BURAMU II EXAMINATIONS

SEPTEMBER, 2021

MATHEMATICS PAPER 1

MARKING SCHEME.

(CONFIDENTIAL)

No	M. Scheme	Marks	Comments
1.	Num: $-18+2=-14$	M_1	
	Den: $18+-11=7$	M_1	
	$\frac{-14}{7}=-2.$	A_1	
		03	
2.	$2^{3y+3}-2^{3y+1}=48$	M_1	
	$2^{3y}(2^3-2)=48$	M_1	
	$2^{3y}=\frac{48}{6}$		
	$2^{3y}=2^3$		
	$3y=3$ $y=1$	A_1	
		03	
3.	(a) $100,000 \times 77.24$	M_1	
	$=7,724,000$	A_1	
	(b) $=\frac{1724,000}{122.23}$	M_1	
	$=£63,192$	A_1	
		04	

4. Num:
$12x^2 - 8ax + 9ax - 6a^2$ — M_1

Den: $(3x+2a)(3x-2a)$

$\frac{(3x-2a)(4x+3a)}{(3x+2a)(3x-2a)}$ — M_1

$= \frac{4x+3a}{3x+2a}$. — A_1

03

5. $V = \frac{1}{2} \times 4 \times 6 \times 20$ — B_1

$= 240$

$M = 240 \times 1.25$ — M_1

$= 300$ — A_1

03

6. Total time taken — M_1

$90 + 15 + 5 = 110$ min

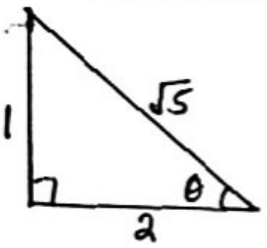
$= 1$hr 50min — M_1

1500h + 1hr 50min

$= 1650$ hrs — A_1

03

7. (a)



$\cos\theta = \frac{2}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$ · M1

$= \frac{2\sqrt{5}}{5}$ A1

(b) $\tan(90-\theta) = \frac{2}{1} = 2$. B1

03

8. $8 = 2^3$

$12 = 2^2 \times 3$

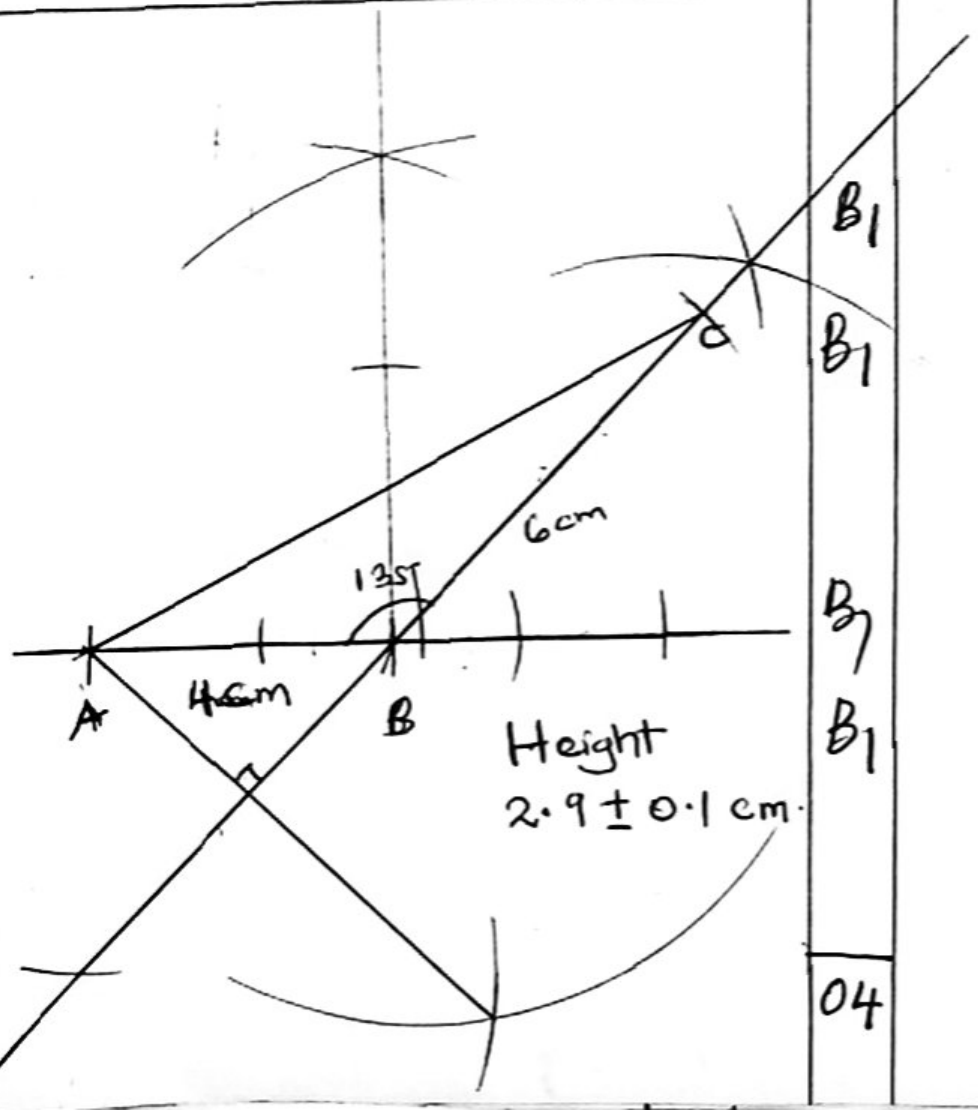
$14 = 2 \times 7$

$l.c.m = 2^3 \times 3 \times 7 = 168$ B1

$168 + 4 = 172$. B1

02

9.

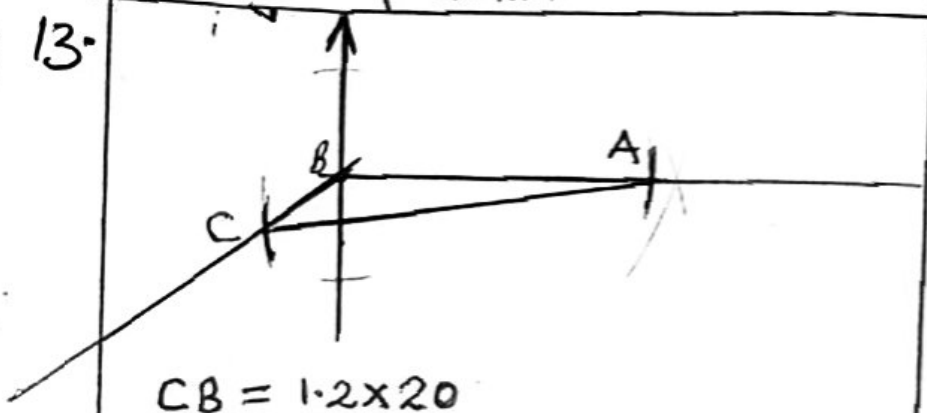


B1 B1 B1 B1

04

10.	c.f 6 15 23 34 37 39	B_1
	$7.5 + \left(\frac{19.5 - 15}{8}\right) 4$	M_1
	$= 9.75.$	A_1
		03
11.	$3x - 2 < 10 + x$	
	$2x < 12$	B_1
	$x < 6$	
	$10 + x < 2 - 5x$	B_1
	$-4x < -8$	
	$x > 2$	
	$2 < x < 6$	B_1
	Integral values 3, 4, 5	
		03
12. (a)	$\frac{1}{2} \times 12 \times 7 \sin 60$	M_1
	$= 36.37$	A_1
(b)	Shaded region.	
	$36.37 - \frac{60}{360} \times \frac{22}{7} \times 7^2$	M_1
	$= 10.72.$	A_1
		04

13. 1cm rep 20km



$CB = 1.2 \times 20$

$= 24\text{Km} \pm 2$.

B_1 Locating C.

B_1 Locating A

B_1 ~~Locating A~~ Form 24Km

03

14. $q = 3\begin{pmatrix}3\\2\end{pmatrix} - 2\begin{pmatrix}1\\-3\end{pmatrix} = \begin{pmatrix}7\\12\end{pmatrix}$ M1

$\sqrt{7^2 + 12^2} = \sqrt{193}$ M1

$= 13.89$. A1

03

15 $\frac{1}{0.325} = 1(0.3077 \times 10^1)$

$3.25 \times 10^{-1} = 3.077$. B1

$(125 \times 10^{-6})^{\frac{1}{3}} = 5 \times 10^{-2}$ M1

0.05×3.077

$= 0.15385$. A1

03

16 $125 + 140 + 160 + 145n - 435 = 180n - 360$ M1

$350 = 35n$

$n = 10$ A1

$180(10-2) = 1440°$ B1

03

17 a) i $\frac{16200}{y}$ B1

ii) $\frac{16200}{y+3}$ or $\frac{16200}{y} - 60$ B1

b i) $\frac{16200}{y} - \frac{16200}{y+3} = 60$ M1

$60y^2 + 180y - 48600 = 0$ M1

$y^2 + 3y - 810 = 0$

$(y+30)(y-27) = 0$ M1

$y = -30$ or 27

$y = 27$ only A1

ii) $\frac{16200}{30}$ M1

$= 540$ A1

$\frac{15}{100} \times \frac{16200}{27}$ M1

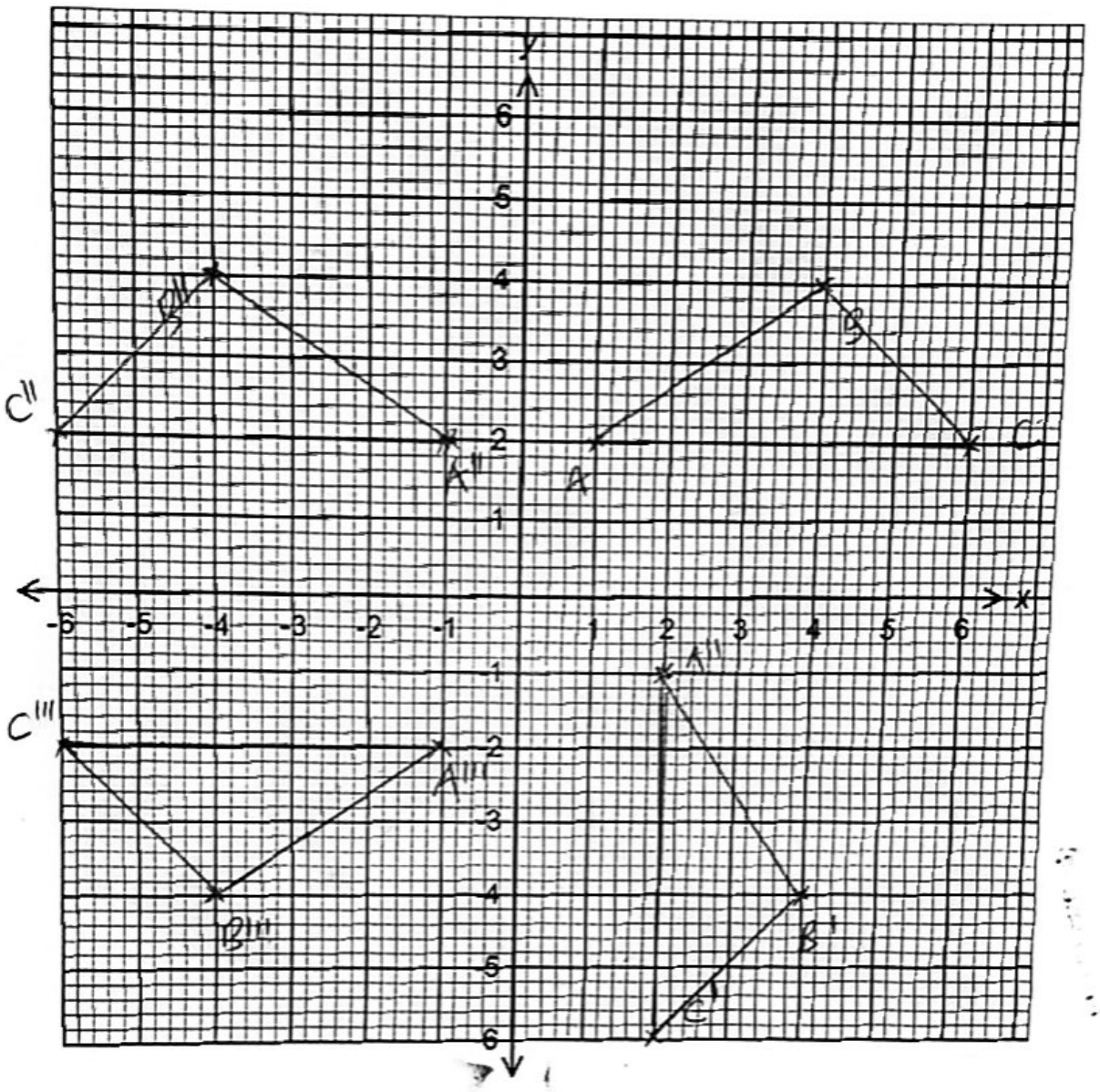
$=$ Ksh. 90 A1

10

19	i) $1\frac{1}{2} \times 80$	M1	
	$= 120\text{km}$	A1	
	ii) $120 - 50$	M1	
	$= 40$	A1	
	iii) Time taken $= \frac{120}{40} =$	M1	
	$= 3$ Hours.	A1	
	$8 \cdot 30\text{ am} + 3 = 11 \cdot 30\text{ am}$	B1	
	iv) $3 \times 120 = 360\text{km}$	M1A1	
	$600 - 360 = 240\text{km}$	B1	
		10	

20 A triangle has vertices A (1, 2), B (4, 4) and C (6, 2).

(a) Draw triangle ABC on the grid provided. (1mark)



(b) Construct the image triangle A'B'C' image of triangle ABC under a rotation of 90° clockwise about the origin. (2marks)

(c) Draw triangle A''B''C'' the image of triangle A'B'C' under a reflection in line $y = x$, state the coordinates of A''B''C'' (3 marks)

Coordinates $A''(-1,2)$ $B''(-4,4)$ $C''(-6,2)$ B_1

(b) Draw triangle A'''B'''C''' the image of triangle A''B''C'' under a reflection in the line $y = 0$ and state the coordinates of its vertices. (2marks)

Coordinates $A'''(-1,-2)$ $B'''(-4,-4)$ $C'''(-6,-2)$

(c) Describe a single transformation that maps triangle A''B''C'' onto triangle ABC. (2 marks)

Single transformation Reflection in the line $x=0$ (y axis)

21. a. $y = x^2 + x + 9$

x	-2	-1	0	1	2	3
y	11	9	9	11	15	21

$\frac{1}{2} \times 1 \left[(11+21) + 2(9+9+11+15) \right]$

$= 0.5(32 + 88) = 60$

(b) $\int_{-2}^{0} (x^2+x+9)\,dx + \int_{0}^{3} (x^2+x+9)\,dx$

$\frac{x^3}{3} + \frac{x^2}{2} + 9x + C \Big|_{-2}^{0} + \frac{x^3}{3} + \frac{x^2}{2} + 9x + C \Big|_{0}^{3}$

$\left(-\left(\frac{-8}{3} + \frac{4}{2} + 9(-2)\right)\right)$ $\left(\frac{3^3}{3} + \frac{3^2}{2} + 9(3) - 0\right)$

$= +18\frac{2}{3}$. $= 9 + 4\frac{1}{2} + 27$

$= 40.5$

$18\frac{2}{3} + 40\frac{1}{2} = 59\frac{1}{6}$.

(c) $\frac{59\frac{1}{6} - 59}{59\frac{1}{6}} \times 100\% = 1\frac{29}{71}\%$

$= 1.41\%$

22. (a) Length of CD

$CD^2 = 15^2 + 12^2 - 2\times15\times12\cos30$ M1 M1

$= 225 + 144 - 360\cos30$

$= 57.23$

$= 7.57$. A1

(b) Length of AB.

$\frac{AB}{\sin30} = \frac{15}{\sin120}$ M1 m1

$AB = \frac{15\sin30}{\sin120} = 8.66$ A1

(c) Area of BCD

$s = 0.5(8.66+3.34+7.57) =$ m1

$= 9.785$

$A = \sqrt{9.785(6.445)(1.125)(2.215)}$ A1

$= 12.54\ cm^2$

(d) Size of $\angle BDC$

$3.34^2 = 7.57^2 + 8.66^2 - 2\times7.57\times8.66\cos D$ m1

$\cos D = \frac{53.3 + 75.0 - 11.16}{131.11} = 0.8934$ A1

$= 26.70°$

23. a) Det = $150 - 96 = 54$

$$\frac{1}{54}\begin{pmatrix}30 & -24\\ -4 & 5\end{pmatrix}$$ B1

$$Q^{-1} = \begin{pmatrix}\frac{5}{9} & -\frac{4}{9}\\ -\frac{2}{27} & \frac{5}{24}\end{pmatrix}$$ B1 — Must be a matrix

b) (i) $\begin{pmatrix}5 & 24\\ 4 & 30\end{pmatrix}\begin{pmatrix}b\\ g\end{pmatrix} = \begin{pmatrix}96\,000\\ 93\,000\end{pmatrix}$ B1

ii

$$\begin{pmatrix}\frac{5}{9} & -\frac{4}{9}\\ -\frac{2}{27} & \frac{5}{24}\end{pmatrix}\begin{pmatrix}5 & 24\\ 4 & 30\end{pmatrix}\begin{pmatrix}b\\ g\end{pmatrix} = \begin{pmatrix}\frac{5}{9} & -\frac{4}{9}\\ -\frac{2}{27} & \frac{5}{24}\end{pmatrix}\begin{pmatrix}96000\\ 93000\end{pmatrix}$$ M1 — Pre-multiply.

$$\begin{pmatrix}1 & 0\\ 0 & 1\end{pmatrix}\begin{pmatrix}b\\ g\end{pmatrix} = \begin{pmatrix}12\,000\\ 1500\end{pmatrix}$$ M1

M1

$$\begin{pmatrix}b\\ g\end{pmatrix} = \begin{pmatrix}12,000\\ 1,500\end{pmatrix}$$

A1

A bull costs ksh. 12,000
A goat costs ksh. 1,500

c) $K = \left(\frac{30}{100} \times 12000\right)5 + \left(\frac{40}{100} \times 1500\right)24$ M1

$= 32,400$

$T = 4 \times 12\,000 \times \frac{25}{100} + \frac{50}{100} \times 1500 \times 30$ M1

$= 34,500$

A1

Teso by sh. 2100.

10

24. (a) Y- intercept $x=0$

$y = 0+0-0+2$

$= 2.$ B_1

(b)(i) Turning points

$x^2+2x-3=0$ M_1

$(x^2-x)+(3x-3)=0$

$x(x-1)+3(x-1)=0$

$(x+3)(x-1)=0$ A_1

$x=-3$ and $x=1$

when $x=-3$, $y=11$ B_1

$(-3, 11)$.

when $x=1$ $y=\frac{1}{3}$ B_1

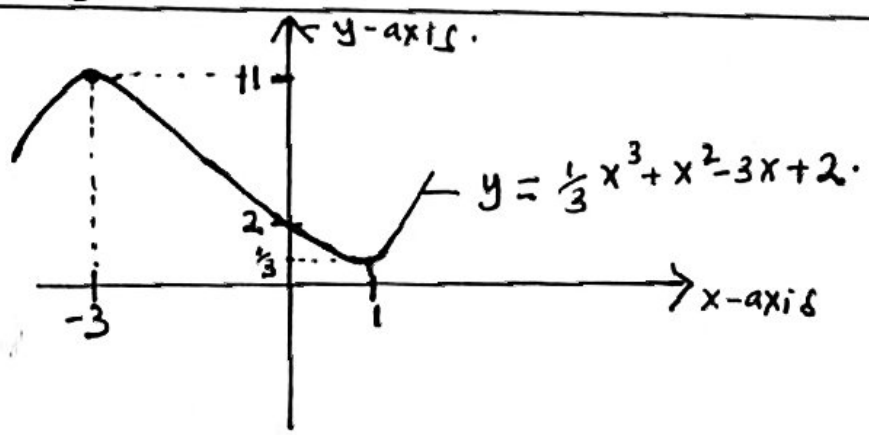
$(1, \frac{1}{3})$.

(ii) $\frac{d^2y}{dx^2} = 2x+2$ $2(-3)+2=-4$

$(-3, 11)$ is a maximum point B_1

$(2\times1)+2=4.$

$(1, \frac{1}{3})$ is a minimum point. B_1



B_1 B_1 B_1

10

18 (a) Gradient $= \frac{3+3}{1+6} = \frac{6}{7}$

$\frac{6}{7} = \frac{y-3}{x-1}$ M1

$7y - 6x = 15$ A1

b) $\frac{y+3}{x-2} = \frac{6}{7}$ M1

$y = \frac{6}{7}x - \frac{33}{7}$ A1

(c) $L_3 = \frac{-7}{6} = \frac{y-3}{x-2}$ M1

$6y + 7x = 32.$ A1

(d) $7y - 6x = 15$
$6y + 17x = 32$ B1

$\begin{pmatrix} 7 & -6 \\ 6 & 7 \end{pmatrix}\begin{pmatrix} y \\ x \end{pmatrix} = \begin{pmatrix} 15 \\ 32 \end{pmatrix}$ M1

$\frac{1}{85}\begin{pmatrix} 7 & 6 \\ -6 & 7 \end{pmatrix}\begin{pmatrix} 7 & -6 \\ 6 & 7 \end{pmatrix}\begin{pmatrix} y \\ x \end{pmatrix} = \frac{1}{85}\begin{pmatrix} 7 & 6 \\ -6 & 7 \end{pmatrix}\begin{pmatrix} 15 \\ 32 \end{pmatrix}$ M1

$\begin{pmatrix} y \\ x \end{pmatrix} = \frac{1}{85}\begin{pmatrix} 297 \\ 134 \end{pmatrix}$

$y = 3.49$
$x = 1.58$
$R\ (1.58, 3.49)$ A1

10