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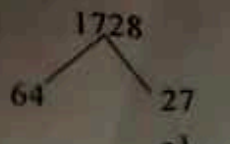
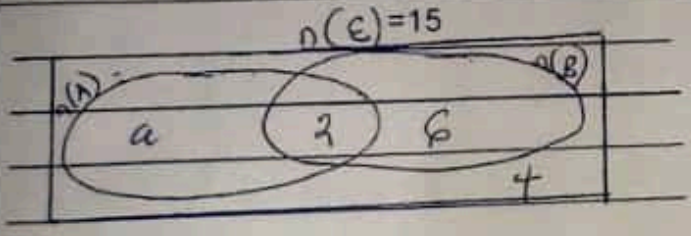
WAKISSHA JOINT MOCK EXAMINATIONS
MARKING GUIDE
Uganda Certificate of Education
MATHEMATICS 456/2
July/August 2023

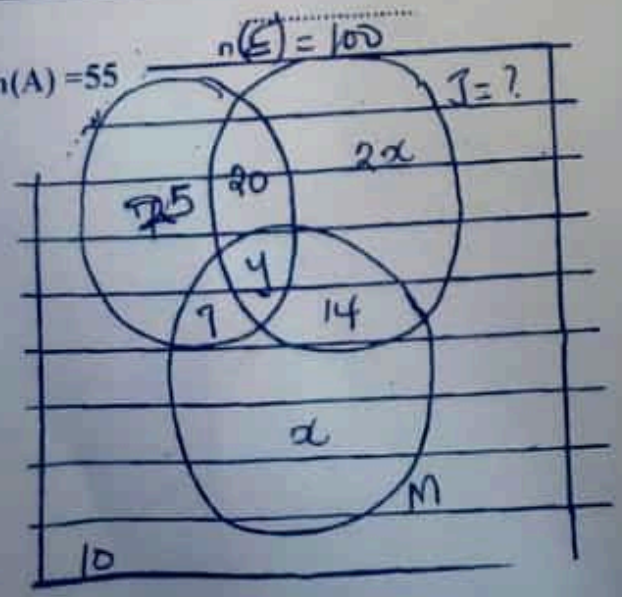
SECTION A (40 MARKS)

No.	Solution	Marks	Comments
1.	 Alternative $1728 = 2^6 \times 3^3$ $\sqrt[3]{2^6 \times 3^3} = 2^2 \times 3^1$ $= 12$	M_1 A_1 M_1 A_1 04	Prime factorizing 1728 or use of ladder method. Product (index form) ~~Taking square root & it's simplification.~~ → Cube root
		04	
2.	 $a + 2 + 6 + 4 = 15$ $a = 3$ $n(A \cup B) = 15 - 4 = 11$ $n(A) = 3 + 2 = 5$	M_1 ~~A_1~~ ~~B_1~~ ~~B_1~~ M_1 A_1 04	Correct subst For ~~equating~~ For C's 3 ~~C's~~ 11 C's 5 M_1 for Correct subst
3.	$f^{-1}(x) = \frac{4x}{9+x}$ Let $f^{-1}(x)$ be y $y = \frac{4x}{9+x}$ $y(9+x) = 4x$ $9y = 4x - xy$ $9y = x(4 - y)$	M_1	For manuplating

	$x = \frac{9y}{4-y}$ $f(x) = \frac{9x}{4-x}$ the denominator = 0 for unde fined $4 - x = 0$ $x = 4$	A_1 M_1 A_1	correct ... Equaling ...
		04	
4.	Time $\Rightarrow \frac{90}{15} = 2hrs$ Total time = $2+1\frac{1}{2}$ Average speed = $\frac{\text{Tot. distance}}{\text{Tot. Time}}$ $= \frac{90+150}{3\frac{1}{2}} = \frac{240}{3.5}$ $= 53.\bar{3} km/h^{-1}$ 68.5714 km/hr or $68\frac{4}{7}$ km/hr	~~B_1~~ M_1 ~~B_1~~ M_1 M_1 A_1	Total time ~~for time 1st journey~~ ~~time added~~ Total for simplificat...
		04	
5.	$\overline{OP} = \begin{pmatrix} a \\ -5 \end{pmatrix}$, $\overline{OQ} = \begin{pmatrix} 6 \\ c \end{pmatrix}$, $\overline{PQ} = \begin{pmatrix} -1 \\ 13 \end{pmatrix}$ $\overline{OP} = \overline{OQ} - \overline{OP}$ $\begin{pmatrix} -1 \\ 13 \end{pmatrix} = \begin{pmatrix} 6 \\ c \end{pmatrix} - \begin{pmatrix} a \\ -5 \end{pmatrix}$ $-1 = 6 - a$ $-1 - 6 = -a$ $a = 7$ $13 = c + 5$ $c = 8$ $2\lvert\overline{OQ}\rvert = 2\sqrt{6^2 + 8^2}$ 2x10 = 20 units	M_1 A_1 A_1 ~~A_1~~ B_1	Correct substn. ~~equating vectors~~ C's 7 C's 8 C's 20 Acc $\begin{pmatrix} 12 \\ 16 \end{pmatrix}$
		04	
6.	$0.12m = (0.12 \times 100)cm$ $= 12cm$ $v.s.f. = \frac{81}{3} = 27$ $l.s.f. = \sqrt[3]{27} = 3$ $\frac{h}{12} = \frac{1}{3}$ $h = 4cm$	~~B_1~~ M_1 ~~B_1~~ M_1 ~~A_1~~ M_1 A_1	for v.s.f for L.s.f. for equating ratios for 4 Acc
		04	

7.	$\frac{6000,000}{12}$ $= 500,000$ $tax = \frac{20}{100} \times 500,000$ $= 100,000$ $Net = 500,000 - 100,000$ $400,000$	B_1 M_1 B_1 M_1 A_1	~~converting~~ Gross month ~~simplifying~~ for tax ~~simplifying~~ Subtraction for net fee
		04	
8.	$\log \frac{6^2}{3} - \log 1.2$ $\log \frac{36}{3} - \log 1.2$ $\log \frac{12}{1.2}$ $\log 12 \div \frac{12}{10}$ $\log_{10}^{10} = 1$	B_1 M_1 M_1 A_1	~~simplifying~~ $6^2/36$ ~~Squaring~~ Law of log ~~Dividing~~ simplification C's 1
		04	
9.	$t = \frac{10}{x}$, $t = \frac{10}{x+1}$ $\frac{10}{x} + \frac{30}{60} = \frac{10}{x+1}$ $\frac{20-x}{2x} = \frac{10}{x+1}$ $20x + 20 - x^2 - x = 20x$ $x^2 + x - 20 = 0$ $(x-4)(x+5) = 0$ Cult $x = 4$ or $x = -5$ $\therefore x = 4$km/hr	B_1 ~~M_1~~ M_1 M_1 A_1	for time ~~and for equating~~ t_1 and t_2 ~~for solving~~ equating Solving for ~~cared~~ answer 4km/hr
		04	
10.	$P \propto \frac{1}{q^2}$ $P = \frac{k}{q^2}$ $5 = \frac{k}{2^2}$ $5 \times 4 = k$ $k = 20$ $P = \frac{20}{q^2}$ $P = \frac{20}{100}$ $P = \frac{1}{5}$	M_1 A_1 M_1 ~~A_1~~ A_1	~~manipulating~~ for $P = k/q$ correct value of k = cd's k simplifying C's 1/5 acc 0.2
		04	

SECTION B

11.	(a) $h(x)=x^2+3,\ g(x)=x-1$ $hg(x)=(x-1)^2+3$ $\therefore hg(a)=(a-1)^2+3$ $=a^2-2a+4$ $gh(x)=x^2+3-1$ $\therefore gh(a)=a^2+2$ $a^2-2a+4=a^2+2$ $-2a=-2$ $a=1$	M_1 ~~A_1~~ M_1 M_1 M_1 A_1	for hg(a) ~~Correct substitution of hg(x) or hg(a)~~ for gh(a) ~~Correct simplification gh(x) or gh(a)~~ for equating Simplification solving
	(b) (i) Let $k=x^2-5x-14$ $x^2-5x=k+14$ $\left(x-\frac{5}{2}\right)^2=k+14+\frac{25}{4}$ $\left(x-\frac{5}{2}\right)^2=k+\frac{81}{4}$ $x-\frac{5}{2}=\sqrt{k+\frac{81}{4}}$ $x=\sqrt{k+\frac{81}{4}}+\frac{5}{2}$ $h^{-1}(x)=\sqrt{\left(x+\frac{81}{4}\right)}+\frac{5}{2}$ (ii) $h^{-1}(4.75)=\sqrt{\left(4.75+\frac{81}{4}\right)}+\frac{5}{2}$ $=\frac{10}{2}+\frac{5}{2}$ or $\frac{+10}{2}-\frac{5}{2}$ $=7.5$ or 2.5 Acc $15/2$ or $5/2$	~~B_1~~ M_1 M_1 ~~A_1~~ M_1 M_1 A_1 M_1 A_1	~~Let k(x) = k~~ Transformation quadratic eqn ~~Transformation of formular~~ ~~Taking square root on each side.~~ substitution ~~Add $5/2$ on each side~~ Simplification ~~For $h^{-1}(x)$~~ for $h^{-1}(x)$ Substit. In $h^{-1}(x)$ Accept $15/2$ or $7\frac{1}{2}$
		12	
12.	n(A) = 55  	B_1 B_1 B_1 B_1	for $2x$ and x for 25 for 20 for 7 ~~Other regions~~ for 14 for 10

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$\frac{3}{4}(y-3x)$ BN: NC=3:1

$\overrightarrow{AN} = \overrightarrow{AB} + \overrightarrow{BN}$

$= 3x + \frac{3}{4}(y-3x)$ M_1

$= \frac{12x+3y-9x}{4} = \frac{3}{4}(x+y)$

(b) $\overrightarrow{MT} = \overrightarrow{MA} + \overrightarrow{AT}$

$-x + \frac{2}{3} + \left(\frac{3}{4}x + \frac{3}{4}y\right) = \frac{2}{4}(-x+y)$

$\overrightarrow{TC} = \overrightarrow{TA} + \overrightarrow{AC} = \frac{-2}{3}\left(\frac{2}{4}x + \frac{3}{4}y\right) + y$ M1

$\frac{2}{4}(y-x)$

$\frac{\overrightarrow{MT}}{\overrightarrow{TC}} = \frac{\frac{2}{4}(y-x)}{\frac{2}{4}(y-x)}$

$\frac{\overrightarrow{MT}}{\overrightarrow{TC}} = 1$

$\overrightarrow{MT} = \overrightarrow{TC}$

Since T is a common point, M T and C are collinear.

~~Simplification~~
M1 Correct route
M1 ~~Correct route~~ c/s BC.
A1 ~~Correct answer~~ Cao

M1 ~~Simplification~~ Correct routes
M1 Correct substitn

Correct $\overrightarrow{TC}$

M1 simplifying

A1 correct ratio or ~~answer~~ value of k

B1 conclusion

12

14. (a) $\frac{4,800,000}{15}$

*shs*320,000

M1 Dividing

A1 ~~correctitude~~

(b) Cash terms

$\frac{1}{5} \times 10 = 2\,pieces$

$2 \times 5000,000 = 10,000,000/=$

M1A1 simplification

Hire purchase,

Initial Deposit = $\frac{25}{100} \times 4000,000$

$= 1000,000$

$1,000,000 + 4,800,000$

$= 5,800,000$

M1 simplification

A1 for 5800,000 c/s 5800,0

M1✓ ~~Correct answer~~

Hire purchase $= 5,800,000 \times 8$

Shs 46,400,000

A1 cao 46,4 ~~simplifying~~

M1✓ c/s 46,400,0

Total = 46,400,000 + 10,000,000

56,400,000/=

A1 Cao

M1✓ ~~Adding~~ for c/

Profits = S.P − B.P

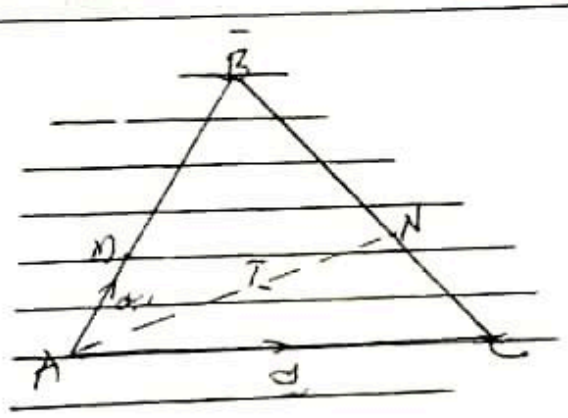
$56,400,000 - (10 \times 4000,000)$

A1 correct answer

Profits = 16,400,000/=

	Let x represent those who visited Mbale only From $y + 7 + 20 + 25 = 55$ $y + 52 = 55$ $y = 3$ $20 + y + 14 + 2x + x + 7 + 25 + 10 = 100$ $20 + 3 + 14 + 2x + x + 32 + 10 = 100$ $x = 7$ Those who visited Jinja $20 + y + 2x + 14$ $= 51$ students	~~B1~~ ~~M1~~ ~~A1~~ M1 A1	~~for 7~~ ~~simplifying~~ ~~for 7~~ addition ~~simplifying~~ for 51
	b(ii) Not visited Arua = $10 + x + 14 + 2x$ $10 + 21 + 14$ $= 45$ students.	M1 A1	for adding regions ~~simplifying~~ for 45
	(c) P (Almost two towns) = $\frac{10+7+14+25+20+14+7}{100}$ $= \frac{97}{100}$	M1 A1	Identifying almost regions ~~simplifying~~ ~~for 45~~ Acc 0.97
		12	

13. (a)



(i) $\overline{AB} = \overline{AM} + \overline{MB}$ M1

$= \underline{x} + 2\overline{AM}$ ~~A1M1~~

$x + 2x = 3\underline{x}$ ~~M1A1~~

(ii) $\overline{BC} = \overline{BA} + \overline{AC}$ M1

$= -3x + y$ A1

(iii) $\overline{BN} = \frac{3}{4}\overline{BC}$

M1 Correct ratio/route.

~~For correct~~

~~root~~

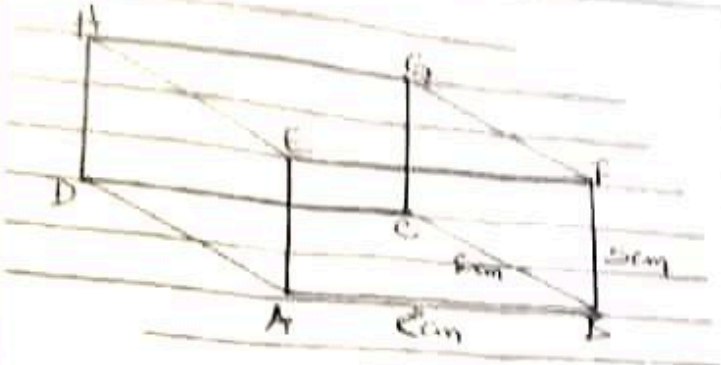
A1 expression

M1 Correct ~~answer~~ path/route.

A1 ~~Correct route~~ expression

15.	(a) $2(3^t) = 162$ $\frac{2(3^t)}{2} = \frac{162}{2}$ $3^t = 81$ $3^t = 3^4$ $t = 4$	A_1 M_1 M_1 M_1 A_1	correct answer Adding / subtraction Dividing proper factorizing / indices for $t = 4$
	(b) $\log(x + y) = 1$ $x + y = 10$ _____ (i) $\log_2(xy) = 4$ $xy = 16$ _____ (ii) $(10 - y)(y) = 16$ $10y - y^2 = 16$ Gather $y_1 = 2$ or $y_2 = 8$ Finding x: $x = 10 - y$ When y = 2, $\Rightarrow x = 10 - 2 = 8$ When y = 8, $x = 10 - 8 = 2$	B_1 B_1 M_1 M_1 M_1 A_1 A_1	Extracting eqn. Extracting eqn. substitution simplifying for quadratic for values of y for factors substituting correct value of y substituting $x = 8$ $x = 2$
		12	
16.	$6 + x = distance$ $S = \frac{d}{t}$ $9:45 + \frac{x}{60}$ $10:50 + \frac{240 - x}{80}$ $t_1 = 9.45 + \frac{x}{60}$ $t_1 = t_2$ $t_2 = 10:50 + \frac{240 - x}{80}$	M_1	equating simplifying manipulating
	$9:45 + \frac{x}{60} = 10:50 - 9.45$ $9:45 + \frac{x}{60} = 10:10 + \frac{240 - x}{80}$ $\frac{8x - 1440}{480} = \frac{13}{12}$ $\frac{x}{60} - \frac{240 - x}{80} = 10:50 - 9:45$ $\frac{12(14x - 1440)}{480} = \frac{13}{12}$ $\frac{8x - 1440 + 6x}{480} = \frac{13}{12}$ $12(14x - 1440) = 13(480)$ $\frac{14x - 1440}{480} = \frac{13}{12}$ $168x - 17280 = 6240$ $x = 140km$	M_1 M_1 A_1	Equating Extraction correct value of

	$9:45+\frac{140}{60}$ $9:45+2:20$ $=12:05$	M_1	Adding
		A_1	Adding
	$S=\frac{d}{t}$	M_1	Equating
	$40=\frac{240}{t}$ $t=6hrs$	A_1	correct value of t
	$9:45+6:00$ $=15:45$		
	$S=\frac{d}{t}$		
	$80=\frac{240}{t}$		
	$t=\frac{240}{80}$	B_1	C's 3
	$t=3\ hrs$		
	So; (c) 10: 50 − 3: 00 = 13: 50 9: 45 + 4: 00 = 13: 45	M_1	Adding time
	13: 50 -13: 45 5minutes	A_1	correct value of t
		12 marks	

 Let x be the length CG $2x + 6 = 16$ $2x = 10$ $x = 5$ Or x be length BF EA + AB + BF + FE = 26 $x + 8 + x + 8 = 26$ $2x + 16 = 26$ $\frac{2x}{2} = \frac{26-16}{2} = \frac{10}{2}$ $x = 5$	B_1 B_1 B_1 M_1 A_1	For base seen. For closed figure Am/sketch for equation for $x = 5$
(b) (i) Volume = L x W x H 8 x 6 x 5 240cm^3	M_1M_1 A_1	substitution & simplification C's 240.
(b)(ii) Total surface Area = 2 [lw + wh + lh] 2(6 x 8 + 6x 5 + 8 x 5) 2 (48 + 30 + 40) 236cm^2	M_1M_1 M_1 A_1	substitution Areas Doubling. for 236.
	12 marks	

END