4.3.2 Mathematics Alternative A Paper 2 (121/2)

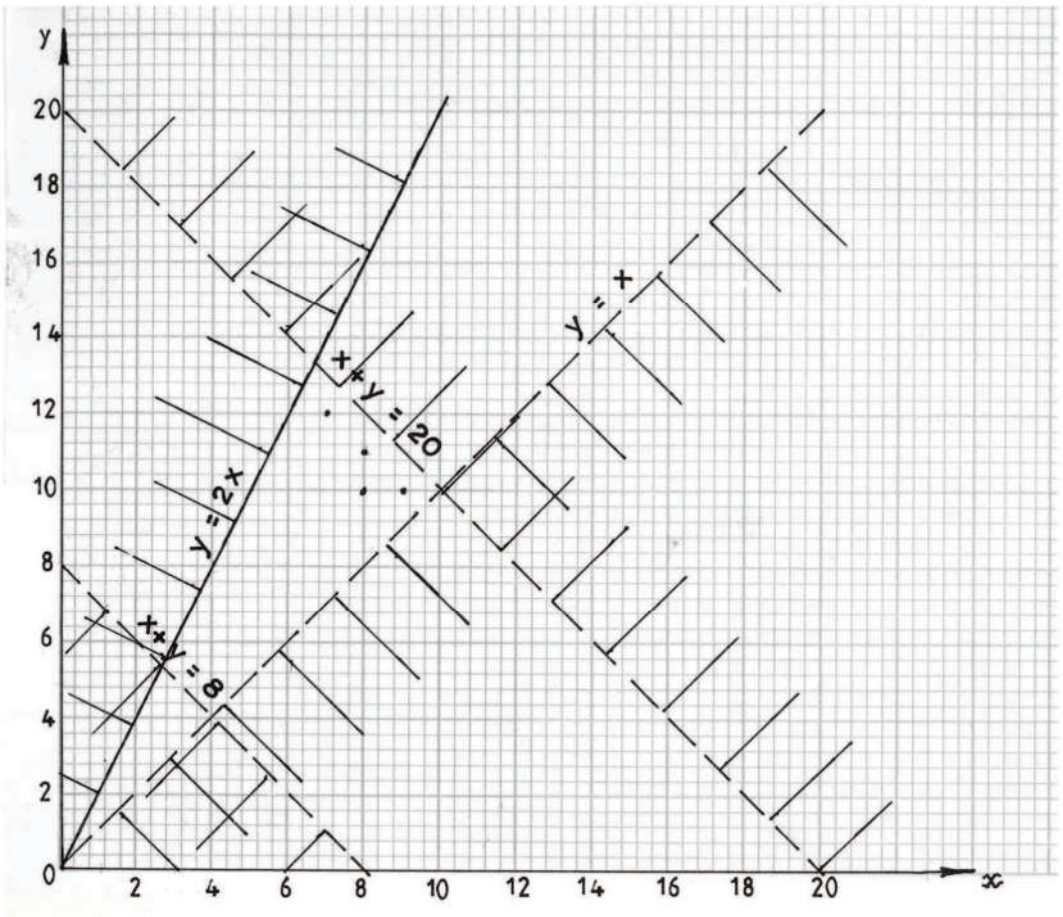
1.	Limits: 12.5 ± 0.05 m and 9.23 ± 0.005 m Maximum difference $= 12.55 - 9.225$ $= 3.325$ m	B1 M1 A1 3	
2.	a) First 6 terms $-7, -4, -1, 2, 5, 8$ b) Sum of 1st 50 terms $S_{50} = \frac{50}{2}\{2 \times -7 + 49 \times 3\}$ $= 3325$	 B1 M1 A1 3	
3.	a) $\angle BAC = 70^\circ - 30^\circ = 40^\circ$ Reflex $\angle BOC = 360^\circ - 80^\circ$ $= 280^\circ$ b) $\angle ACO = 40^\circ - 30^\circ = 10^\circ$	B1 B1 B1 3	
4.	$L = \frac{kM}{N^2}$ $2 = \frac{k \times 12}{36}$ $k = 6$ $\therefore$ equation $L = \frac{6M}{N^2}$	B1 M1 A1 3	
5.	<table><tr><th>Marks</th><th>Frequency</th><th>c.f</th></tr><tr><td>1 - 10</td><td>2</td><td>2</td></tr><tr><td>11 - 20</td><td>4</td><td>6</td></tr><tr><td>21 - 30</td><td>11</td><td>17</td></tr><tr><td>31 - 40</td><td>5</td><td>22</td></tr><tr><td>41 - 50</td><td>3</td><td>25</td></tr></table> Median $= 20.5 + \frac{12.5 - 6}{11} \times 10$ $= 20.5 + 5.91$ $= 26.41$ $\simeq 26$	 B1 M1 M1 A1 4	for c.f

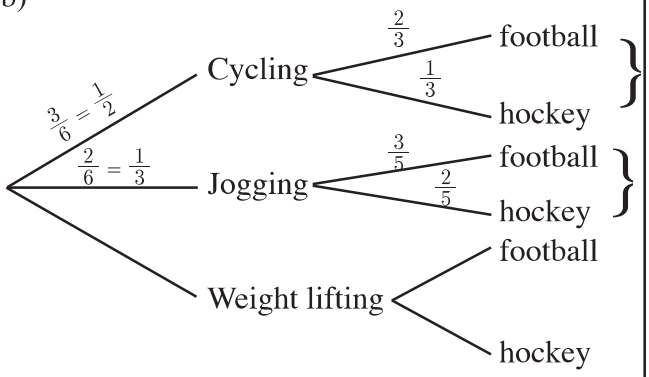
6.	Amplitude = 2 Period $= \frac{360}{3} = 120^\circ$	B1 B1 2	
7.	Area scale factor $= \frac{30}{5} = 6$ $4x - 2x + 2 = 6$ $2x = 4$ $x = 2$	B1 M1 A1 3	
8.	$(3-x)^7 = 3^7 - 7(3)^6x + 21(3)^5x^2 - 35(3)^4x^3$ $+35(3)^3x^4 + ...$ $= 2187 - 5103x + 5103x^2 - 2835x^3 + 945x^4$ $(2.8)^7 = (3 - 0.2)^7$ $= 2187 - 5103(0.2) + 5103(0.2)^2$ $- 2835(0.2)^3 + 945(0.2)^4$ $= 1349.352$	 B1 M1 A1 3	
9.	$\text{Log}\frac{15^2}{x} = \log 5(x-4)$ $\frac{15^2}{x} = 5(x-4)$ $x^2 - 4x - 45 = 0$ $(x - 9)(x + 5) = 0$ $x = 9$ or -5 $x = 9$	M1 M1 M1 A1 4	
10.	$PR = \sqrt{60^2 + 11^2} = 61$ $\text{Tan}\,\theta = \frac{10}{61}$ $\theta = 9.31^\circ$	B1 M1 A1 3	

11.	$3x - y = 9$ ..... $\times x$ $x^2 - xy = 4$ $3x^2 - xy = 9x$ $x^2 - xy = 4$ $2x^2 = 9x - 4$ $2x^2 - 9x + 4 = 0$ $(2x - 1)(x - 4) = 0$ $x = \frac{1}{2}$ or $x = 4$ $y = 3\left(\frac{1}{2}\right) - 9$ or $3(4) - 9$ $= -7\frac{1}{2}$ or 3	M1 M1 A1 B1 4	Attempt to solve Factors
12.	$\left(1 + \frac{r}{100}\right)^4 = \frac{495000}{280000}$ $1 + \frac{r}{100} = 1.153$ $r = 15.3$	M1 M1 A1 3	
13.	$8008 = \frac{40 + \theta}{360} \times 2 \times \frac{22}{7} \times 6370$ $40 + \theta = \frac{8008 \times 360 \times 7}{2 \times 22 \times 6370} = 72$ $\theta = 72° - 40°$ $= 32°$ Position of B(32° S, 20°W)	M1 M1 A1 3	or 32° seen
14.	$\underset{\sim}{r} + \underset{\sim}{s} = (7\underset{\sim}{i} + 2\underset{\sim}{j} - \underset{\sim}{k}) + (-\underset{\sim}{i} + \underset{\sim}{j} - \underset{\sim}{k})$ $= 6\underset{\sim}{i} + 3\underset{\sim}{j} - 2\underset{\sim}{k}$ $\lvert \underset{\sim}{r} + \underset{\sim}{s} \rvert = \sqrt{6^2 + 3^2 + (-2)^2}$ $= 7$	B1 M1 A1 3	

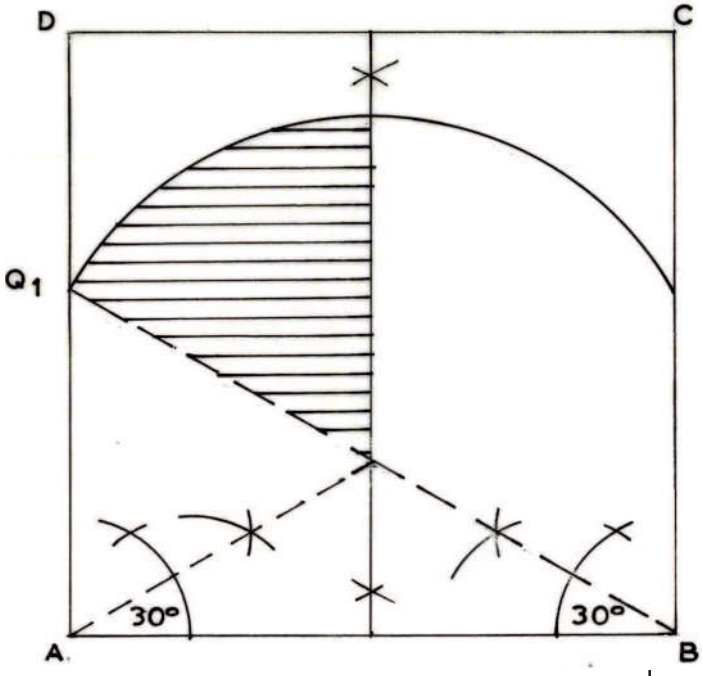
15.	$y = \int (x^2 - 4x + 3)\,dx$ $= \frac{1}{3}x^3 - 2x^2 + 3x + c$ $0 = \frac{1}{3} - 2 + 3 + c$ $\therefore c = -\frac{4}{3}$ $\therefore y = \frac{1}{3}x^3 - 2x^2 + 3x - \frac{4}{3}$	M1 M1 A1 3	
16.	Temperature at the 2nd minute = 60° Temperature at the 11th minute = 18° Average rate of cooling $= \frac{60 - 18}{2 - 11}$ $= \frac{42}{\lvert 9 \rvert}$ $= 4\frac{2}{3}$ C/ min	B1 M1 A1 3	for both √
17.	a) $A = \frac{3}{4}B, C = 2B$ $\Rightarrow A:B:C = \frac{3}{4}B:B:2B$ $= 3:4:8$ b) $\left(\frac{168}{8} \times 4\right)$litres $= 84\ l$ c) (i) $\frac{3 \times 160 + 4 \times 205 + 8 \times 100}{3 + 4 + 8}$ = Ksh 140 (ii) $\frac{182 - 140}{140} \times 100\%$ $= 30\%$ (iii) Ksh 140 $\times \frac{125}{100}$ = Ksh 175	M1 A1 M1 A1 M1 A1 M1 A1 M1 A1 10	

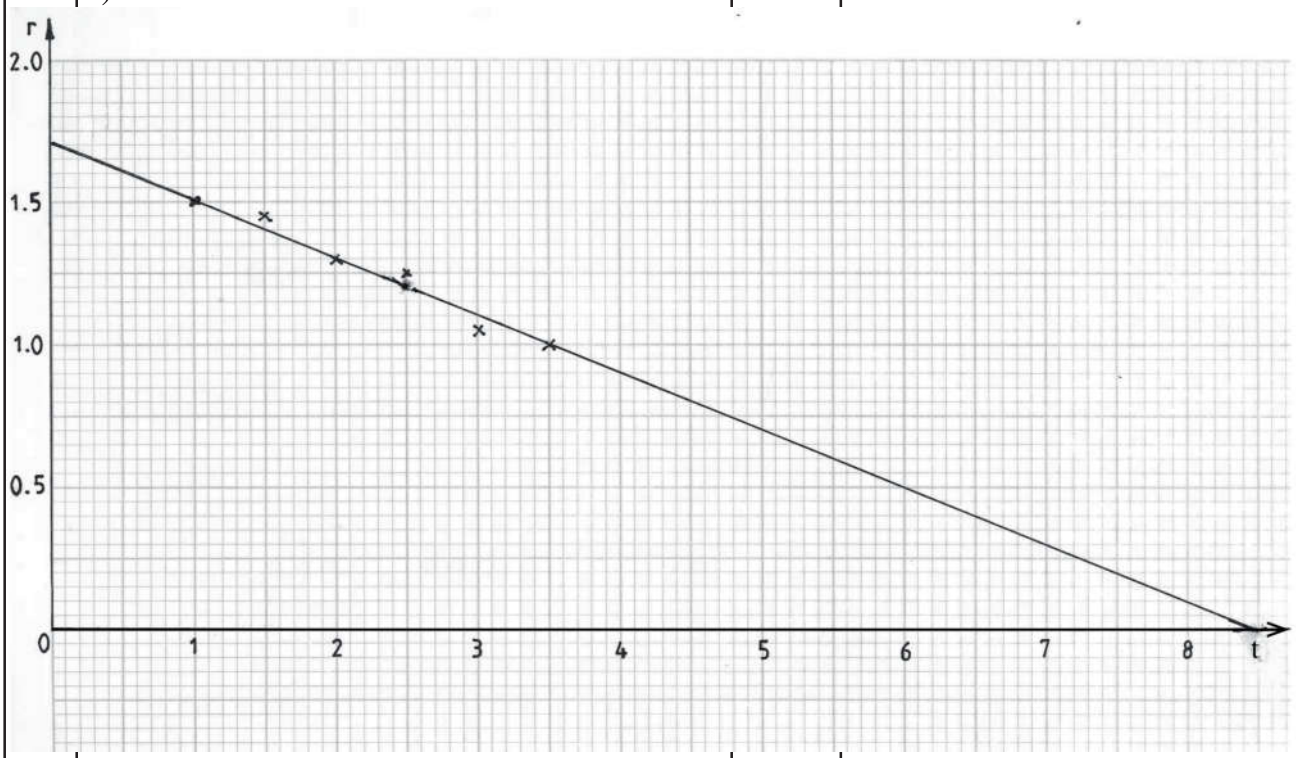
18.	a) (i) $(50 + 40)(50) = 30(30 + x)$ $4500 = 900 + 30x$ $30x = 3600$ $QS = x = 120$ cm	M1 A1	
	(ii) $RS = \frac{1}{2}QS$ $= \frac{1}{2}(120) = 60$ cm $OR = \sqrt{61^2 - 60^2}$ $= 11$ cm	B1 M1 A1	
	b) (i) $\text{Sin}\,\theta = \frac{60}{61}$ $\theta = 79.6°$	M1 A1	or equivalent
	(ii) Angle at the centre $= 2 \times 79.6$ $= 159.2°$	M1	
	Length of minor arc QS $= \frac{159.2}{360} \times 2\pi \times 61$ $= 169.5$ cm	M1 A1	
		10	
19.	a) (i) $38392 + 2108$ $=$ Ksh 41000	M1 A1	
	(ii) $10164 \times 0.1 + 9576 \times 0.15 + 9576 \times 0.2$ $+ 9576 \times 0.25 + 2108 \times 0.3$	M1 M1 M1	√ 1st band √ 3 middle bands √ last (5th) band
	$= 1016.4 + 1436.4 + 1915.2 + 2394 + 632.4$ $=$ Ksh 7394.4	A1	
	monthly income tax $= 7394.4 - 1162$ $=$ Ksh 6232.4	B1	
	b) Amount saved in coop society $= \frac{5}{100} \times (41000 - 15000)$	M1	
	$=$ Ksh1300 Nett pay $41000 - (6232.4 + 1300)$ $=$ Ksh 33467.6	M1 A1	
		10	

20.	a) $y > x$ $y \leq 2x$ $x + y < 20$ $x + y > 8$ b) (i)	B1 B1 B1 B1	
	 		
		B1 B1 B1 B1	line y = 2x and √ shading broken line x + y = 20 and √ shading broken line x + y = 8 and √ shading broken line y = x and √ shading
	(ii) Maximum area: 9×10 $= 90\ m^2$	M1 A1	
		10	

21.	a) (i) $\frac{3}{6}+\frac{1}{6}$	M1	
	$=\frac{2}{3}$	A1	
	(ii) $\frac{2}{6}\times\frac{2}{6}$	M1	
	$=\frac{1}{9}$	A1	
	b) 	B1 B1	
	c) (i) P(Gataro plays football)		
	$=\frac{1}{2}\times\frac{2}{3}+\frac{1}{3}\times\frac{3}{5}+\frac{1}{6}\times\frac{1}{2}$	M1	
	$=\frac{37}{60}$	A1	
	(ii) P(neither jogs nor plays football)		
	$=\frac{1}{2}\times\frac{1}{3}+\frac{1}{6}\times\frac{1}{2}$	M1	
	$=\frac{1}{4}$	A1	
		10	

22.	a) (i) $\underset{\sim}{BA} = \underset{\sim}{a} - \underset{\sim}{b}$	B1	
	(ii) $\underset{\sim}{BN} = \frac{1}{3}\underset{\sim}{BA} = \frac{1}{3}(\underset{\sim}{a} - \underset{\sim}{b})$	B1	
	(iii) $\underset{\sim}{ON} = \underset{\sim}{b} + \frac{1}{3}(\underset{\sim}{a} - \underset{\sim}{b})$	M1	
	$= \frac{1}{3}\underset{\sim}{a} + \frac{2}{3}\underset{\sim}{b}$	A1	
	b) $\underset{\sim}{BX} = h\underset{\sim}{BM} = h\left(\frac{1}{2}\underset{\sim}{a} - \underset{\sim}{b}\right)$		
	$\underset{\sim}{OX} = k\underset{\sim}{ON} = k\left(\frac{1}{3}\underset{\sim}{a} + \frac{2}{3}\underset{\sim}{b}\right)$	B1	
	also		
	$\underset{\sim}{OX} = \underset{\sim}{OB} + \underset{\sim}{BX}$		
	$= \underset{\sim}{b} + h\left(\frac{1}{2}\underset{\sim}{a} - \underset{\sim}{b}\right)$	B1	
	$k\left(\frac{1}{3}\underset{\sim}{a} + \frac{2}{3}\underset{\sim}{b}\right) = \underset{\sim}{b} + h\left(\frac{1}{2}\underset{\sim}{a} - \underset{\sim}{b}\right)$	M1	
	$\frac{1}{3}k\underset{\sim}{a} = \frac{1}{2}h\underset{\sim}{a}$		
	$\frac{1}{3}k = \frac{1}{2}h \Longrightarrow k = \frac{3}{2}h$.....(i)		
	$\frac{2}{3}k\underset{\sim}{b} = \underset{\sim}{b} - h\underset{\sim}{b}$	M1	
	$\frac{2}{3}k = 1 - h$.....(ii)		
	Substituting $k = \frac{3}{2}h$ in (ii)		
	$\frac{2}{3}\left(\frac{3}{2}h\right) = 1 - h \Longrightarrow h = \frac{1}{2}$	M1	
	Substituting $h = \frac{1}{2}$ in (i)		
	$k = \frac{3}{2}\left(\frac{1}{2}\right) = \frac{3}{4}$	A1	for $h = \frac{1}{2}$ and $k = \frac{3}{4}$
		10	

23.			
	(i)	B2	locus of P
	(ii)	B1	construction of 30°
		B1	identification of centre
		B1	drawing of arc
	b) (i) $9.2 \times 10 = 92$ m	B1	
	(ii) area of region bounded by locus of P, locus of Q and line BQ_1	B1	Identifying region
	angle = 60° radius = 46 m	B1	for radius and angle of sector
	$= \pi \times 46^2 \times \frac{60}{360}$	M1	
	$= 1107.94$		
	$\simeq 1108\ m^2$	A1	
		10	

24.	a) 		
		S1 P2 L1	√ scale (P1 for 4 points √ plotted) √ line
	b) (i) value of a $= \frac{-0.7}{3.5}$	M1	
	$= -0.2$	A1	
	value of k = 1.7	B1	
	(ii) equation: $r = -0.2t + 1.7$	B1	
	(iii) value of t when r = 0 $\therefore 0 = -0.2t + 1.7$ $0.2\,t = 1.7$	M1	
	$t = \frac{1.7}{0.2} = 8.5$	A1	
		10	