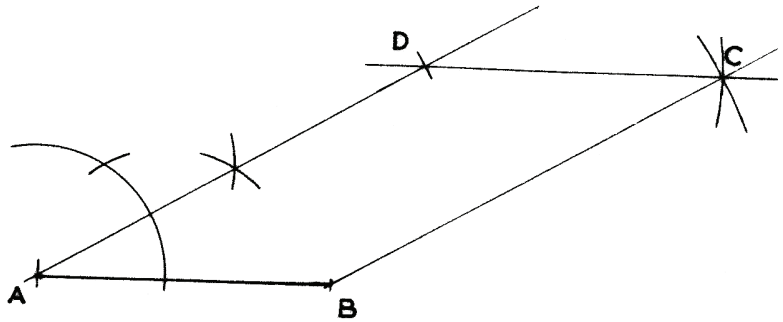
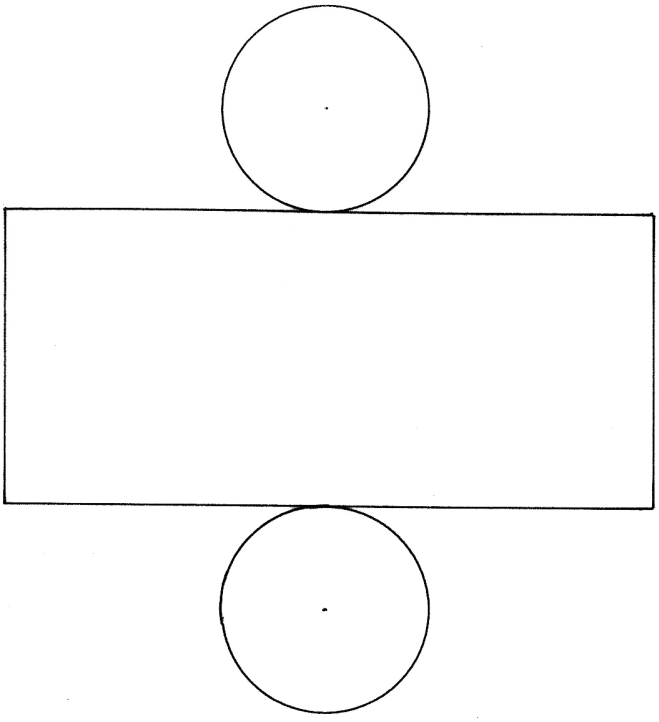
4.3.3 Mathematics Alternative B (122/1)

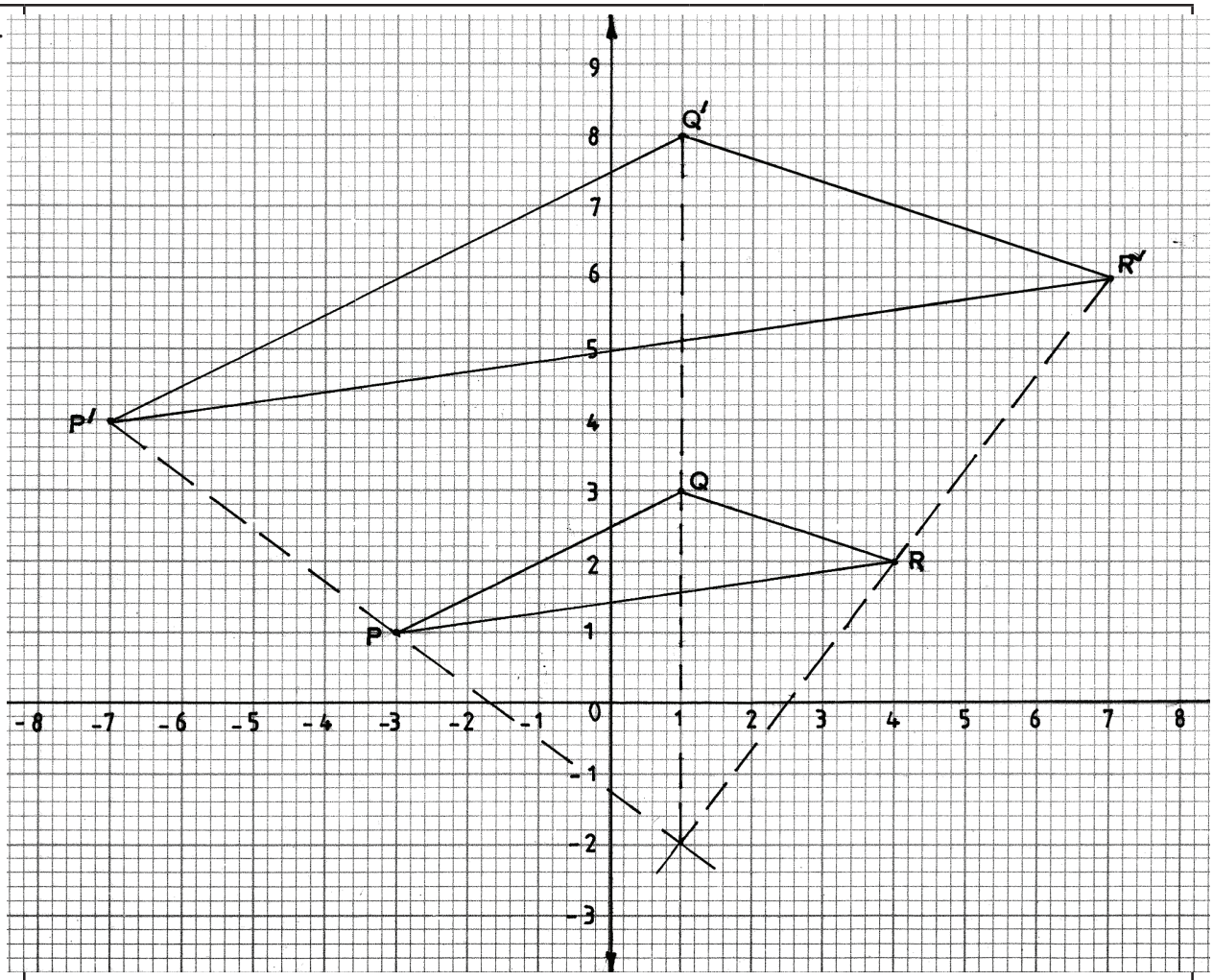
1.	$\frac{^{-}8 \times {}^{+}2 + {}^{-}11}{{}^{+}18 \div {}^{-}2 \times {}^{+}3} = \frac{-27}{-27}$ $= 1$	M1 A1 2	
2.	Number of boys $= 630 - 84$ $= 546$ Number of students $= 630 + 546$ $= 1176$ Number of parents $= 1176 \div 4$ $= 294$	M1 M1 A1 3	
3.	$3(78 - y) + 5y = 300$ $2y = 66$ $y = 33$ $\therefore x = 78 - 48 = 45$ $10x + 15y = 450 + 495 = 945$	M1 A1 B1 3	
4.	(a) $96 = 2^5 \times 3$ $84 = 2^2 \times 3 \times 7$ $36 = 2^2 \times 3^2$ GCD of 96, 84 and 36 $= 2^2 \times 3 = 12$ (b) Number of packets of foodstuffs $= \frac{96}{12} + \frac{84}{12} + \frac{36}{12}$ $= 8 + 7 + 3 = 18$	M1 A1 M1 A1 4	or equivalent
5.	$\frac{128}{2^5 \div 2^8} = \frac{2^7}{2^{-3}}$ $= 2^{10}$	B1 B1 B1 3	√ numerator √ denominator

6.		B1 B1 B1 3	√ construction of 30° √ construction of AD = 6 cm identifying C and completing parallelogram
7.	$4\alpha + \alpha + 10 = 90^\circ$ $5\alpha = 80^\circ$ $\alpha = 16^\circ$ $\sin\alpha = 0.276$	M1 A1 B1 3	
8.	$\frac{0.375 \div 0.06 - 4.2}{3.96 + 2.8 \times 0.05} = \frac{6.25 - 4.2}{3.96 + 0.14}$ $= \frac{2.05}{4.1}$ $= 0.5$	M1 M1 A1 3	Evidence of division and multiplication should be seen.
9.	Mangoes: $2x + x + \frac{1}{3}x$ $= 3\frac{1}{3}x$ Oranges: $\frac{1}{3}y + y + \frac{2}{3}y = 2y$ Total Fruits $= 3\frac{1}{3}x + 2y$	M1 M1 A1 3	

10.	(a) Cylinder (b)  Two circles of radius 1.4 touching the longer sides of a rectangle 4 cm by 8.8 cm.	B1 B1 B1 3	 for correct circles for correct rectangle
11.	Fraction of circumference made $= \frac{12}{60}$ $\frac{22}{7} \times 2r \times \frac{12}{60} = 17.6$ $r = \frac{7}{22} \times \frac{60}{12} \times \frac{17.6}{2}$ $= 14$	B1 M1 M1 A1 4	 or equivalent
12.	$\angle RQP = 147°$ $\angle SRP = 90°$ $\angle SRQ = 90 + 12 = 102°$	B1 B1 B1 3	or $\angle RPS = 57°$ or $180 - (57 + 21) = 102°$

13.	$2x^2 + 6y - 3x - 4xy$ $= 2x^2 - 4xy - 3x + 6y$ $= 2x(x - 2y) - 3(x - 2y)$ $= (2x - 3)(x - 2y)$	 M1 A1 2	or equivalent
14.	$x^2 \sin 30^0 = 34$ $x = \sqrt{\frac{34}{\sin 30}}$ $\simeq 8$ cm	M1 M1 A1 3	

15.



	(a) $\triangle PQR$ $\triangle P'Q'R'$ (b) Centre of enlargement $(1, -2)$ Scale factor of enlargement $= \frac{10}{5} = 2$	B1 B1 B1 B1 4	
16.	$\frac{L}{2.1} = \frac{L+5}{3.5}$ $3.5L - 2.1L = 10.5$ $L = 7.5$ $L = 5 + 7.5 = 12.5$ Curved area $= \frac{22}{7} \times (3.5 \times 12.5 - 2.1 \times 7.5)$ $= 88 \text{ cm}^2$	M1 M1 M1 A1 4	 for area for difference

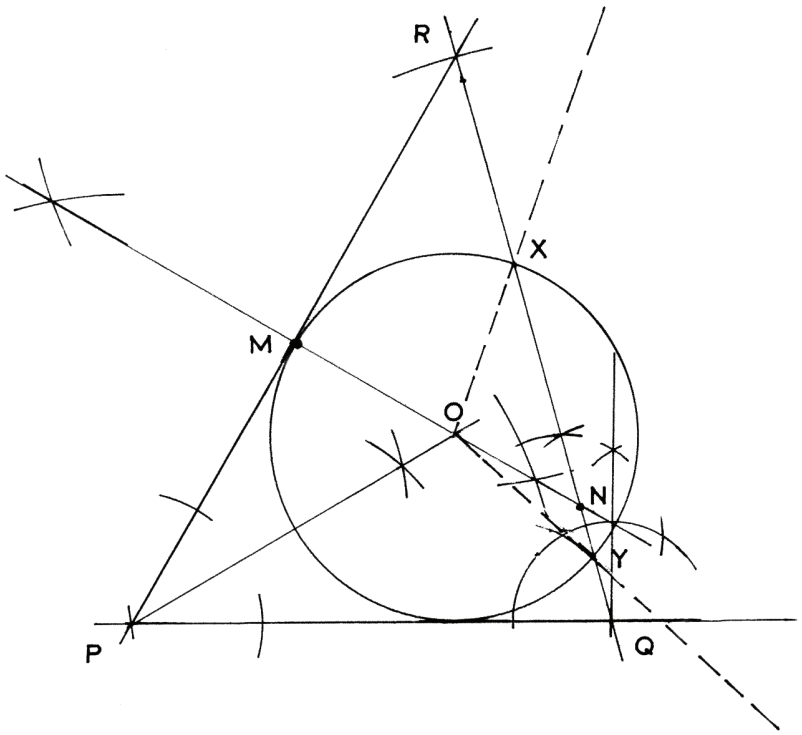
17.	(a) (i) Mumo's contribution:		
	$= \frac{25}{100} \times (30000 + 50000)$	M1	
	$= 20000$	A1	
	(ii) Ratio - Keya : Limo : Mumo		
	$= 30000 : 50000 : 20000$	M1	
	$= 3 : 5 : 2$	A1	
	(b) Mumo's share of profit		
	$= \frac{2}{10} \times 25000$	M1	
	$= 5000$	A1	
	(c) (i) $20000 + x = 80000 \times \frac{7}{8}$	M1	
	$x = 50000$	A1	
	(ii) Mumo's % contribution in business during 2nd year		
	$= \frac{70000}{150000} \times 100$	M1	or $\frac{7}{15} \times 100\%$ M1
	$= 46\frac{2}{3}\%$	A1	$= 46\frac{2}{3}\%$ A1
		10	

18.	(a) $1.54l = 1540\ \text{cm}^3$	B1	
	Volume $= \frac{22}{7} \times r^2 \times 10 = 1540$	M1	
	$r = \sqrt{\frac{1540 \times 7}{22 \times 10}}$		
	$= 7$		
	$\therefore$ Diameter $= 2 \times 7 = 14\ \text{cm}$	A1	
	(b) (i) Length of ribbon		
		M1	
	$= 2 \times \frac{22}{7} \times 14 + 2 \times 2$	M1	addition of the overlap
	$= 88 + 4 = 92$	A1	
	(ii) Surface area covered by ribbon		
	$= 88 \times 1.5 = 132\ \text{cm}^2$	B1	
	(c) Surface area		
	$= \frac{22}{7} \times 49 + \frac{22}{7} \times 14 \times 10$	M1	
		M1	
	$= 154 + 440$		
	$= 594\ \text{cm}^2$	A1	
		10	

19.	(a) Scale used:		
	9 cm represent 90 m	B1	
	$\therefore$ scale 1:1000	B1	
	(b) (i) perimeter of homestead		
	$(2 \times 10) \times 4$	M1	
	$= 80$ m	A1	
	(ii) Area of piece of land in ha.		
	$AB = 13.8 \times 10 = 138;$ $BC = 6 \times 10 = 60$		
	$\frac{\frac{1}{2}(60+90) \times 138}{10000}$	M1 M1	conversion to Hectares
	$= 1.035$ ha	A1	
	(c) $\perp$ distance from centre of homestead to side CD shown	B1	
	Distance, 3.6 cm, on map	B1	
	Actual distance $3.6 \times 10 = 36$ m	B1	
		10	

20.	(a) Gradient of L_1		
	$= \frac{1 - {}^{-}2}{6 - {}^{-}3}$	M1	
	$= \frac{1}{3}$		
	equation of L_1		
	$= \frac{y-1}{x-6} = \frac{1}{3}$	M1	
	$3y - 3 = x - 6$ $3y = x - 3$ $y = \frac{1}{3}x - 1$	A1	
	(b) Gradient of L_2		
	$= \frac{-1}{\frac{1}{3}}$	M1	
	$= -3$		
	$\therefore$ equation $\frac{y-2}{x-{}^{-}1} = -3$	M1	
	$y = -3x - 1$ $\Rightarrow 3x + y + 1 = 0$	A1	
	(c) equation of L_3		
	$\frac{y-1}{x-1} = -3$	M1	
	$y - 1 = -3(x - 1)$	A1	
	$y = -3x + 4$		
	x intercept: when $y = 0$, $x = \frac{4}{3}$ $\therefore$ coordinates of x intercepts $\left(\frac{4}{3}, 0\right)$	B1	
	y intercept: when $x = 0$, $y = 4$ $\therefore$ coordinates of y intercept $(0, 4)$	B1	
		10	

21.

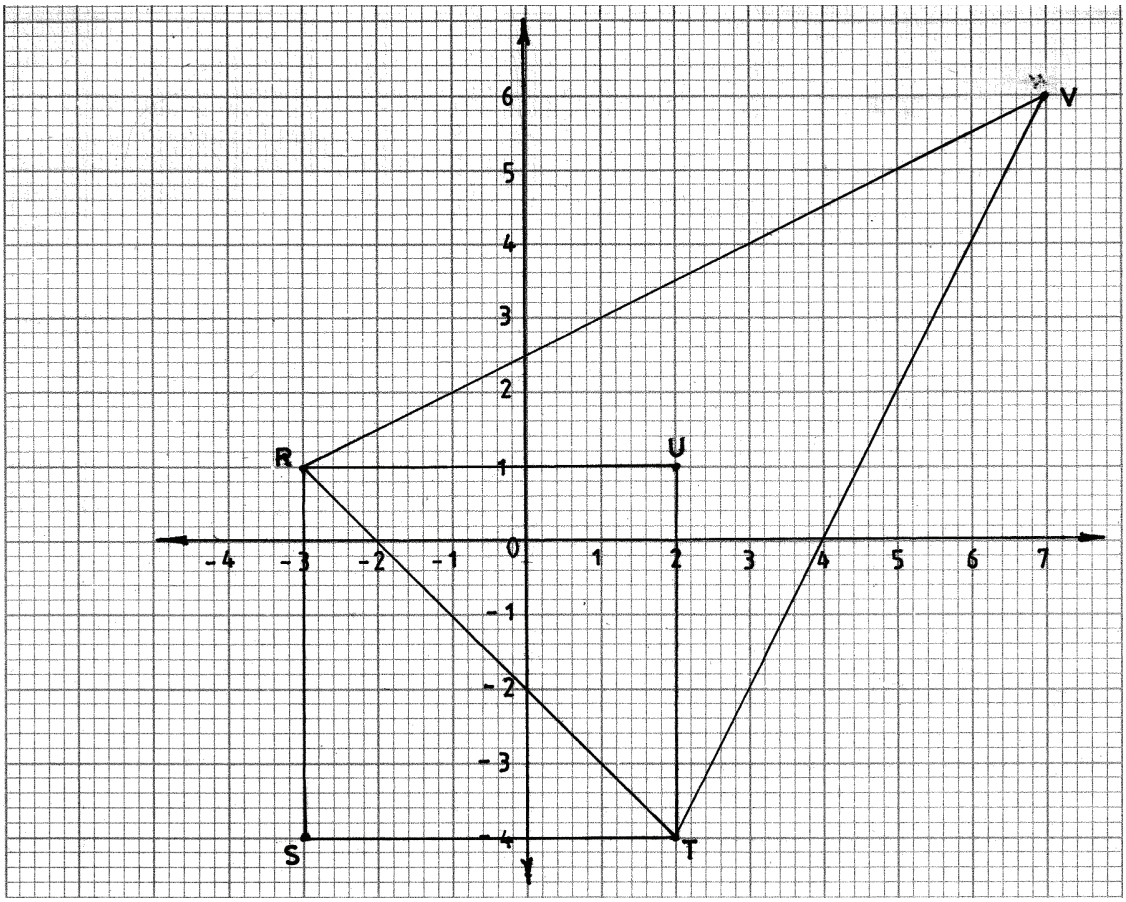


(a)	Lines PQ and PR	B1	
	angle 75° constructed	B1	
	completion of △ PQR.	B1	
		B1	
(b)	(i) ⊥ bisector of PR	B1	
	(ii) angle bisector ∠ QPR	B1	
	∠ POM 60° ± 1°	B1	
	(iii) circle with radius OM	B1	
	XY = 4.3 ± 0.1	B1	
	∠ XOY 114° ± 1°	B1	
		10	

22.	(a) (i) $\frac{400\text{m}}{64\text{s}}$	M1	
	$= 6.25$ m/s	A1	
	(ii) speed during second lap		
	6.25×1.06	M1	
	6.625 m/s	A1	
	(b) (i) total time for two laps		
	time for 2nd lap $= \frac{400}{6.625}$	M1	
	$\simeq 60.38$ s		
	total time		
	$= 64 + 60.38$	M1	
	$= 124.38$ s	A1	
	(ii) average speed in km/h		
	$\frac{800}{124.38}$ m/s	M1	
	$= \frac{800}{124.38} \times \frac{3600}{1000}$	M1	√ conversion
	$= 23.15$ km/h	A1	
		10	

23.	(a) (i) amount of money spent		
	$= \frac{420}{8} \times 20 + 50$	M1	
	$= 1100$	A1	
	(ii) number of bananas sold		
	$= 420 + \frac{420}{70} - 14$		
	$= 412$	B1	
	(b) (i) s.p. of bananas		
	$= 1100 \times 1.6$ $= 1760$	M1	
	let x be number of bananas sold at sh 30		
	$\therefore \frac{x}{5} \times 30 + \frac{412 - x}{3} \times 10 = 1760$	M1	
	$18x + 412 - 10x = 1760$	M1	
	$x = 145$	A1	
	(ii) No of bananas sold at sh 10		
	$= 412 - 145 = 267$	B1	
	Amount of money obtained		
	$= \frac{267}{3} \times 10$	M1	
	$= 890$	A1	
		10	

24.

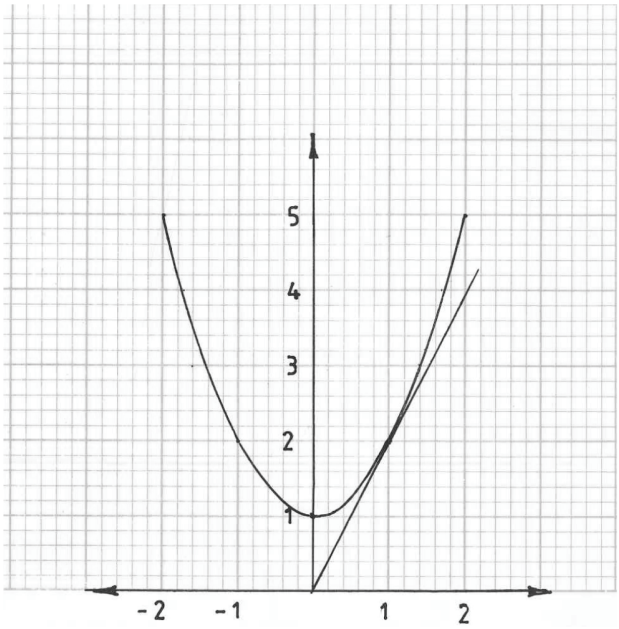


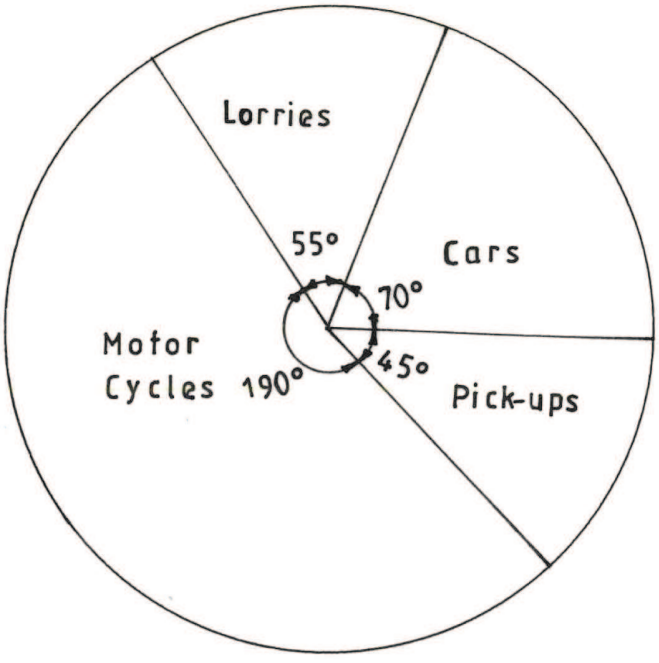
(a) (i)	$\triangle$ RST $\surd$ drawn	B1	
(ii)	Area of $\triangle$ RST: $\frac{1}{2} \times 5^2$ $= 12.5$	M1 A1	
(b) (i)	Plotting point U coordinates of point U $(2, 1)$	B1 B1	
(ii)	Plotting of point V coordinates of point V $(7, 6)$	B1 B1	
(c)	Area of quadrilateral RSTV diagonals RT $= \sqrt{50}$ and SV $= \sqrt{200}$	B1	for RT and SV
	$\therefore$ Area $= \frac{1}{2} \times \sqrt{50} \times \sqrt{200}$	M1	
	$= \frac{1}{2} \times 5\sqrt{2} \times 10\sqrt{2}$		
	$= 50$	A1	
		10	

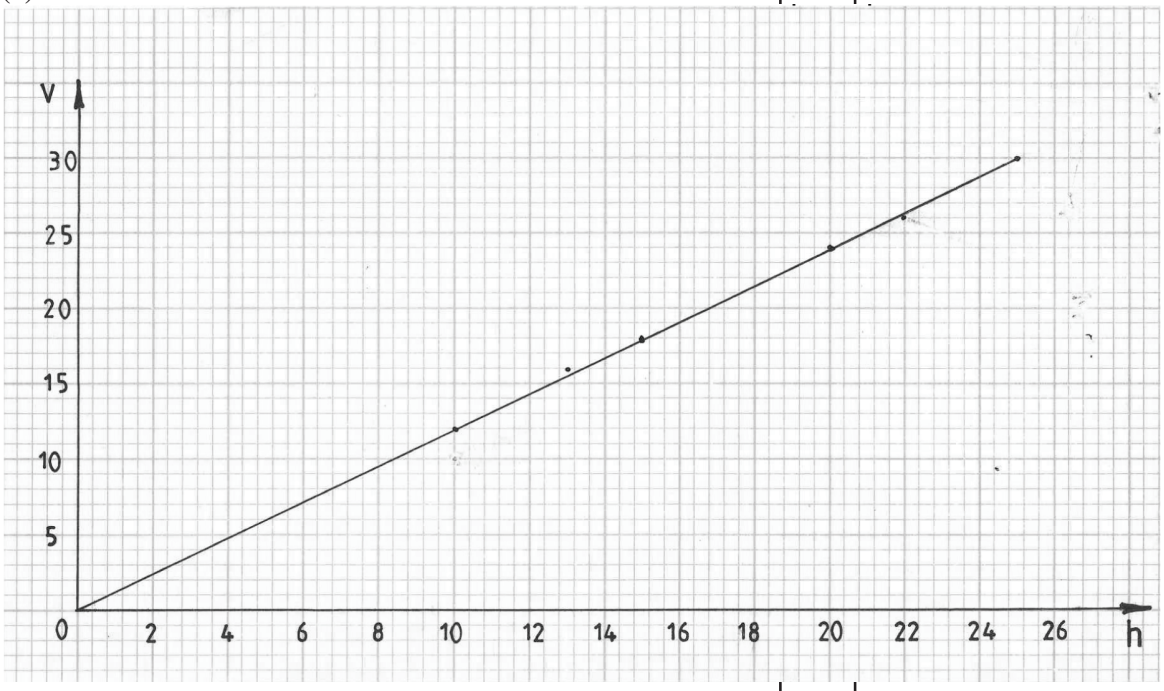
4.3.4 Mathematics Alternative B Paper 2 (122/2)

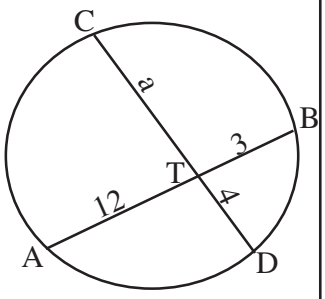
1.	$\frac{(0.214)^{1/2}-(0.38)^3}{(0.817)^{1/4}} = \frac{0.40772934}{0.950726313}$ $= 0.4289$	B1 B1 2	
2.	(a) $\frac{ar^5}{ar^2} = \frac{5}{32} \times \frac{4}{5}$ $r^3 = \frac{1}{8} \Rightarrow r = \frac{1}{2}$ (b) $ar^2 = \frac{5}{4}$ $a \times \left(\frac{1}{2}\right)^2 = \frac{5}{4} \Rightarrow a = \frac{5}{4} \times \frac{4}{1}$ $a = 5$	M1 A1 M1 A1 4	
3.	$\frac{1}{2} \times 4a\{3a + (3a + 3)\} = 60$ $2a(6a + 3) = 60$ $12a^2 + 6a - 60 = 0$ $2a^2 + a - 10 = 0$ $(2a + 5)(a - 2) = 0$ $a = 2$ or $a = -\frac{5}{2}$ $a = 2$	M1 M1 A1 3	
4.	Complete squares = 12 Part squares = 20 Approx. area $= 12 + \frac{20}{2}$ $= 22$	B1 M1 A1 3	for 12 and 20

5.	$A = 48000\ (1.05)^3$ $= 55\ 566$ Interest = 55 566 - 48 000 $= 7\ 566$	M1 A1 B1 3	
6.	$3(4\underset{\sim}{i} + 5\underset{\sim}{j}) - 2(8\underset{\sim}{i} - 3\underset{\sim}{j}) = p\underset{\sim}{i} + 3q\underset{\sim}{j}$ $12\underset{\sim}{i} + 15\underset{\sim}{j} - 16\underset{\sim}{i} + 6\underset{\sim}{j} = p\underset{\sim}{i} + 3q\underset{\sim}{j}$ $-4\underset{\sim}{i} + 21\underset{\sim}{j} = p\underset{\sim}{i} + 3q\underset{\sim}{j}$ $\therefore p = -4$ $3q = 21 \Rightarrow q = 7$	 M1 M1 A1 3	 for -4i + 21 j for both p = -4 and q = 7
7.	ln 1h A does $\frac{1}{8}$ of work B does $\frac{1}{10}$ of work ln 3h both A and B do $3\left(\frac{1}{8}+\frac{1}{10}\right)$ $= \frac{27}{40}$ of work Remaining piece of work $= 1 - \frac{27}{40}$ $= \frac{13}{40}$ Time for A to complete the remaining work $= \frac{13}{40} \div \frac{1}{8}$ $= 2\frac{3}{5}$ h	 M1 M1 M1 A1 4	

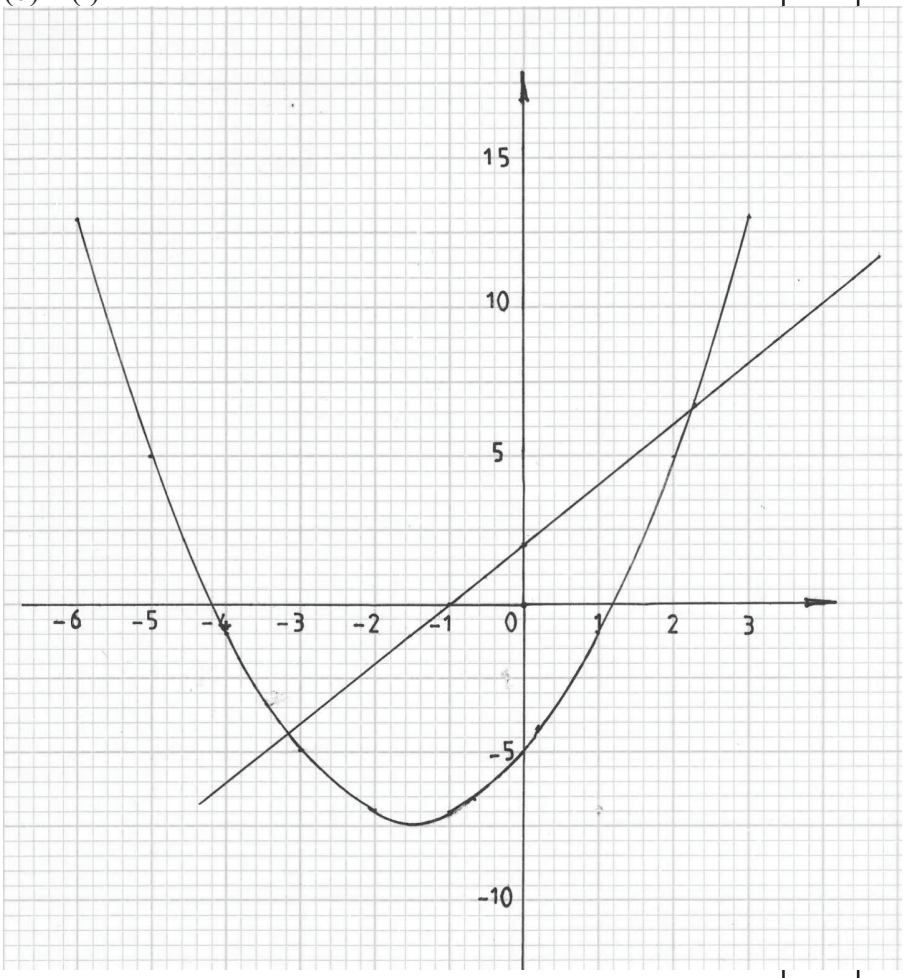
8.	 tangent at A gradient = $\frac{4-0}{2-0}$ = 2	B1 M1 A1 3	
9.	$\tan^{-1}\sqrt{3} = 60$ $2\theta - 30 = 60°, 240°, 420°, 600°$ $2\theta = 90°, 270°, 450°, 630°$ $\theta = 45°, 135°, 225°, 315°$	B1 B1 B1 3	
10.	Longitude difference = 50° + 22° = 72° Distance = $\frac{72}{360} \times \frac{22}{7} \times 2 \times 6370$ = 8008 km	M1 M1 A1 3	

11.	$\det \begin{pmatrix} 8 & 3 \\ 4 & 2 \end{pmatrix} = 16 - 12 = 4$ Matrix N = $\frac{1}{4}\begin{pmatrix} 2 & -3 \\ -4 & 8 \end{pmatrix}$ $= \begin{pmatrix} \frac{1}{2} & -\frac{3}{4} \\ -1 & 2 \end{pmatrix}$	B1 M1 A1 3	
12.	5x + 6y =50 7x + 5y = 53 42x + 30y = 318 25x + 30y = 250 17x = 68 x = 4 20 + 6y = 50 $\Rightarrow$ y = 5	M1 M1 A1 B1 4	for both equations set
13.	Angle for: Cars = $\frac{14}{72} \times 360^\circ = 70^\circ$ Lorries = $\frac{11}{72} \times 360^\circ = 55^\circ$ Motor cycle = $\frac{38}{72} \times 360^\circ = 190^\circ$ Pick ups = $\frac{9}{72} \times 360^\circ = 45^\circ$  	B2 B1 3	All angles correct (allow B1 for 3 correct)

14.	Area scale factor = Det of matrix $= \frac{4}{9} - 0$ $= \frac{4}{9}$ Area of A'B'C'D' = $\frac{4}{9} \times 27$ $= 12 \text{ cm}^2$	M1 M1 A1 3	
15.	(a)  (b) Constant of proportionality = Gradient = $\frac{24-12}{20-10} = 1.2$	P1 L1 B1 3	√ plotting √ line drawn or equivalent

16.	Let CT = a AT.TB = CT.TD $12 \times 3 = a \times 4$ $a = \frac{12 \times 3}{4}$ $= 9$ CT : TD = 9:4	M1 A1 B1 3	
17.	(a) (i) $40000 \times \frac{20.5}{100}$ $= 8200$ (ii) total hire purchase price $= 8200 + 12 \times 4800$ $= 65800$ (iii) deposit as percentage of hire purchase price $= \frac{8200}{65800} \times 100\%$ $= 12.46200608 = 12.5\%$ (iv) h.p. price more than cash price $= 65800 - 40000 = 25800$ (b) Bidii's deposit as percentage of cash price $= 65800 - (12 \times 4000)$ $= 17800$ %age $= \frac{17800}{40000} \times 100\%$ $= 44.5\%$	M1 A1 M1 A1 M1 A1 B1 M1 A1 B1 10	

18.	(a) (i) let number of pieces be n		
	$15 = 0.5 + (n - 1) \times 0.25$	M1	
	$0.25n = 14.75$		
	$n = 59$	A1	
	(ii) length of 10th piece		
	$= 0.5 + (10 - 1)0.25$	M1	
	$= 0.5 + 9 \times 0.25 = 2.75$ m	A1	
	(iii) $S_{59} = \frac{59}{2}\{2 \times 0.5 + 58 \times 0.25\}$	M1	
	$= 457.25$ m	A1	
	(b) $63 = \frac{n}{2}\{2 \times 0.5 + (n-1)0.25\}$	M1	
	$126 = n\{1 + 0.25n - 0.25\}$		
	$0.75n + 0.25n^2 = 126$		
	$n^2 + 3n - 504 = 0$		
	$(n + 24)(n - 21) = 0$	M1	or equivalent
	$n = -24$ or 21	A1	
	$n = 21$	B1	
		10	

19.	(a) 	**x**	-6	-5	-4	-3	-2	-1	0	1	2	3
---	---	---	---	---	---	---	---	---	---	---
y	13	5	(-1)	-5	-7	-7	(-5)	-1	5	13 | (b) (i)  (ii) -4.2, 1.2 c(i) (-3.2, -4.5) (2.2, 6.5)	B2 S1 P1 C1 B1 B1 L1 B1 B1 10	(allow B1 for 5 values √) √ coordinates

20. (a) The mean:

$$= \frac{2\times 34.5 + 4\times 44.5 + 10\times 54.5 + 13\times 64.5 + 14\times 74.5 + 5\times 84.5 + 2\times 94.5}{50}$$ B1 mid points

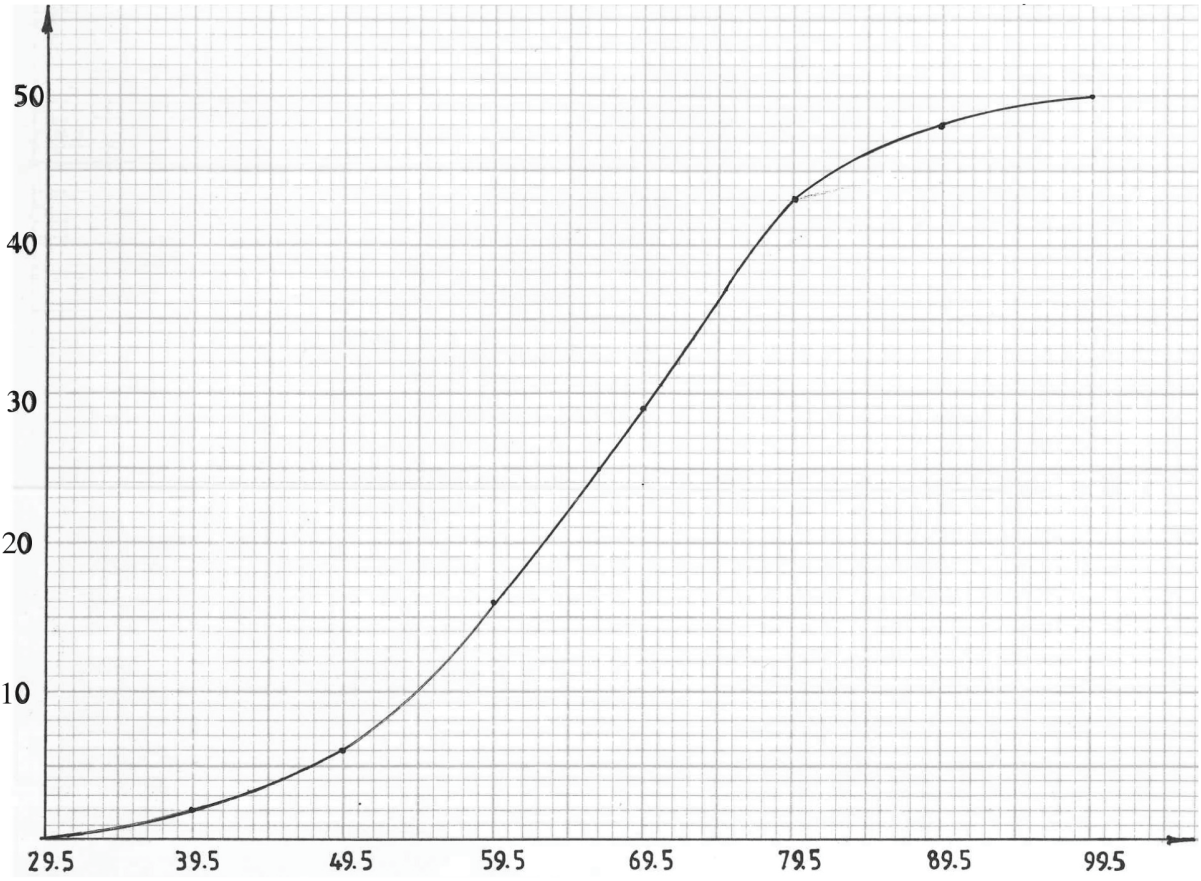
$$= \frac{3285}{50}$$ M1 for $\sum fx$

$= 65.7$ A1

(b)

Marks	30-39	40-49	50-59	60-69	70-79	80-89	90-99
frequency	2	4	10	13	14	5	2
cf	2	6	16	29	43	48	50

B1 √ cfs



S1
P1
C1

(c) (i) median : 66.5 B1 25^{th} pos
B1 for 66.5

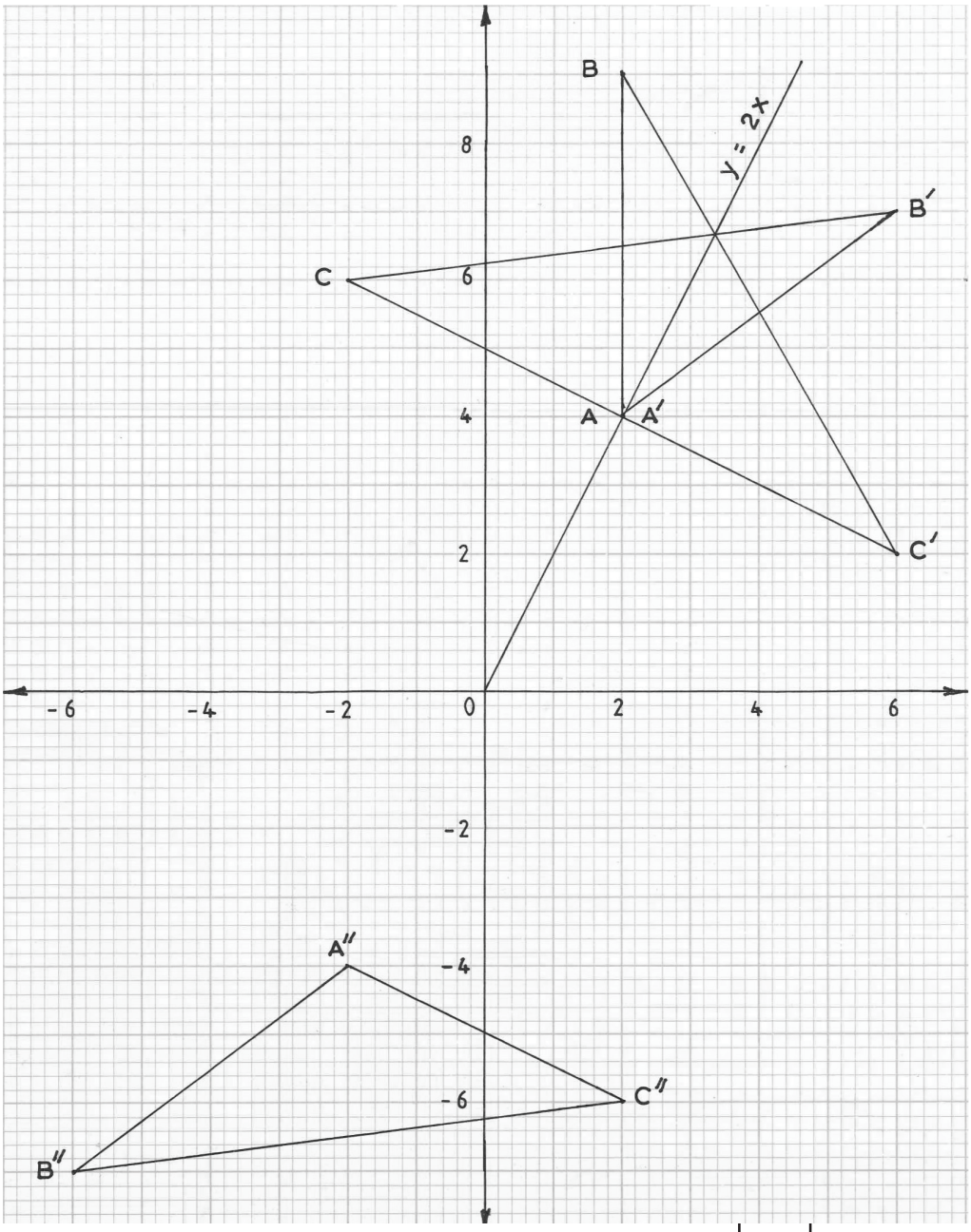
(ii) position of student who scores 75 = 37^{th} B1

10

21.	(a) AD = $\sqrt{9.2^2 - 6^2}$ = 7.0 (b) Angle ABD = $\cos^{-1}\frac{6}{9.2}$ = 49.3° (c) $\frac{BC}{9.2} = \tan 40°$ BC = 9.2 tan 40 = 7.7 (d) Area of ΔACD: $\angle ADB = 90° - 49.3° = 40.7$ Side DC: $\frac{9.2}{DC} = \cos 40°$ DC = $\frac{9.2}{\cos 40°} = 12\ cm$ ∴ Area ΔACD = $\frac{1}{2}$ AD × DC sin (40 + 40.7) = $\frac{1}{2}$ × 7 × 12 × sin 80.7 = 41.4 cm²	M1 A1 M1 A1 M1 A1 B1 B1 M1 A1 10	

22.	(a) P(Daudi uses a train and is punctual)		
	$= 0.3 \times 0.8$	M1	
	$= 0.24$	A1	
	(b) P(Daudi uses bus and is late for work)		
	$= 0.5 \times 0.3$	M1	
	$= 0.15$	A1	
	(c) P(Daudi punctual)		
	$= 0.3 \times 0.8 + 0.5 \times 0.7 + 0.2 \times 0.9$	M1	
	$= 0.24 + 0.35 + 0.18$		
	$= 0.77$	A1	
	(d) P(Daudi late)		
	$= 1 - 0.77$	M1	
	$= 0.23$	A1	
	(e) P(Daudi uses train or bus and is punctual)		
	$= 0.3 \times 0.8 + 0.5 \times 0.7$	M1	
	$= 0.59$	A1	
		10	

23.



(a) (i)	B1	ΔABC drawn
(ii) $\begin{pmatrix} -\frac{3}{5} & \frac{4}{5} \\ \frac{4}{5} & \frac{3}{5} \end{pmatrix}\begin{pmatrix} 2 & 2 & 6 \\ 4 & 9 & 2 \end{pmatrix} = \begin{pmatrix} 2 & 6 & -2 \\ 4 & 7 & 6 \end{pmatrix}$	M1 A1	
(b) Reflection in line y = 2x	B1 B1 B1	ΔA'B'C' √ drawn reflection equation y = 2x
(c) (i)	B1	ΔA"B"C" √ drawn
(ii) matrix of H = $\begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$	B1	
(d) $HT = \begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}\begin{pmatrix} -\frac{3}{5} & \frac{4}{5} \\ \frac{4}{5} & \frac{3}{5} \end{pmatrix} = \begin{pmatrix} \frac{3}{5} & -\frac{4}{5} \\ -\frac{4}{5} & -\frac{3}{5} \end{pmatrix}$	M1 A1	or equivalent
	10	

24.

Dr			Cr		
Date 2014	Particulars	Sh Cts	Date 2014	Particulars	Sh Cts
January			January		
1	Balance	3250.00	3	Oranges	9000.00
5	Orange	11750.00	4	Pawpaw	1650.00
6	Pawpaw	1812.50	4	Vegetables	700.00
6	Vegetable	1140.00	4	Transport	200.00
			8	Market fees	150.00
			10	Wages	400.00
			11	Balance	5852.50
		17952.50			**17952.50**

Oranges sales = 11750.00	B1
Pawpaw sales = 1812.50	B1
Oranges purchase = 9000.00	B1
Pawpaw purchase = 1650.00	B1
all other entries correct	B2
Totals	M1
Dr/Cr columns = 17952.50	A1
Balance on 11/01/2011	
= Sh 17952.50 - (900 + 1650 + 700 + 200 + 150 + 400)	M1
= 5852.50	A1
	10