BUKAKA CLUSTER EXAMINATIONS

MARKING SCHEME: F4 END OF TERM 1 2025

MATHEMATICS PP 2.

1.

No	Std form	Log
45.3	4.53×10^{1}	T. 6561
0.00697	6.97×10^{-1}	$^{-3}.8432 +$
		T.4993
0.534	5.34×10^{-1}	T. 7275
		T.7718
		T.7718
		3
		- 3 + 2.7718
		3
0.8393	8.393×10^{-1}	T.9239

B 1 (All correct logs)

B1(addition and subtraction)

B1 (cube root)

A1

2. a) $1 - 6 (^{1}/_{2} x)^{1} + 15 (^{1}/_{2} x)^{2} - 20 (^{1}/_{2} x)^{3}$ B1

$1 - 3x + {}^{15}/_{14} x^{2} - {}^{5}/_{2} x^{3}$ B1

b) $0.98^{6} = (1 - 0.02)^{6}$

$-{}^{1}/_{2} x = -0.02$

$X = 0.04$ B1

$1 - 3 (0.04) + {}^{15}/_{4} (0.04)^{2} - 5 {}^{5}/_{2} (0.04)^{3}$

$1 - 0.12 + 0.006 - 0.0016$

0.88584 B 1

3. $\frac{\sqrt{3} - 2\sqrt{2}}{3\sqrt{2} + \sqrt{3}} \quad \frac{(3\sqrt{2} - \sqrt{3})}{(3\sqrt{2} - \sqrt{3})}$ m 1

$$\frac{3\sqrt{6} - 3 - 12 + 2\sqrt{6}}{18 - 3}$$

$$\frac{\sqrt{6} - 15}{15} = \frac{1}{15}\sqrt{6} - 1$$ m1

a = $\frac{1}{15}$ b = 6 c = -1 A1

4. $6y = 4.8 \times 5$ M1

$Y = 4$

$OT^2 = 18 \times 8$ M1

$OT = 12$ A1

5.

$$D = \begin{pmatrix} 2 & 3 \\ -5 & 0 \end{pmatrix} \begin{pmatrix} 1 & -4 \\ 5 & 1 \end{pmatrix} - \begin{pmatrix} 3 & -1 \\ 4 & 2 \end{pmatrix}$$

$$\begin{pmatrix} 17 & -5 \\ -5 & 20 \end{pmatrix} - \begin{pmatrix} 3 & -1 \\ 4 & 2 \end{pmatrix} = \begin{pmatrix} 14 & -4 \\ -9 & 18 \end{pmatrix}$$

det = (18 x 14) – (-9 x -4) = 216

inverse = $\frac{1}{216}\begin{pmatrix} 18 & 4 \\ 9 & 14 \end{pmatrix}$

6.

$$\begin{pmatrix} 4 \\ -7 \\ 3 \end{pmatrix} - \begin{pmatrix} 2 \\ 5 \\ 3 \end{pmatrix} = \begin{pmatrix} 2 \\ -12 \\ 0 \end{pmatrix}$$

AB =

AB = 2i – 12j + Ok

$$|AB| = \sqrt{2^2 + (-12)^2 + 0^2}$$

$$= \sqrt{4 + 144}$$

= 148

= 12.17

7.

1kg of Tamu mixed with x kg of Chungu

(70 x 1) + (64 x x) = 68 x (1 + x)

70 + 64x = 68 + 68x

M1 eqn to find x

M1

$x = \frac{1}{2}$

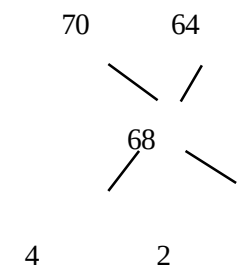
Tamu: Chungu = 1: x = $1:\frac{1}{2}$

= 2:1

A1

3

Alternative Formula



8

- Actual volume = $^1/_3$x 3.142 x 21^2 x 14.0 = 6466.236
- Minimum volume = $^1/_3$ x 3.142 x 20.5^2x 13.95 = 6139.9786
- Maximum volume = $^1/_3$x 3.142 x 21.5^2 x 14.05 = 6802.024 **M1**
- Absolute error = $\frac{\text{max–min}}{2} = \frac{6802.024–6139.9786}{2} = 331.0227$ **M1**

% error = $\frac{\text{Absolute error}}{\text{actual volume}} x100 = \frac{331.0227}{6466.236} x100 = 5.1192\%$ **M1**

3

9	$\text{Log}_2 \frac{x+7}{x-7} = Log\ 8_2$ **M1(for correct $Log_2 8$)** Dropping the logs $\frac{x+7}{x-7} = 8$ **B1(for dropping logs)** $x + 7 = 8x - 56$ $63 = 7x$

	X=9 **A1**	
	Total 3 mks	
10	$A = 450{,}000(1 + \frac{24}{100} x \frac{1}{4})^{18}$ **M(for correct substitution)** A= 1,284,453 **A1**	
	Total 2 mks	
11	$p^2d^2 = \frac{d^4 - hk}{Bd^2}$ $Bp^2d^4 = d^4 - hk$ $hk = d^4 - Bp^2d^4$ $d^4 = \frac{hk}{1 - Bp^2}$ $d = \sqrt[4]{\frac{hk}{1 - Bp^2}}$	M1 M1 A1
12	$\frac{2x - 1}{6} = \frac{x + 1}{3x}$ $3x(2x - 1) = 6(x + 1)$ $6x^2 - 3x - 6x - 6 = 0 \Longrightarrow 6x^2 - 9x - 6 = 0$ $x = \frac{-(-9) \pm \sqrt{(-9)^2 - (4 \times 6 \times -6)}}{2 \times 6}$ $x = \frac{9 \pm 15}{12}$ $x = \frac{24}{12} = 2 \; or \; x = \frac{-6}{12} = -0.5$	M1 M1 A1 Both values
13	$L_1 \Longrightarrow 2y + x \leq 6$ $L_2 \Longrightarrow y \leq x - 2$ $L_3 \Longrightarrow y > 0$	B1 B1 B1
14	$L_4 \Longrightarrow x > 0$ Let AC = x $x^2 = 6^2 + 11^2 - (2 \times 6 \times 11 \times \cos 110°)$ $x^2 = 36 + 121 + 45.15 = 202.15$ $x = \sqrt{202.15} = 14.22 \; cm$	B1 M1 M1 A1

15.	$C\left(\frac{6-2}{2}, \frac{6-2}{2}\right)$ C (2,2) $r = \sqrt{(2-0)^2 + (2-6)^2}$ $= \sqrt{20}$ or $2\sqrt{5}$ $(x-2)^2 + (y-2)^2 = 20$ $x^2 - 4x + 4 + y^2 - 4y + 4 = 20$ $x^2 + y^2 - 4x - 4y - 12 = 0$	B1 M1 A1	Centre and radius given. Expression of eqn of a circle Accuracy in the required format
16.	$ar^3 - 48 \quad ar^6 - 384$ $\frac{ar^6}{ar^3} = \frac{384}{48} \quad r^3 = 8 \quad r = 2$ $8a = 48 \quad a = 6 \quad \therefore \quad 6 \times 2^8 = 1536$	M1 M1 A1	
17.	a) Basic house taxable income 35750 12500 48250 b) 9860 x $\frac{10}{100}$ = 986 9860 X $\frac{15}{100}$ = 1479 9860 X $\frac{20}{100}$ = 1972 9860 X $\frac{25}{100}$ = 2465 8810 X $\frac{30}{100} = \frac{2643}{9545}$ 9545 – 1062 = 8483 c) 48250 – (8483 + 715 + 1352 + 400) 48250 – 10923	M 1 A 1 M1 M1 A1 M 1 M1	

	37327	A1

18.

	t	x	t	xt	Xt^2	
45-49	3	47	-15	-45	675	B1
50-54	9	52	-10	-90	900	B1
55-59	13	57	-5	-65	325	
60-64	15	62	0	0	0	
65-69	5	67	5	25	125	
70-74	4	72	10	40	400	B1
75-79	1	77	15	15	225	
					2650	B1

a) Mean = $62 + \frac{-120}{50} = 59.6$ M1

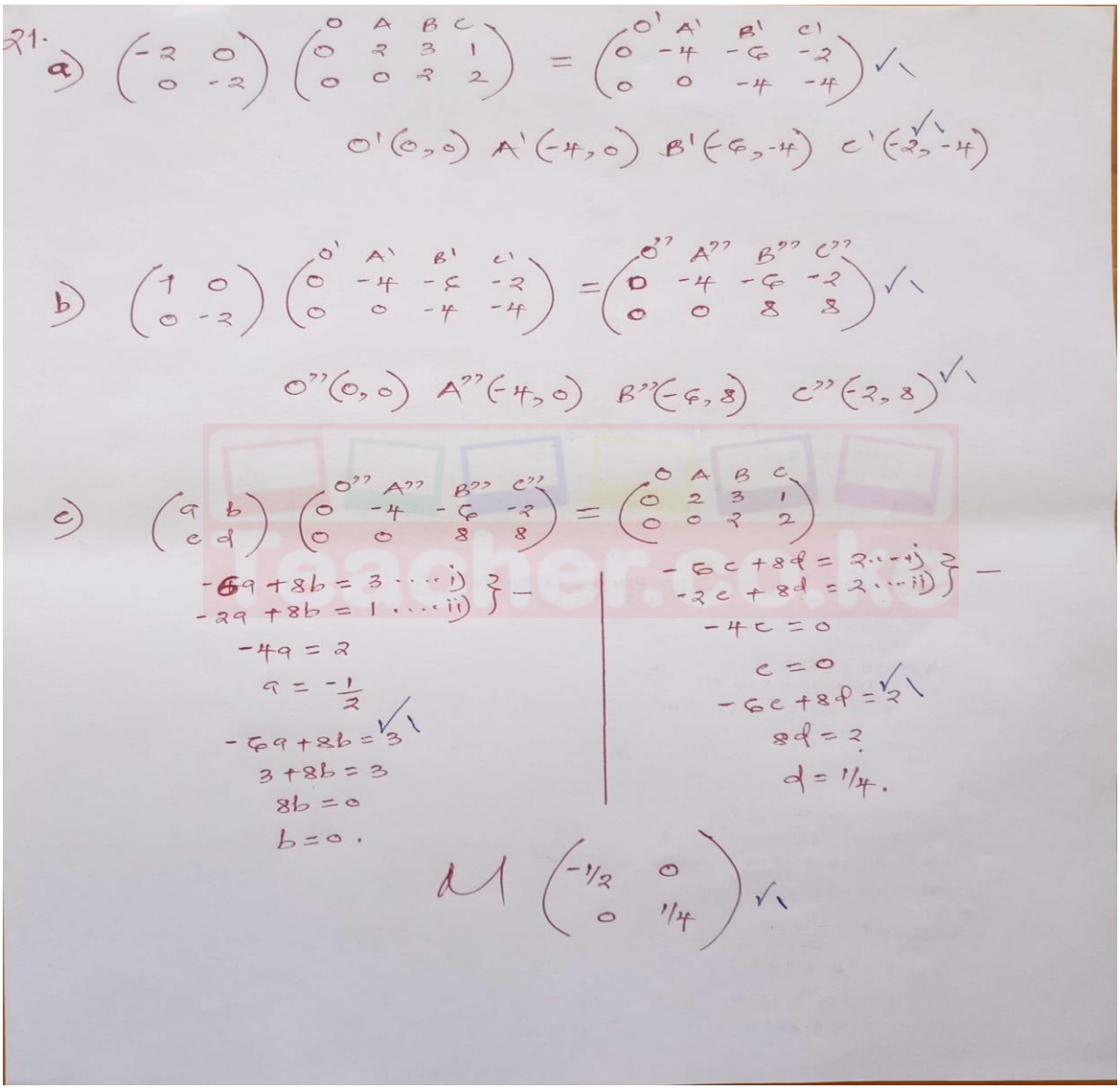
A1

b) Variance $\frac{2650}{50} - (\frac{-120}{50})^2 = 47.25$ M1

A1

c) Standard deviation $\sqrt{47.25} = 6.873$ M1

A1



23. a) i) P(B)

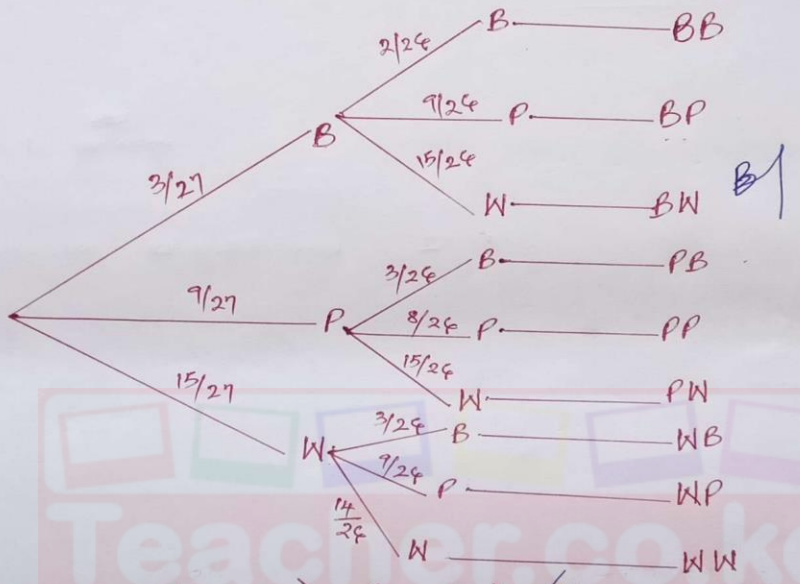
$3/27 = 1/9$ ✓1

ii) P(P) or P(W)

$9/27 + 15/27 = 24/27$ ✓1

$= 8/9$ ✓1

b)



B1

i) $P(BB) = (3/27 \times 2/26) + (3/27 \times 9/26) + (3/27 \times 15/26) + (9/27 \times 3/26) + (15/27 \times 3/26)$

$\frac{1}{117} + \frac{1}{26} + \frac{5}{78} + \frac{1}{26} + \frac{5}{78}$ ✓1 $= \frac{25}{117}$ ✓1

ii) P(BB) or P(PP) or P(WW)

$= (3/27 \times 2/26) + (9/27 \times 8/26) + (15/27 \times 14/26)$ ✓1

$= \frac{1}{117} + \frac{4}{39} + \frac{35}{117}$ ✓1

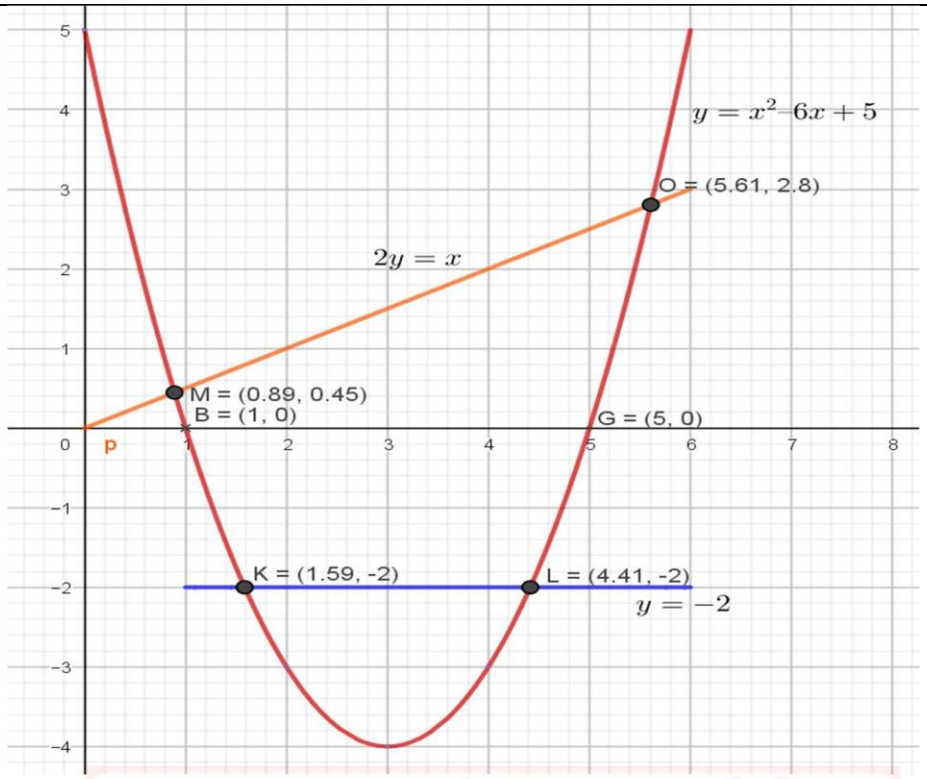
$= \frac{16}{39}$ ✓1

21	(a) (i) Fraction filled in 1 hr by PtQ $= \frac{2}{9} + \frac{1}{3} = \frac{5}{9}$ Time taken to fill tank = $\frac{9}{5} = 1\frac{4}{5}$ hrs (ii) Fraction filled in 1 hr by P, Q & r $= \frac{5}{9} - \frac{1}{2} = \frac{1}{18}$ Time taken to fill = $\frac{18}{1}$ = 18 hours (b) (i) Fraction filled by 9.00 a.m P → $\frac{2}{9}$ x 1 hr = $\frac{2}{9}$ Q → $\frac{1}{3}$ x $\frac{1}{4}$hrs = $\frac{1}{12}$ Both P and Q → $\frac{2}{9} + \frac{1}{12}$ $= \frac{11}{36}$ (ii) Fraction to be filled = $\frac{25}{36}$ Time taken = $\frac{25}{36}$ x 18 = $12\frac{1}{2}$ hrs Time taken for taken to fill up = 0900 1230 2130 hrs or 9.30 p.m	M1 A1 M1 A1 M1 M1 A1 M1 A1
22	a) Table of values	

x	0	1	2	3	4	5	6
x^2	0	1	4	9	16	25	36
$-6x$	0	−6	−12	−18	−24	−30	−36
y	5	0	−3	−4	−3	0	5

B1

B1



B1 - axes & scale

B1 - plotting

B1 - curve

b) (i) $x = 1 \text{ or } 5$ B1

(ii) Draw a graph of $y = -2$ B1

$x = 1.6 \text{ or } x = 4.4$ B1

(iii) Draw graph of $2y = x$ B1

$x = 0.9 \text{ or } x = 5.6$ B1

23.	a) $P\alpha Q^2, \frac{1}{Q}$ $P = kQ^2 + \frac{m}{Q}$ (10.5=6.25k+0.4m)0.25 (30.75=16k+0.25m)0.4 $\begin{cases} 2.625 = 1.5625k + 0.1m \\ 12.3 = 6.4k + 0.1m \end{cases}$ $\frac{-9.675k}{-4.8375} = \frac{-4.8375}{-4.8375}$ k = 2 12.3 = 12.8 +0.1m m = -5 $P = 2Q^2 - \frac{5}{Q}$	M1 M1 A1 B1	Attempt to come up with simultaneous eqn. Attempt to solve simultaneous eqn. Accurate value of k Equation connecting the variables.
		04	
	b) $P = 2(1.5)^2 - \frac{5}{1.5}$ $= 1\frac{1}{6}$	M1 A1	Substitution Accuracy, accept decimal point to 4s.f
		02	
	$Q\alpha\sqrt{R}$ $Q = k\sqrt{R}$ c) i) $3.04 = k\sqrt{3.61}$ $k = 1.6$ $Q = 1.6\sqrt{R}$	M1 A1	Substitution Accuracy.
		02	
	ii) $P = 2\left(1.6\sqrt{R}\right)^2 - \frac{5}{1.6\sqrt{R}}$ $= 5.12R - \frac{3.125}{\sqrt{R}}$	M1 A1	Substitution Accuracy.
		02	
		10	

24.	a) i) $\mathbf{XB} = \begin{pmatrix}18\\3\end{pmatrix} - \begin{pmatrix}0\\6\end{pmatrix} = \begin{pmatrix}18\\-3\end{pmatrix}$	B1	Correct vector
	ii) $\mathbf{ZA} = \begin{pmatrix}6\\10\end{pmatrix} - \begin{pmatrix}21\\0\end{pmatrix} = \begin{pmatrix}-15\\10\end{pmatrix}$	B1	Vector correct
	b) i) $\mathbf{OM} = \mathbf{OZ} + \mathbf{ZM}$		
	$= \begin{pmatrix}21\\0\end{pmatrix} + k\begin{pmatrix}-15\\10\end{pmatrix}$	M1	Attempt to express in terms of k
	$= \begin{pmatrix}21-15k\\10k\end{pmatrix}$		
	$\mathbf{OM} = \mathbf{OX} + \mathbf{XM}$		
	$= \begin{pmatrix}0\\6\end{pmatrix} + m\begin{pmatrix}18\\-3\end{pmatrix}$	M1	Attempt to express in terms of m
	$= \begin{pmatrix}18\\6-3m\end{pmatrix}$		
	$\begin{pmatrix}21-15k\\10k\end{pmatrix} = \begin{pmatrix}18\\6-3m\end{pmatrix}$	M1	Connecting the eqns.
	$21 - 15k = 18m$		
	$10k = 6 - 3m$	M1	Attempt to solve simultaneous eqn
	$18m + 15k = 21$		
	$3m + 10k = 6$		
	$18m + 15k = 21$		
	$18m + 60k = 36$	A1	Values of k and m
	$-45k = -15$		
	$k = \frac{1}{3}$		
	$m = \frac{8}{9}$	M1	Substitution
	ii) $\mathbf{OM} = \begin{pmatrix}21-15\left(\frac{1}{3}\right)\\10\left(\frac{1}{3}\right)\end{pmatrix}$	A1	Accuracy
	$= \begin{pmatrix}16,3\frac{1}{3}\end{pmatrix}$	B1	Correct ratio.
	iii) 3 : -2	10	