 \times 13^2 \times 7 = 2^2 \times 7^2 \times 13^2$ is a perfect square. ∴ Smallest factor is 7	B1 B1 **2**	
2	Time taken: Juma $\frac{3120}{48} = 65$ min, Weru $\frac{3120}{120} = 26$ min, Njeri $= \frac{3120}{156} =$ 20min LCM of 65, 26, 20 5 | 65 | 26 | 20 13 | 13 | 26 | 4 2 | 1 | 2 | 4 2 | 1 | 1 | 2 | 1 | 1 | 1 LCM = 260 min or 4h 20 mins Time together is 1120h	M1 M1 A1 **3**	or equivalent
3	$\frac{^-9 \div ^+ 3 \times ^+ 4 - ^- 2}{(^+15 - ^- 5) \div ^- 4} = \frac{-10}{-5}$ $= 2$	M1 M1 A1 **3**	correct numerator correct denominator

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4	$\frac{\frac{3}{4}of\,8\frac{1}{5}-4\frac{1}{2}}{1\frac{1}{4}\div1\frac{7}{8}\times3\frac{3}{10}}=\frac{\frac{3}{4}\times\frac{41}{5}-\frac{9}{2}}{\frac{5}{4}\times\frac{8}{15}\times\frac{33}{10}}$ $=\frac{\frac{123-90}{20}}{\frac{11}{5}}$ $=\frac{33}{20}\times\frac{5}{11}$ $=\frac{3}{4}$	M1 M1 A1 **3**	numerator denominator
5	**No** **Log** 84.56 1.9272 $(0.0027)^{1/3}$ $\bar{3}.4314 \div 3 \longrightarrow +\bar{1}.1438$ 1.0710 $\underline{0.045}$ $-\bar{1}.6532$ 261.7 $\longleftarrow$ 2.4178	M1 M1 M1 A1 **4**	All logs correct Correct cube root Correct multiplication and division
6	$4\times10\times10+2\times(10\times10-x^2)$ $=400+200-2x^2$ $=600-2x^2$	M1 M1 A1 **3**	
7	$\frac{22}{7}\times0.7\times0.7\times h=3.234$ $1.54h=3.234$ $h=\frac{3.234}{1.54}$ $=2.1\text{m}$	M1 M1 A1 **3**	Conversion from l to m^3

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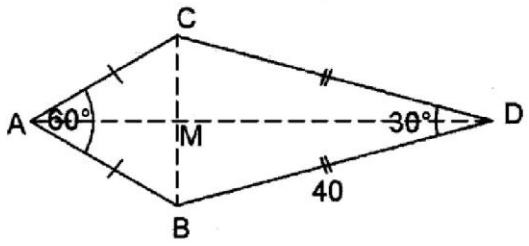
8	$\frac{BM}{40} = \sin 15° \Rightarrow BM = 40\sin 15°$ $BC = 2 \times 40\sin 15°$ $= 20.71$ cm Area of the quadrilateral $= \frac{1}{2} \times (20.71)^2 \times \sin 60 + \frac{1}{2} \times 40^2 \times \sin 30$ $= 185.7 + 400$ $= 585.7 \text{cm}^2$	M1 M1 M1 A1 **4**	 Area of ΔABC Area of ΔBDC
9	$\frac{135}{360} \times \frac{22}{7} \times r^2 = 36.96$ $r^2 = \frac{36.96 \times 360 \times 7}{135 \times 22}$ $r = \sqrt{31.36}$ $= 5.6$ cm	M1 M1 A1 **3**	
10	$\frac{r^2 + \sqrt[3]{r}}{t - 3\frac{2}{3}} = \frac{27^2 + \sqrt[3]{27}}{5 - 3\frac{2}{3}}$ $= \frac{729 + 3}{1\frac{1}{3}}$ $= 549$	M1 A1 **2**	

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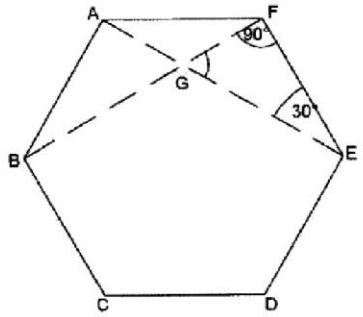
11	Let Njoka's salary be x, and Okoth's salary be y $\frac{1}{4}x+\frac{1}{6}y=16000$ $\frac{4}{9}x+\frac{1}{3}y=30000$ $3x+2y=192000$ $4x+3y=270000$ $9x+6y=576000$ $8x+6y=540000$ $x = 36000$ $y = 42000$ Njoka's sh36000 and Okoth's sh42000	B1 M1 A1 **3**	
12	$x - 8 \leq -x$ $\quad -x \geq 4 - 3x$ $2x \leq 8$ $\quad 2x \geq 4$ $x \leq 4$ $\quad x \geq 2$ $2 \leq x \leq 4$  	M1 M1 A1 B1 **4**	
13	$\angle BAF = 120°$ interior angle of a regular hexagon $\angle AEF = \angle FAE = \frac{180-120}{2} = 30°$ In $\Delta EFG, \angle EFG = 120 - 30 = 90°$ $\therefore \angle FGE = 180 - (90 + 30) = 60°$	B1 B1 B1 **3**	

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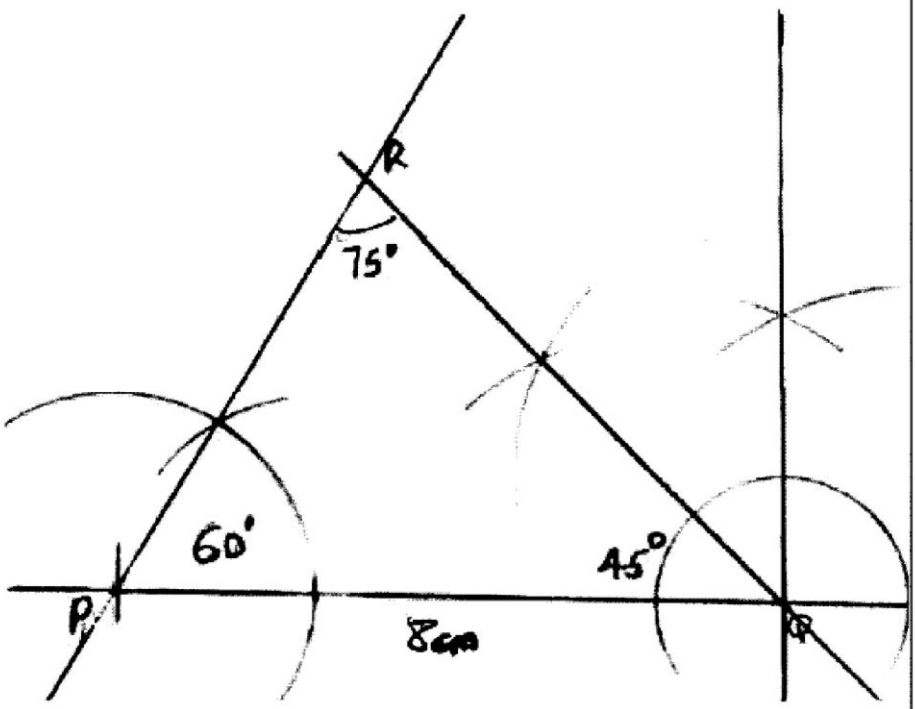
14	 PR = 5.9 ± 0.1cm	B1 B1 B1 B1 **4**	PQ = 8 and ∠60° constructed 75° or 45° constructed Complete Δ
15	Selling price was Ksh 36 000 × $\frac{88}{100}$ = Ksh 31 680 Cost price was Ksh 31 680 × $\frac{100}{125}$ = Ksh 25 344	M1 M1 A1 **3**	

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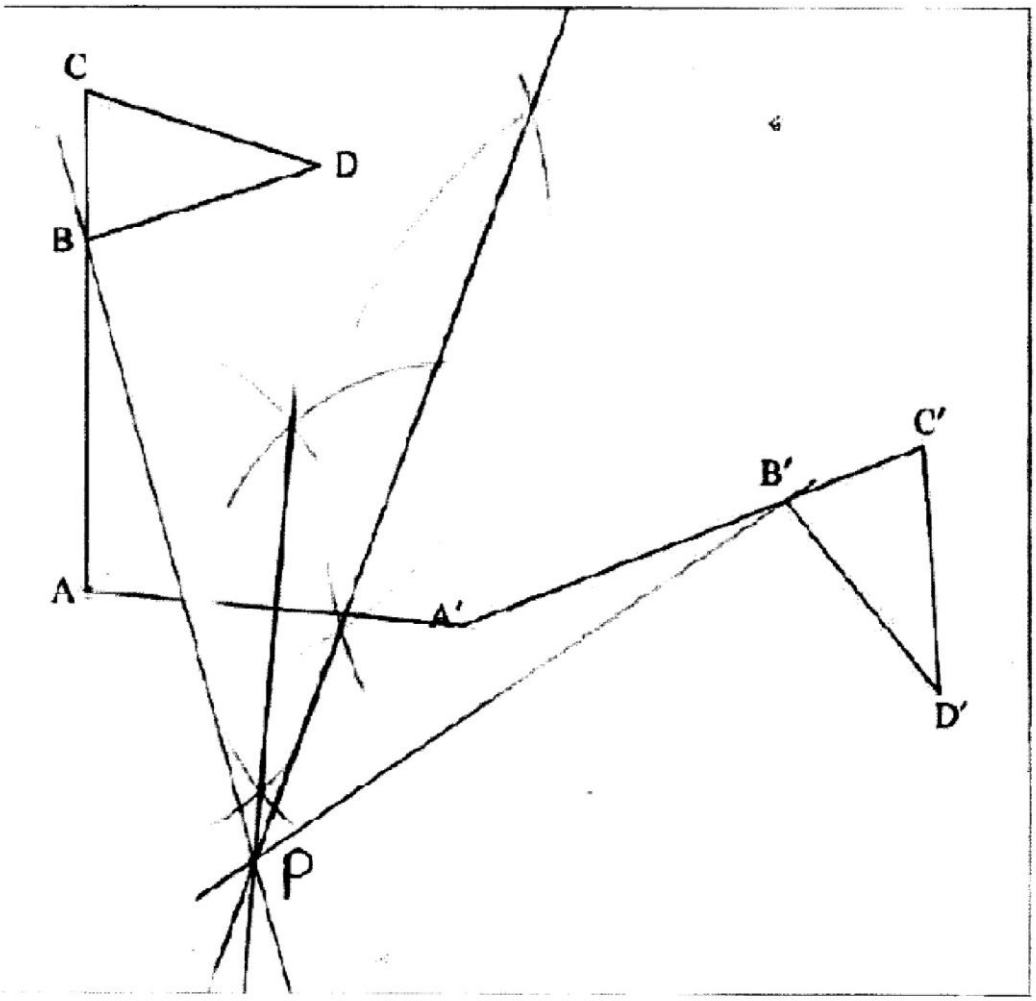
16		B1	at least 2 perpendicular bisector
	Centre P	B1	
	Angle of rotation, -71°	B1	
		3	

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17	(a) $\frac{4}{100} \times (400000 - 250000) +$ $\frac{7.5}{100} \times (525000 - 400000) + 60000$ $= 6000 + 9375 + 60000$ $=$ Ksh 75 375 (b) $94500 = 60000 + 6000 + x$ $x = 28500$ Value of goods for commission of Ksh 28500 $= \frac{28500}{7.5} \times 100$ $=$ Ksh 380 000 Total sale $= 250000 + 150000 + 380000$ $=$ Ksh 780 000	M1 M1 M1 A1 M1 A1 M1 A1 M1 A1 **10**	

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18. (a)	$y+2x=4$ $-y+3x=1$ $5x=5$ $x=1$ $y+2=4 \Rightarrow y=2$	M1 A1	
	T(1,2)		
	Grad $\frac{-2-2}{3-1}=\frac{-4}{2}=-2$	B1	
	$\frac{y-2}{x-1}=-2$	M1	
	$y=-2x+4$	A1	
(b)	Grad $=-2$		
	$\frac{y-4}{x-5}=-2$ $\Rightarrow y-4=-2x+10$ $y=-2x+14$	M1 A1	
(c)	Grad $=\frac{1}{2}$	B1	
	$\frac{y-2}{x-1}=\frac{1}{2}$ $y-2=\frac{1}{2}(x-1)$ $2y-4=x-1$ $-x+2y=3$	M1 A1	
		10	

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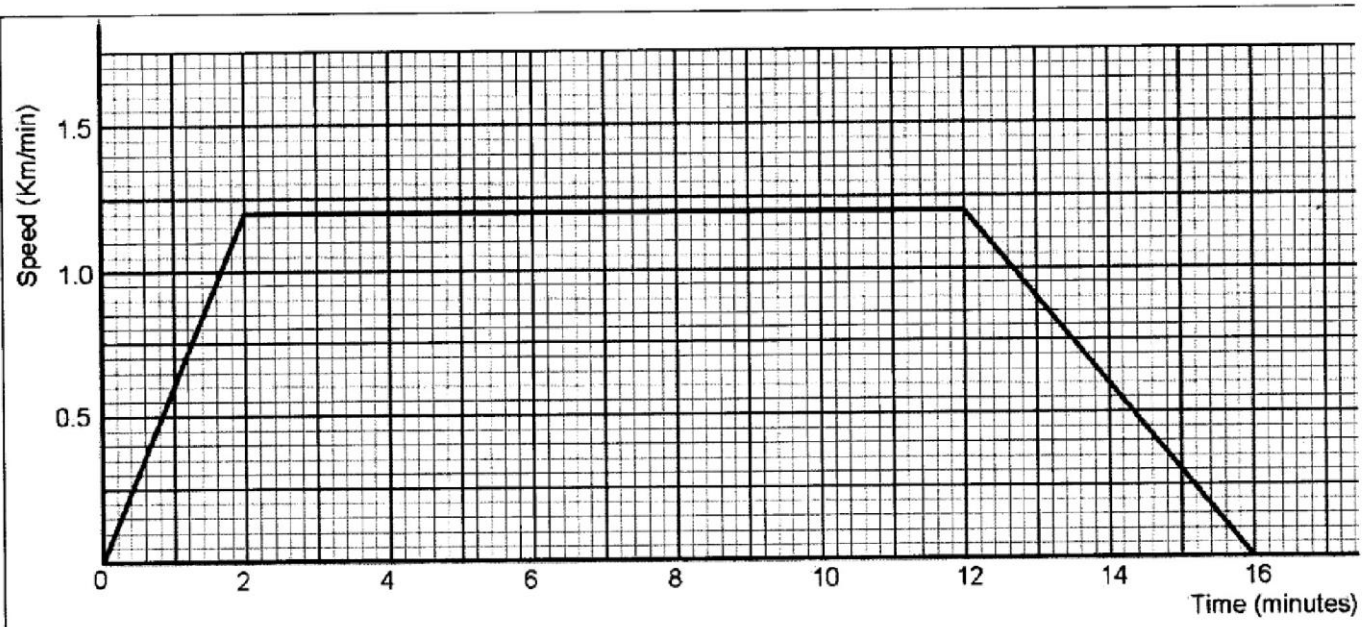
19. (a)			
	Scale	S1	
	Acceleration part	B1	
	Constant acceleration.	B1	
	Deceleration	B1	
(b)			
(i)	$\frac{1}{2}\times 4\times 1.2\times 1000\text{m}$ $=2400\text{m}$	M1 A1	
(ii)	$\frac{1}{2}\times 2\times 1.2+1.2\times 10+\frac{1}{2}\times 4\times 1.2km$	M1	or equivalent
	$=15.6\text{km}$	A1	
(iii)	$\text{Average speed}=\frac{15.6}{\frac{4}{15}\text{h}}$ $=58.5\text{km/h}$	M1 A1	
		10	

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20. (a)			
(i)	Area of A+ C $= (x-y)(x-y)+y^2$	B1	
(ii)	Area of $B+D = y(x-y)+y(x-y)$ $= 2y(x-y)$	M1 A1	
(iii)	$(x-y)^2 + y^2 + 2y(x-y)$ $= (x-y)(x-y) + y^2 + 2yx - 2y^2$ $= x^2 - 2yx + y^2 + y^2 + 2yx - 2y^2$ $= x^2$	M1 A1	
(b)	$2(x-2)+2(x-2)$ $= 4x-8$	M1 A1	
(c)	$25c^2 - 16 = (5c)^2 - 4^2$ $= (5c+4)(5c-4)$	B1	
(d)	$5024^2 - 4976^2 = (5024+4976)(5024-4976)$		
(i)	$= 10000 \times 48$ $= 480000$	B1	
(ii)	$8.96^2 - 1.04^2 = (8.96+1.04)(8.96-1.04)$ $= 10 \times 7.92$ $= 79.2$	B1	
		10	

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21. (a)	Area of the base of the cuboid $=8 \times 6cm^2 = 48cm^2$ Area of 4 faces of the side of the cuboid $=(2\times 8\times 3+2\times 6\times 3)cm^2$ $=48+36cm=84cm^2$ Total $48+84=132cm^2$	M1 M1 A1	
(b)	Consider faces VEF and VHG use Hero's formula:- $S=\frac{1}{2}(13+13+8)=17cm$ Area of VEF and VHG $=2\sqrt{17(17-13)(17-13)(17-8)cm}$ $=2\sqrt{17\times 4\times 4\times 9}$ $=98.96cm^2$ Consider faces VFG and VEH $S=\frac{1}{2}(13+13+6)=16cm$ Area of VFG $=2\sqrt{16(16-13)(16-13)(16-6)}$ $=2\sqrt{16\times 3\times 3\times 10}$ $=75.90cm^2$ Area of triangular faces 98.96+75.90 $=174.86cm^2$	B1 M1 M1 M1 A1	
(c)	Surface area of the solid =132+174.86 $=306.86cm^2$	M1 A1	
		10	

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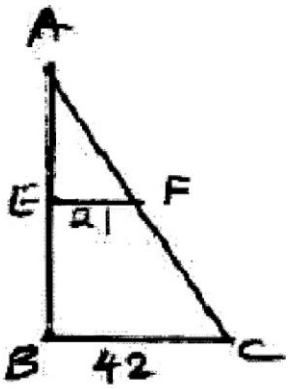
22. (a)	Vertical height of small cone: $\frac{AE}{40}=\frac{21}{42}\Rightarrow AE=20\text{cm}$ Volume of frustum $=\frac{1}{3}\times\frac{22}{7}\times42^2\times40-\frac{1}{3}\times\frac{22}{7}\times21^2\times20$ $=73920-9240$ $=64680\text{cm}^3$	B1 M1 M1 M1 A1	
(b)	Volume of cylindrical part $=\frac{22}{7}\times21^2\times30$ $=41580\,\text{cm}^2$	M1 A1	
(c)	Volume of hemispherical part $=\frac{1}{2}\times\frac{4}{3}\times\frac{22}{7}\times21^3$ $=19404\text{cm}^2$ Total volume $=64680+41580+19404$ $=125\ 664\ \text{cm}^2$	M1 A1 B1	
		10	

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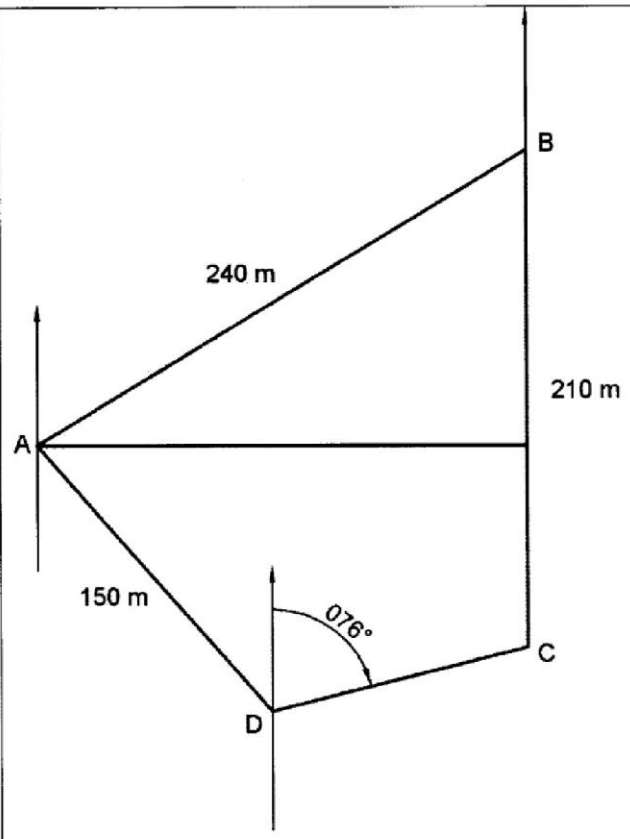
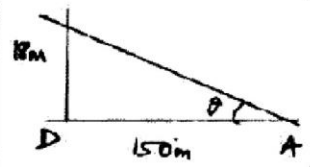
23. (a)		B1 B1 B1 B1	Position of B Position of C Position of D Complete Diagram ABCD
(b)	(i) Distance CD = 3.7×30 =111km Bearing of C from D =076°	B1 B1	
	(ii) Distance of A to the west of B $= 6.9 \times 30$ =207km	M1 A1	
(c)	$\tan\theta = \frac{18}{150}$ $= 0.12$ $\theta = \tan^{-1} 0.12$ $= 6.84°$	M1 A1 **10**	

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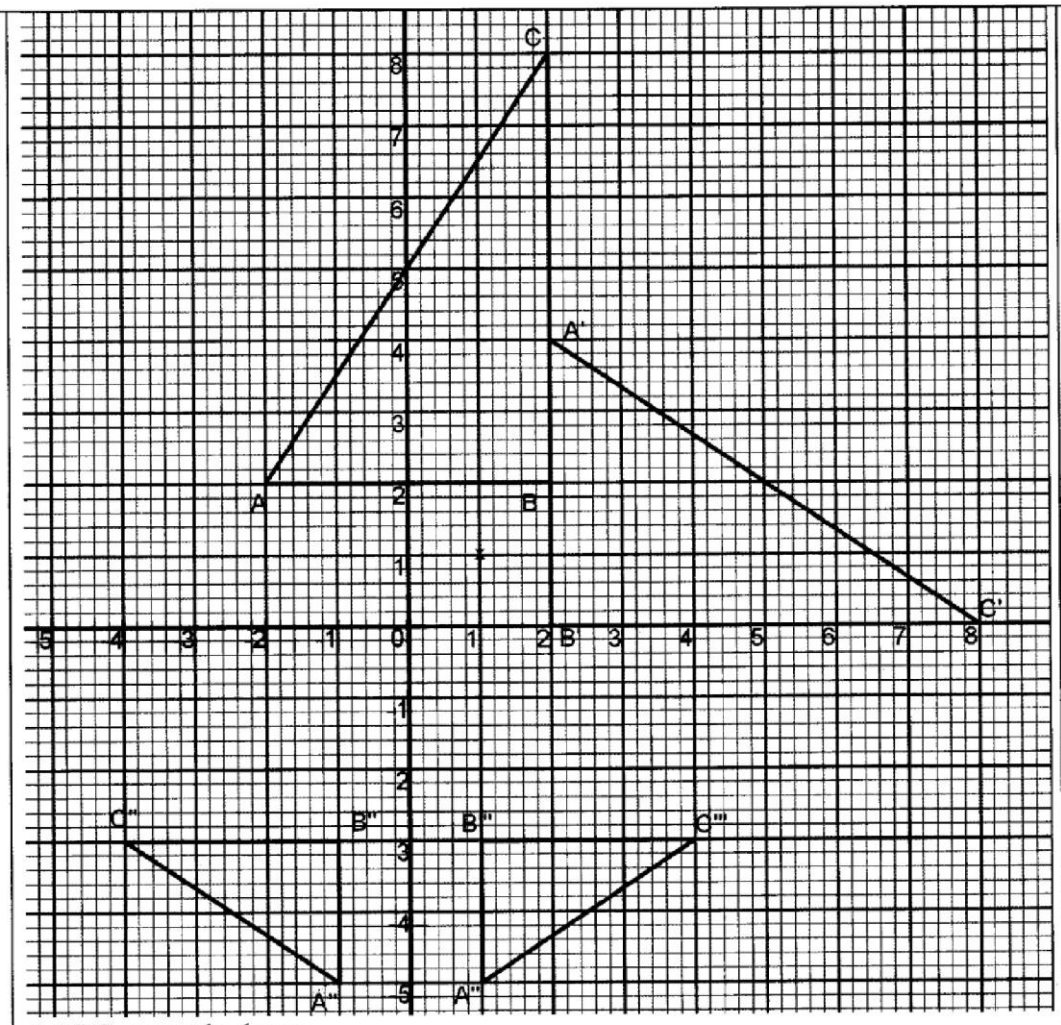
24 (a)			
	Δ ABC correctly drawn	B1	
	$A'B'C'$ correctly plotted	B1	
	Δ $A'B'C'$ drawn	B1	
(b)(i)	Δ $A''B''C''$ drawn	B1	
(ii)	enlargement	B1	
	scale factor, $-\frac{1}{2}$ centre $(0, -2)$	B1 B1	s.f centre
(c)	Δ $A'''B'''C'''$ drawn	B1	
(d)(i)	Directly congruent	B1	
(ii)	Oppositely congruent	B1	
		10	

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