4.3 MATHEMATICS ALTERNATIVE A (121)

4.3.1 Mathematics Alternative A Paper 1 (121/1)

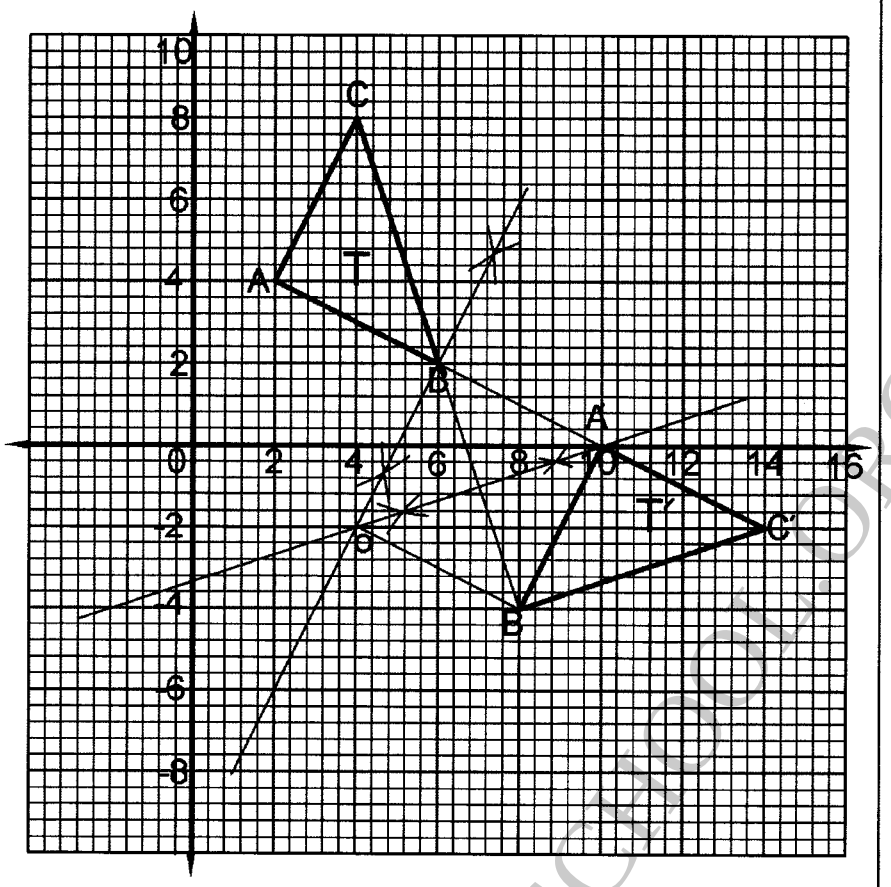
No.	Marking Scheme	Marks	Comments
1.	$\sqrt{\frac{0.0961}{4.0836-3.7112}} = \sqrt{0.2581}$ $= 0.5080$ Standard form $= 5.080 \times 10^{-1}$	M1 A1 B1 **3**	
2.	$189 = 3 \times 3 \times 3 \times 7$ $= 3^3 \times 7$ $\therefore p^3 \times q = 3^3 \times 7$ $p = 3, q = 7$	B1 B1 B1 **3**	
3.	Let the number of kg of maize be m and numberof kg of beans be b Buying price $= 20m + 60b$ Selling price $= 48(m+b)$ $\frac{60}{100} = \frac{48(m+b)-(20m+60b)}{20m+60b}$ $0.6 = \frac{28m-12b}{20m+60b}$ $\Rightarrow 12m + 36b = 28m - 12b$ $16m = 48b$ $\frac{m}{b} = \frac{3}{1}$ $\therefore$ Ratio m:b = 3:1	B1 M1 M1 A1 **4**	or equivalent

4.	$\angle BAC = 180° - (80° + 30°) = 70°$ $\frac{AC}{\sin 80°} = \frac{12}{\sin 70°}$ $= 12.58$ cm Area of $\Delta ABC = \frac{1}{2} \times 12 \times 12.58 \sin 30°$ $= 6 \times 12.58 \times 0.5$ $= 37.74$ cm^2	M1 M1 A1 **3**	or equivalent
5.	No. of sides of a hexagon = 6 Each exterior angle, $x = \frac{360}{6}$ $= 60°$ Size of each exterior angle $= 180° - 60°$ $= 120°$	B1 B1 **2**	
6.	No. Log $(1.654)^2$ 0.2185×2 0.4370 45.73 1.6602 0.56 $\bar{1}.7482$ or (-0.2518) 1.4084 $\bar{1}.0286$ or $(-0.9714) \times \frac{1}{3}$ $\bar{1}.6762$ or -0.3238 $= 0.4745$	M1 M1 M1 A1 **4**	All logs correct Correct squaring and multiplication Correct cube root and division

7.	(a) $\frac{2x}{3}+\frac{5y}{7}=1$ $14x+15y=21$ $y=\frac{-14}{15}x+\frac{21}{15}$ gradient of L $=\frac{15}{14}$ (b) Equation of L $\frac{y-11}{x-4}=\frac{15}{14}$ $y=\frac{15}{14}x+\frac{47}{7}$	B1 M1 A1 **3**	
8.	$\pi^c=180°$ $\frac{2\pi^c}{9}=\frac{180\times\frac{2\pi}{9}}{\pi}$ $=40°$	M1 A1 **2**	
9.	Area $=\frac{1}{2}\times$ b $\times$h Let h be the other shorter side $346.8=\frac{1}{2}\times 17\times$ h h = 40.8 longest side $=\sqrt{17^2+40.8^2}$ $=\sqrt{1953.64}$ = 44.2m	B1 M1 A1 **3**	

10.	$L_1 : y - x \leq 1$ $L_2 : x < 4$ $L_3 : x + 2y \geq 6$	B1 B1 B1 **3**	or equivalent or equivalent
11.	$\frac{840}{x} - \frac{840}{x+1} = 4$ $4x^2 + 4x - 840 = 0$ $x^2 + x - 210 = 0$ $(x+15)(x-14) = 0$ $x = 14$ No of seedling planted by Murimi per row $= \frac{840}{14}$ $= 60$	M1 M1 A1 B1 **4**	
12.	£500 000 to Ksh $= 50\,000 \times 130.10$ = Ksh 6 505 000 Balance after expenditure $= \frac{20}{100} \times 6\,505\,000$ = Ksh 1 301 000 Amount in Rands $= \frac{1\,301\,000}{9.58}$ = R 153 804	B1 B1 B1 **3**	

13.	Mid ordinates are | x | -3 | -1 | 1 | 3 | 5 | 7 | | y | 10 | 2 | 2 | 10 | 26 | 50 | Area = 2 (10 + 2 + 2 + 10 + 26 + 50) = 200	B1 M1 A1 **3**	
14.	$3\begin{pmatrix}4\\3\end{pmatrix}-2\begin{pmatrix}x\\y\end{pmatrix}+4\begin{pmatrix}-2\\-5\end{pmatrix}=\begin{pmatrix}10\\-19\end{pmatrix}$ $\begin{pmatrix}4-2x\\-11-2y\end{pmatrix}=\begin{pmatrix}10\\-19\end{pmatrix}$ 4 - 2x = 10 -2x = 6 x = -3 -11-2y = -19 -2y = -8 y = 4 $b=\begin{pmatrix}x\\y\end{pmatrix}=\begin{pmatrix}-3\\4\end{pmatrix}$	M1 M1 A1 **3**	Attempt to solve for x or y

15. (a)		B1	
(b)	Centre of rotation (4, -2) Angle of rotation – 90°	B1 B1 **4**	
16.	$3t + 2a = 9000$ $4t + a = 9500$ $a = 9500 - 4t$ $3t + 2(9500 - 4t) = 9000$ $-5t = -10000$ $t = 2000$ $\Rightarrow a = 9500 - 8000 = 1500$ Cost of hiring 2 technicians 5 artisans $= 2 \times 2000 + 5 \times 1500 =$ Ksh 11500	M1 A1 B1 **3**	Attempt to solve For both values of a and t

17.	(a) $2y-3x=6$ $3y+x=20$ $2y-3x=6$ $9y+3x=60$ $11y=60$ $y=6$ $x = 20-18$ $=2$ Coordinates of A are (2, 6) (b) $L_2 : 3y = -x + 20$ $y=-\frac{1}{3}x+20$ Gradient of perpendicular = 3 $\frac{y-6}{x-2}=3$ $y=3x-6+6$ $y=3x$ (c) Gradient of L_4 = gradient of L_1 $=\frac{3}{2}$ $\frac{y-3}{x+1}=\frac{3}{2}$ $2y-6=3x+3$ $2y-3x=9$ When $x=0$ $y=4.5$ When $y=0$ $x=-3$	M1 A1 B1 B1 M1 A1 M1 A1 B1 B1 **10**	Attempt to solve for $x=2$ $y=6$

18. (a)

Mass Kg	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79
Freq. (f)	2	4	8	9	11	7	5	3	1

B1 correct classes

B1 correct frequencies

(b) (i) Mean =

$$\frac{2 \times 37 + 4 \times 42 + 8 \times 47 + 9 \times 52 + 11 \times 57 + 7 \times 62 + 5 \times 67 + 3 \times 72 + 1 \times 77}{50}$$

M1 correct midpoints

$$= \frac{2775}{50}$$

M1

$$= 55.5 \text{ kg}$$

A1

(ii) C.f's 2,6,14,23,34,41,46,49,50

B1

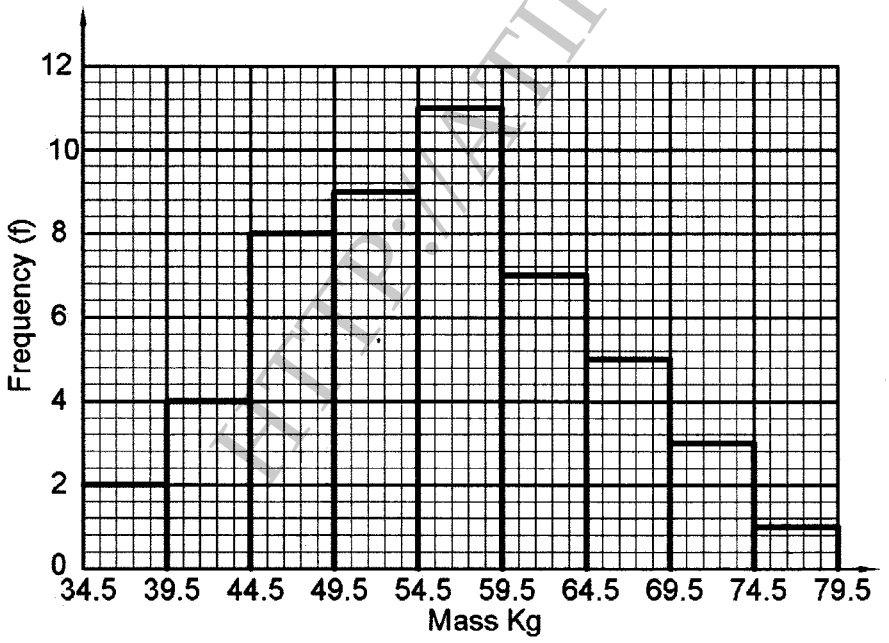
$$\text{Median} = 54.5 + \frac{2}{11} \times 5$$

M1

$= 55.4$ kg

A1

(c)



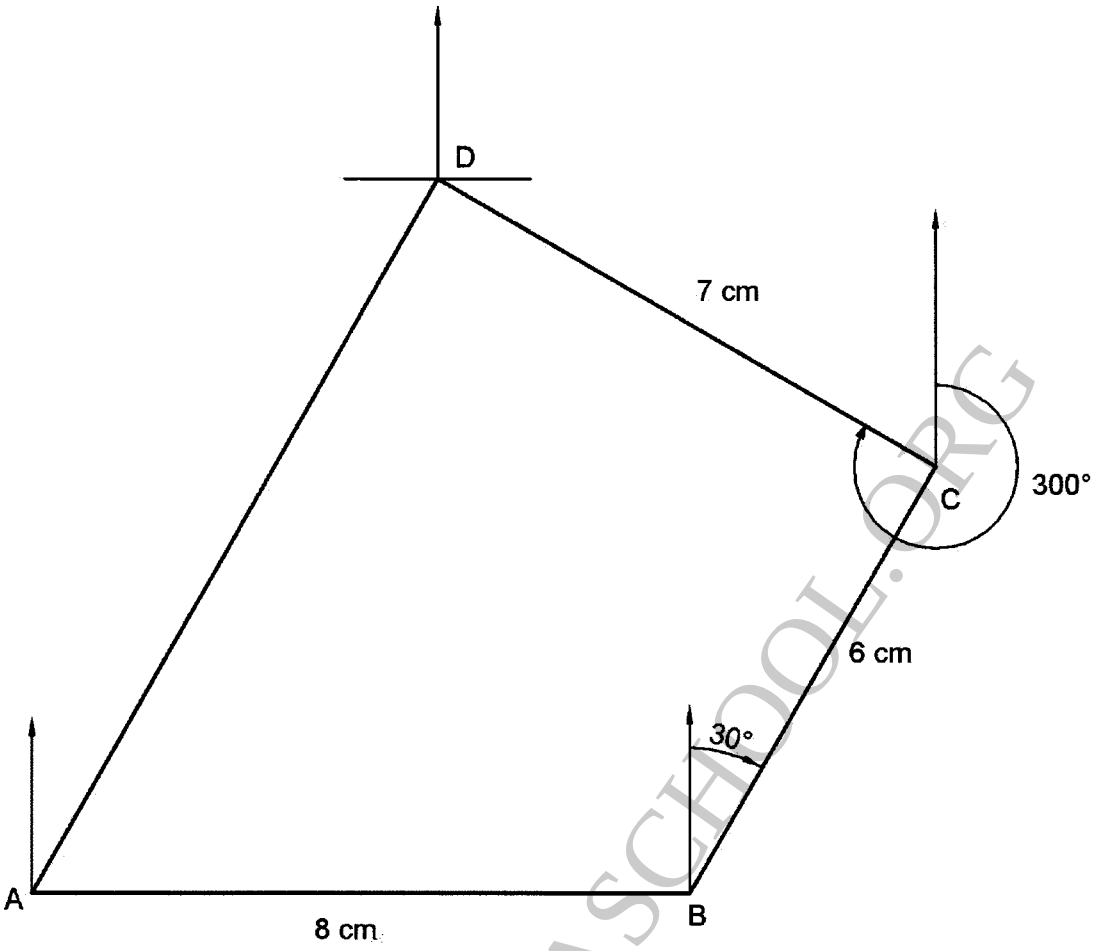
B2

10

19.	(a) Volume of Solid S Volume of conical part $= \frac{1}{3}\pi \times (0.9)^2 \times 1.5$ $= 1.3m^2$ Volume of cylindrical part $= \pi \times (0.9)^2 \times 3$ $= 7.6m^3$ Volume of pillar = 1.3 + 7.6 $= 8.9m^3$	M1 M1 M1 A1	
	(b) S.A. of Solid S Slant length of conical part $= \sqrt{(1.5)^2 + (0.9)^2} = 1.7$ S.A. of conical part $= \pi \times (0.9) \times 1.7$ $= 4.8m^2$ S.A. of cylindrical part $= 2\pi \times 0.9 \times 3 + \pi \times (0.9)^2$ $= 19.5m^2$ S.A. of Solid S = $19.5m^2 + 4.8m^2$ $= 24.3m^2$	B1 M1 M1 A1	
	(c) $(1.6)^2 \times L = 8.9m^3$ h = 3.5m	M1 A1	
		10	

20. (a)	Length DC = $\sqrt{3^2+5^2}$	M1	
	= 5.8cm	A1	
(b)	$\tan^{-1}\frac{5}{3} = 59.0°$	M1 A1	or equivalent
(c)	Size of angle ACB		
	$11^2 = 5^2+8^2-2 \times 5 \times 8\ Cos\ C$	M1	
	$\cos C = \frac{5^2+8^2-11^2}{2 \times 5 \times 8}$		
	= -0.4		
	$\angle ACB = Cos^{-1}(-0.4)$	M1	
	$\angle ACB = 113.6°$	A1	
(d)	Area of ABCD = Area of ACD + Area of ABC		
	$= \frac{1}{2} \times 3 \times 5 + \frac{1}{2} \times 5 \times 8$ Sin 113.6	M1 M1	
	$= 25.8cm^2$	A1	
		10	

21.



(a) Location of B	B1
Location of C	B1
Location of D	B1
Complete quadrilateral ABCD	B1
(b) Bearing of A from D = 180 + 30	
= 210°	B1
(c) Distance BD = 9.2 cm × 1 km	M1
= 9.2 km ± 0.1	A1
(d) Perimeter:	
AD = 10.0 ±0.1 km	B1

	Perimeter $= 10 + 8 + 6 + 7$ $= 31$ km	M1 A1 **10**	
22.	(a) $\begin{pmatrix} 3 & x \\ x+1 & 2 \end{pmatrix}\begin{pmatrix} 1 & 2 \\ 3 & 0 \end{pmatrix} = \begin{pmatrix} 3+3x & 6 \\ x+7 & 2x+2 \end{pmatrix}$ $\begin{pmatrix} 3+3x & 6 \\ x+7 & 2x+2 \end{pmatrix} = 0$ $\Rightarrow (3+3x)(2x+2) - 6(x+7) = 0$ $6x + 6x^2 + 6x - 6x - 36 = 0$ $6x^2 + 6x - 36 = 0$ $x^2 + x - 6 = 0$ $(x+3)(x-2) = 0$ $x = 2 \text{ or } -3$ (b) (i) $\begin{matrix} 3x + 5y = 165 \\ 2x + 4y = 120 \end{matrix}$ (ii) $\begin{pmatrix} 3 & 5 \\ 2 & 4 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 165 \\ 120 \end{pmatrix}$ Let $A = \begin{pmatrix} 3 & 5 \\ 2 & 4 \end{pmatrix}$ $A^{-1} = \frac{1}{2}\begin{pmatrix} 4 & -5 \\ -2 & 3 \end{pmatrix}$ $\frac{1}{2}\begin{pmatrix} 4 & -5 \\ -2 & 3 \end{pmatrix}\begin{pmatrix} 3 & 5 \\ 2 & 4 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \frac{1}{2}\begin{pmatrix} 4 & -5 \\ -2 & 3 \end{pmatrix}\begin{pmatrix} 165 \\ 120 \end{pmatrix}$ $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 30 \\ 15 \end{pmatrix}$ $\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 30 \\ 15 \end{pmatrix}$	M1 A1 M1 A1 B1 B1 M1	

	Cost of an exercise book = Ksh. 30 Cost of a pen = Ksh. 15 (iii) $2\times36\times30+36\times15$ = Ksh 2700	A1 M1 A1 **10**	
23.	(a) (i) Original price = $\frac{16200}{x}$ (ii) Price after discount = $\frac{16200}{x+3}$ (b) (i) $\frac{16200}{x}-60=\frac{16200}{x+3}$ $\frac{16200-60x}{x}=\frac{16200}{x+3}$ $(16200-60x)(x+3)=16200x$ $60x^2+180x-48600=0$ $x^2+3x-810=0$ $(x+30)(x-27)=0$ $x=27$ (ii) $\frac{16200}{27+3}$ = Ksh 540 (iii) $\frac{16200}{27}\times\frac{15}{100}$ = Ksh 90	B1 B1 M1 M1 M1 A1 M1 A1 M1 A1 **10**	

24.	(a) (i) When $x = 2$ $y = 2(2)^3 - \frac{9}{2}(2)^2 - 15(2) + 3$ $= -29$	M1 A1	
	(ii) $\frac{dy}{dx} = 6x^2 - 9x - 15$ at $x = 2$ $\frac{dy}{dx} = -9$	B1 B1	
	Equation of tangent; $\frac{y+29}{x-2} = -9$ $y = -9x + 18 - 29$ $y = -9x - 11$	M1 A1	
	(b) $\frac{dy}{dx} = 6x^2 - 9x - 15$ At turning point $6x^2 - 9x - 15 = 0$ $6x^2 + 6x - 15x - 15 = 0$ $(6x - 15)(x+1) = 0$ $x = -1$ or 2.5 at $x = -1$; $y = 11.5$ turning point = (-1, 11.5) at $x = 2.5$, $y = -31\frac{3}{8}$ turning point = $\left(2.5, -31\frac{3}{8}\right)$	M1 A1 B1 B1 **10**	Equating to zero