

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.	<p style="text-align: center;">Alternative</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td>2</td><td>1728</td></tr> <tr><td>2</td><td>864</td></tr> <tr><td>2</td><td>432</td></tr> <tr><td>2</td><td>216</td></tr> <tr><td>2</td><td>108</td></tr> <tr><td>2</td><td>54</td></tr> <tr><td>3</td><td>27</td></tr> <tr><td>3</td><td>9</td></tr> <tr><td>3</td><td>3</td></tr> <tr><td></td><td>1</td></tr> </table> <p>$1728 = 2^6 \times 3^3$</p> <p>$\sqrt[3]{2^6 \times 3^3} = 2^2 \times 3^1$</p> <p>$= 12$</p>	2	1728	2	864	2	432	2	216	2	108	2	54	3	27	3	9	3	3		1	<p style="text-align: center;">M_1</p> <p style="text-align: center;">A_1</p> <p style="text-align: center;">M_1</p> <p style="text-align: center;">A_1</p> <p style="text-align: center;">04</p>	<p>Prime factorizing 1728 or use of ladder method.</p> <p><i>For Pdt</i> Taking square root & its simplification. <i>for awse</i></p>
2	1728																						
2	864																						
2	432																						
2	216																						
2	108																						
2	54																						
3	27																						
3	9																						
3	3																						
	1																						
2.	<p>$n(\epsilon) = 15$</p> <p>$a + 2 + 6 + 4 = 15$</p> <p>$a = 3$</p> <p>$n(A \cup B) = 15 - 4 = 11$</p> <p>$n(A) = 3 + 2 = 5$</p>	<p style="text-align: center;">M_1</p> <p style="text-align: center;">A_1</p> <p style="text-align: center;">M_1</p> <p style="text-align: center;">A_1</p> <p style="text-align: center;">04</p>	<p>For equating <i>(sub)</i></p> <p>For C's 3</p> <p>C's 11</p> <p>C's 5</p>																				
3.	<p>$f^{-1}(x) = \frac{4x}{9+x}$</p> <p>Let $f^{-1}(x)$ be y</p> <p>$y = \frac{4x}{9+x}$</p> <p>$y(9+x) = 4x$</p> <p>$9y = 4x - xy$</p> <p>$9y = x(4 - y)$</p>	<p style="text-align: center;">M_1</p> <p style="text-align: center;">M_1</p> <p style="text-align: center;">04</p>	<p>For manipulating</p>																				

$$x = \frac{9y}{4-y}$$

$$\therefore f(x) = \frac{9x}{4-x}$$

the denominator = 0 for undefined
 $\therefore 4-x=0$

$$x=4$$

A1

correct $f(x)$

denominator

Equating to 0 Correct x

04

4. Time $\Rightarrow \frac{90}{15} = 2\text{ hrs}$

Total time $= 2 + 1\frac{1}{2}$

Average speed = $\frac{\text{Tot. distance}}{\text{Tot. Time}}$

$$= \frac{90+150}{3\frac{1}{2}} = \frac{240}{3.5}$$

$$= 53.3\text{ km/h}^{-1}$$

Accept
 $68.57 \text{ or } 68\frac{4}{7}$
 68.57 km/h

B1

M1

B1

M1

M1

A1

for time 1st journeyfor total distance
time added

for total time

for simplification

04

5.

$$\overrightarrow{OP} = \begin{pmatrix} a \\ -5 \end{pmatrix}, \quad \overrightarrow{OQ} = \begin{pmatrix} 6 \\ c \end{pmatrix}, \quad \overrightarrow{PQ} = \begin{pmatrix} -1 \\ 13 \end{pmatrix}$$

$$\overrightarrow{OP} = \overrightarrow{OQ} - \overrightarrow{OP}$$

$$\begin{pmatrix} -1 \\ 13 \end{pmatrix} = \begin{pmatrix} 6 \\ c \end{pmatrix} - \begin{pmatrix} a \\ -5 \end{pmatrix}$$

$$-1 = 6 - a$$

$$-1 - 6 = -a$$

$$a = 7$$

M1

equating vectors

$$13 = c + 5$$

$$c = 8$$

$$2|\overrightarrow{OQ}| = 2\sqrt{6^2 + 8^2}$$

Accept

$$2 \times 10$$

$$= 20 \text{ units}$$

or $\begin{pmatrix} 12 \\ 16 \end{pmatrix}$

A1

C's 7

A1

C's 8

A1

C's 20

04

6. $0.12m = (0.12 \times 100)\text{cm}$

$$= 12\text{cm}$$

$$v.s.f. = \frac{81}{3} = 27$$

$$l.s.f. = \sqrt[3]{27} = 3$$

$$\frac{h}{12} = \frac{1}{3}$$

$$h = 4\text{cm}$$

Accept

$$0.04\text{m}$$

M1

for v.s.f

M1

for L.s.f.

M1

substitution
for equating ratios

A1

for 4

04

7. 6000.000 12

$$\text{Conse} = 500,000$$

$$\text{tax} = \frac{20}{100} \times 500,000$$

$$= 100,000$$

$$\text{Net} = 500,000 - 100,000$$

$$400,000$$

 B_1 converting to monthly
gross

simplifying

simplifying for subtraction
for net fee M_1 A_1 04

8. $\log \frac{6^2}{3} - \log 1.2$

$$\log \frac{36}{3} - \log 1.2$$

$$\log \frac{12}{1.2}$$

$$\log 12 \div \frac{12}{10}$$

$$\log_{10} 1 = 1$$

 B_1 M_1 M_1 A_1 simplifying for application
of laws
squaring

Dividing simplification

C's 1

 04

9. $t_1 = \frac{10}{x}, t_2 = \frac{10}{x+1}$

$$\frac{10}{x} + \frac{30}{60} = \frac{10}{x+1}$$

$$\frac{20-x}{2x} = \frac{10}{x+1}$$

$$20x + 20 - x^2 - x = 20x$$

$$x^2 + x - 20 = 0$$

$$(x-4)(x+5) = 0$$

Cult $x = 4$ or $x = -5$ $\therefore x = 4 \text{ km/hr}$ Accept $x = 4$. $B_1 M_1$ for time and for equating
 t_1 and t_2 M_1

for solving equations

 M_1 Solving quadratic
equation A_1

for care answer

for correct answer

10.

$$P \propto \frac{1}{q^2}$$

$$P = \frac{k}{q^2}$$

$$5 = \frac{k}{2^2}$$

$$5 \times 4 = k$$

$$k = 20$$

$$P = \frac{20}{q^2}$$

$$P = \frac{20}{100}$$

$$P = \frac{1}{5}$$

Accept 0.2

 M_1 manipulating for $P = \frac{k}{q^2}$ A_1 correct for value of k $M_1 A_1$

simplifying

 04 C's 1/5
C.a.o

SECTION B

11. (a) $h(x) = x^2 + 3$, $g(x) = x - 1$
 $hg(x) = (x-1)^2 + 3$
 $\therefore hg(a) = (a-1)^2 + 3$
 $= a^2 - 2a + 4$
 $gh(x) = x^2 + 3 - 1$
 $\therefore gh(a) = a^2 + 2$
 $a^2 - 2a + 4 = a^2 + 2$
 $+2a \cancel{=} \cancel{+2}$ $2a = \cancel{x} \quad a = 1$

(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) $h^{-1}(4.75) = \sqrt{\left(4.75 + \frac{81}{4}\right)} + \frac{5}{2}$
 $= \frac{10}{2} \pm \frac{5}{2}$

$= 7.5 \quad \text{or } -2.5$

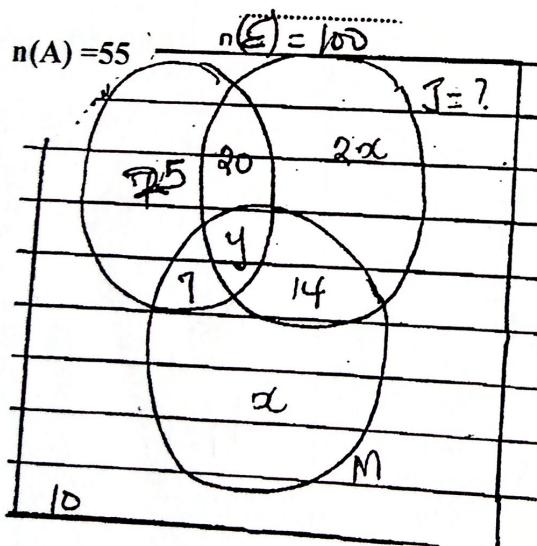
M₁ Correct substitution of ~~For h(x)~~
M₁ x or hg(a)
M₁ For gh(a)
M₁ Correct simplification
M₁ gh(x) or gh(a)
A₁ For equality
Simplification
For solving

M₁ Let $k(x) = k$
M₁ Transformation of
formular
M₁ For Quadratic
eqn.

M₁ Taking square root
on each side.
Add $\frac{5}{2}$ on each
side For substitution
M₁ For simplification
For $h^{-1}(x)$
For $h^{-1}(x)$.

A₁ Substit. In $h^{-1}(x)$
M₁ Accept $\frac{15}{2}$ or $-\frac{7}{2}$

12.



12

B₁ for 25

B₁ for 20

B₁ for 7
Other regions

B₁ for 14

Let x represent those who visited Mbale only From

$$y + 7 + 20 + 25 = 55$$

$$y + 52 = 55$$

$$y = 3$$

$$\therefore 20 + y + 14 + 2x + x + 7 + 25 + 10 = 100$$

$$20 + 3 + 14 + 2x + x + 32 + 10 = 100$$

$$x = 7$$

\therefore Those who visited Jinja

$$20 + y + 2x + 14$$

$$= 51 \text{ students}$$

B₁

B₂

M₁

A

for 10

for x and $2x$

for 3,
simplifying.

for 7

M₁

A₁

for addition
simplifying

for 51

b(ii)

$$\text{Not visited Arua} = 10 + x + 14 + 2x$$

$$10 + 21 + 14$$

$$= 45 \text{ students.}$$

M₁

A₁

For adding the
simplifying regions

for 45

(c) P (Almost two towns) =

$$\frac{10+7+14+25+20+14+7}{100}$$

$$= \frac{97}{100}$$

Accept 0.97

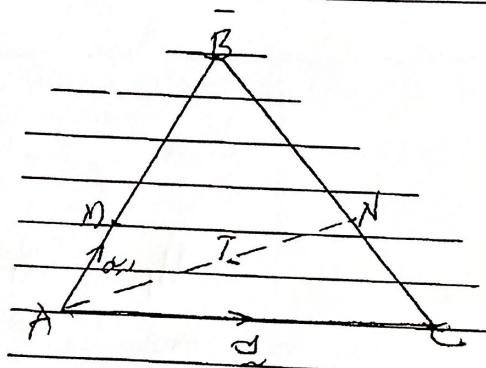
M₁

A₁

Identify the region
simplifying (at most
regions)

for 45 97%

13. (a)



$$(i) \quad \overline{AB} = \overline{AM} + \overline{MB} \quad M_1$$

$$= x + 2\overline{AM} \quad A_1 M_1$$

$$x + 2x = 3x \quad M_1 A_1$$

For correct
 M_1 roof \rightarrow For correct
route

A_1 \rightarrow Express for \overline{AB}

$$(ii) \quad \overline{BC} = \overline{BA} + \overline{AC} \quad M_1$$

$$= -3x + y \quad A_1$$

Correct answer

M_1 \rightarrow Correct route

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

Correct route

A_1 \rightarrow For \overline{BC}

$$2(3^t) = 162$$

$$\frac{2(3^t)}{2} = \frac{162}{2}$$

$$3^t = 81$$

$$3^t = 3^4$$

$$t = 4$$

M₁

M₁

A₁

Dividing
Applicat. of rules
prove factorizing
for t = 4

(b) $\log(x+y) = 1$

$$x+y = 10 \quad (i)$$

$$\log_2(xy) = 4$$

$$xy = 16 \quad (ii)$$

$$(10-y)(y) = 16$$

$$10y - y^2 = 16$$

Gather $y_1 = 2$ or $y_2 = 8$

Finding x;

$$x = 10 - y$$

When y = 2,

$$\Rightarrow x = 10 - 2 = 8$$

When y = 8,

$$x = 10 - 8 = 2$$

B₁

Extracting eqn.
(for Eqn ①)

B₁

Extracting eqn.
(for Eqn ②)

M₁

simplifying, for
substitutin

M₁

for values of y
for quadratic
substituting, for
the factors

A₁

correct value of y = 2 &
for both y = 8

M₁

for X = 2
substituting
c's 2

A₁

for X = 8

12

16. $6+x = \text{distance}$

$$S = \frac{d}{t}$$

$$9:45 + \frac{x}{60}$$

$$10:50 + \frac{240-x}{80}$$

$$t_1 = 9.45 + \frac{x}{60}$$

(1)

$$t_1 = t_2$$

$$t_2 = 10:50 + \frac{240-x}{80}$$

(1)

M₁

For simplifying
Eqn (1)

M₁

For simplifying
manipulating

$$9:45 + \frac{x}{60} = 10:50 - 9:45$$

$$\frac{8x-1440}{480} = \frac{13}{12}$$

$$12(14x-1440) = 13(480)$$

$$\frac{12(14x-1440)}{480} = \frac{13}{12}$$

$$168x - 17280 = 6240$$

$$x = 140 \text{ km}$$

M₁

Equating

M₁

Extraction

A₁

correct value of x

$$9:45 + \frac{140}{60}$$

$$9:45 + 2:20$$

$$= 12:05$$

$$S = \frac{d}{t}$$

$$40 = \frac{240}{t}$$

$$t = 6 \text{ hrs}$$

$$9:45 + 6:00$$

$$= 15:45$$

$$S = \frac{d}{t}$$

$$80 = \frac{240}{t}$$

$$t = \frac{240}{80}$$

$$t = 3 \text{ hrs}$$

So; (c) 10: 50 9: 45

$\frac{3: 00}{13: 50}$	$\frac{4: 00}{13: 45}$
------------------------	------------------------

$$13: 50$$

$$\underline{-13: 45}$$

5 minutes

M₁

A₁

M₁

A₁

Adding

Adding

Equating

correct value of t

B₁

C's 3

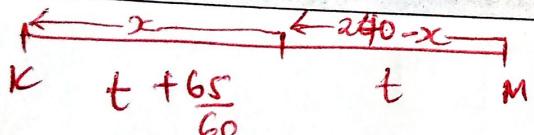
M₁

Adding time

A₁

correct value of t

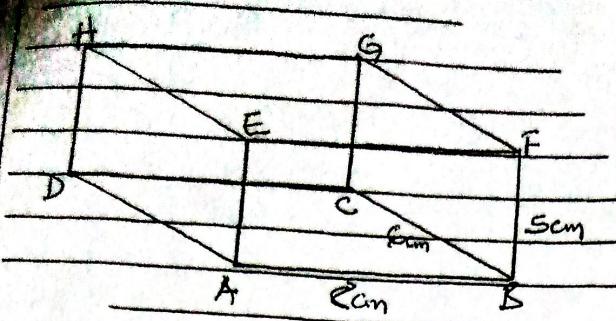
12 marks



$$\begin{array}{r}
 10:50 \\
 - 9:45 \\
 \hline
 1:05 \rightarrow \frac{65}{60}
 \end{array}$$

Cyclist : $d = 5xt$

$$x =$$



Let x be the length CG

$$2x + 6 = 16$$

$$2x = 10$$

$$x = 5$$

Or

x be length BF

$$EA + AB + BF + FE = 26$$

$$x + 8 + x + 8 = 26$$

$$2x + 16 = 26$$

$$\frac{2x}{2} = \frac{26 - 16}{2} = \frac{10}{2}$$

$$x = 5$$

for
AB
6cm
CB

For base seen.
For closed figure
Am/sketch

for Summation /
for equation

for $x = 5$

(b) (i) Volume = $L \times W \times H$

$$8 \times 6 \times 5$$

$$240\text{cm}^3$$

M₁M₁
A₁
C.a.0

substitution &
simplification
C's 240.

(b)(ii) Total surface Area =

$$2 [1w + wh + lh]$$

$$2(6 \times 6 + 6 \times 5 + 8 \times 5)$$

$$2(48 + 30 + 40)$$

$$236\text{cm}^2$$

M₁M₁
M₁
A₁
C.a.0

substitution into formula
Areas simplification
Doubling.

for 236.

12 marks

END