

456/2

MATHEMATICS

PAPER 2

July/ August 2023

2 ½ hours

ASSHU ANKOLE JOINT MOCK EXAMINATIONS 2023

Uganda Certificate of Education

MATHEMATICS

PAPER 2

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES

Answer ALL Questions in Section A and any Five Questions from Section B.

Any Additional Question(s) answered will not be marked

All necessary calculations must be done in the answer sheets provided.

Graph paper is provided.

Silent, Non-Programmable Scientific Calculators and Mathematical Tables with a list of formulae may be used.

SECTION A

1. Given that $p = \begin{pmatrix} -15 \\ 40 \end{pmatrix}$ and $q = k \begin{pmatrix} n \\ -8 \end{pmatrix}$. If $p = q$, find the values of k and n . (4 marks)

2. Without using tables or a calculator, evaluate

$$3 \log 5 - 3 \log 2 + \log 32 - \log 5 \quad (4 \text{ marks})$$

~~0.16 - 2 × 8~~

~~0.16 - 16~~ 3. If y is inversely proportional to $x^2 - 1$ and that when $y = 2, x = 3$, find y when $x = 5$. (4 marks)

~~2 - 15.84~~ 4. Simplify $4 \left(\frac{4}{100} \right) - 8 \times 4^{-1} \times 16^{\frac{3}{4}}$ (4 marks)

5. Given that $n(\varepsilon) = 23$, $n(P' \cap Q) = 3$, $n(P' \cap Q') = 5$ and $n(P \cap Q') = 4$.

(a) Represent this information on a Venn diagram

(b) Find $n(P \cap Q)$ (4 marks)

6. The line $3x + 2y = 8$ cuts the y-axis at $P(0, k)$. Find the

(i) gradient of the line, (2 marks)

(ii) value of k (2 marks)

7. A cone has a circular base of radius 5 cm and a vertical height of 12 cm. Calculate the area of the curved surface (4 marks)

8. A car travels 40 km in 30 minutes, stops for 15 minutes, and then travels a further 100 km in 1 hour 15 minutes. Find the average speed for the whole journey. (4 marks)

9. Find the simple interest on sh. 20,000 for $1\frac{3}{4}$ years at $1\frac{1}{2}\%$ per month. Find also, the amount after $1\frac{3}{4}$ years. (4 marks)

10. Sh. 4,895,000 is divided into three parts in the ratio $1:\frac{1}{2}:\frac{1}{3}$. Find the value of the smallest part. (4 marks)

$$\frac{16}{100} - \frac{8}{4} \quad 2 \quad \frac{16}{100} - 16$$

SECTION B

11.(a) The variable y is partly constant and partly varies as x .

When $x = 2$, $y = 16$ and when $x = 7$, $y = 31$. Find y in terms of x and hence value of y when $x = 4$ and x when $y = 18$. (8 marks)

(b) t varies directly as the square of d and inversely as h . If $t = 2$ when $d = 12$ and $h = 6$, find t when $d = 18$ and $h = 1.5$ (4 marks)

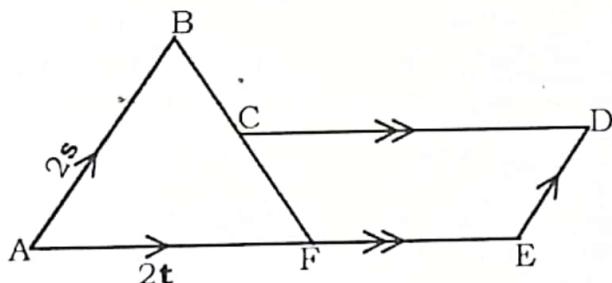
12(a) If $f(x) = ax^2 + bx$, $f(1) = 9$ and $f(2) = 30$. Find

(i) the constants a and b
(ii) $f(5)$ (7 marks)

(b) Given that $f(x) = x^2 + 1$ and $g(x) = x + 1$, find $gf(-2)$ (2 marks)

(c) If $f(x) = \frac{24}{x} + 4$, find $f^{-1}(x)$. (3 marks)

13. In the figure, \overline{AB} is parallel to \overline{ED} , \overline{CD} is parallel to \overline{AE} . And C is the mid-point of \overline{BF} and $\overline{FE} = \frac{1}{2}\overline{AF}$.



Given $AB = 2s$ and $AF = 2t$, express in terms of s and t

- (i) BF (ii) CF (iii) AC (iv) FE

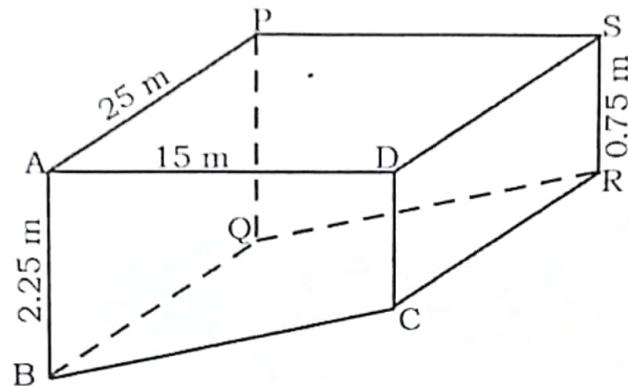
Because CD is parallel to AE and \overline{AB} is parallel to \overline{ED} we can write $CD = pt$ and $ED = qs$.

By considering $AD = AC + CD$ and $AD = AE + ED$, express AD in terms of s and t and work out the values of p and q (scalars)

(12 marks)

14. In a certain school there are 87 students in Form 3. Of these, 43 play Hockey (H), 42 play Football (F) and 47 play Volleyball (V); 15 play Hockey and Volleyball, 17 play Volleyball and Football, 21 play Hockey and Football. Each student plays at least one of the three games and x students play all three.
- show this information above on a venn diagram. (6 marks)
 - Write down an equation in x and hence find x . (3 marks)
 - If a student is chosen at random from Form 3, what is the probability that he plays exactly two of these games? (3 marks)
15. A house was valued at sh. 75,000,000 after an appreciation of 15% in 1 year.
- Calculate the value of the house before appreciation.
 - Mr. John paid a deposit of 15% of the appreciated value of the house, followed by 36 equal monthly instalments of sh. 2,100,000 each. How much did he pay for the house in total?
 - If Mr. John had paid for the house in cash, how much would he have saved.
 - Mr. Tom bought a similar house at sh. 75,000,000 by taking a loan, payable in full at the end of two years at 14% per annum Compound Interest. How much more did Tom pay for the loan than Mr. John paid for the house? (12 marks)
16. The Table below gives the speed, v , m/s of a boy after t seconds from the start in a race.
- | Time (s) | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 |
|-------------|---|-----|-----|-----|-----|-----|----|----|----|
| Speed (m/s) | 0 | 3.2 | 4.8 | 5.8 | 6.4 | 6.8 | 7 | 8 | 10 |
- Plot the speed-time graph and
- Find the acceleration when $t = 4$.
 - Estimate the distance travelled in 16 seconds.
 - Calculate his average speed over the whole journey.
 - If he actually ran a 100m race, find the percentage error in your estimated distance. (12 marks)

17.



The diagram above represents a swimming pool, with trapezium ABCD as its cross-section. $AB = 2.25\text{m}$, $AD = 15\text{m}$, $DC = SR = 0.75\text{m}$ and

$AP = 25\text{m}$.

- (i) Calculate in m^3 , the volume of the swimming pool.
- (ii) The swimming pool is initially empty and is filled through a cylindrical pipe of radius 10 cm. Water flows through the pipe at 0.8 m/s. Find the time in hours and minutes, it takes to fill the swimming pool.

END

$$1. \begin{pmatrix} -15 \\ 40 \end{pmatrix} = k \begin{pmatrix} n \\ -8 \end{pmatrix} \quad \begin{pmatrix} -15 \\ 40 \end{pmatrix} = \begin{pmatrix} kn \\ -8n \end{pmatrix}$$

$$40 = -8k$$

$$-5 = k$$

$$-15 = -5n$$

$$3 = n.$$

M1 } for multiplication
A7 } of scalar into the
vector.

M1 } 04

A7 }

$$2. \log 5^3 - \log 2^3 + \log 2^5 - \log 5$$

$$\log \frac{(125 \times 32)}{8 \times 5} = \log 25 \times 4$$

$$= \log 100$$

$$= 2 \log 10$$

$$= 2.$$

M1 }
M1 }

M1 } 04

~~A7~~

$$3. y \propto \frac{1}{x^2 - 1}$$

$$y = \frac{k}{x^2 - 1}$$

$$y(x^2 - 1) = k$$

$$y = 2 \cdot 8 = 3$$

$$2(3^2 - 1) = k$$

$$2(9 - 1) = k$$

$$2 \times 8 = k$$

$$16 = k$$

$$\therefore y = \frac{16}{x^2 - 1}$$

$$x = 5$$

$$y = \frac{16}{5^2 - 1}$$

$$= \frac{16}{24}$$

$$y = \frac{16}{24}$$

$$= \frac{2}{3}$$

M1 }
M1 }

A7 }

04

M1 }

A7 }

$$y = \frac{2}{3}$$

A7 }

M1 M1

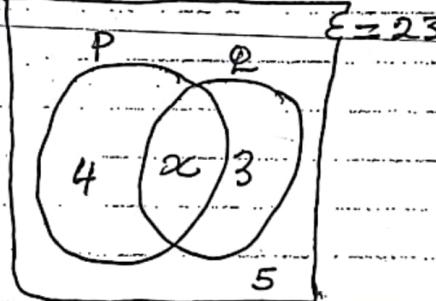
$$4 \cdot \frac{1}{25} - 8 \cdot \frac{1}{4} \cdot 2^{\frac{4 \times 3}{4}}$$

$$\frac{4}{25} - 8 \cdot \frac{1}{4} \cdot 8$$

$$\frac{4}{25} - \frac{16}{1} = \frac{4 - 400}{25}$$

$$= -\frac{396}{25} = -15.84$$

5. $E = 23$



$$4 + x + 3 + 5 = 23$$

$$x = 23 - 12$$

$$x = 11$$

$$n(P \cap Q) = 11$$

6. (i) $2y = -3x + 8$

$$y = -\frac{3}{2}x + 4 \text{ M}_1$$

$$\text{grad. } \bar{b} = -\frac{3}{2} \text{ A}_1$$

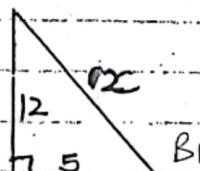
(ii) at Point P, $x = 0$

$$8x_0 + 2k = 8 \text{ M}_1$$

$$k = 4$$

$\therefore k \bar{=} 4$

7.



$$x = \sqrt{12^2 + 5^2}$$

$$= \sqrt{144 + 25}$$

$$= \sqrt{169}$$

$$= \pm 13$$

$$x = 13 \text{ B}_1$$

M1 M1
Simplification

M1
Indices

M1

D4

A1

B1
for 4 and 3
Correctly
located
for 5.

B1

04
A value of x
Answer to question

M1

inform of $y = mx + c$

A1

D4

A1

B1
for diagram seen
~~written~~

A1

B1

(2)

Area of curved surface = $\pi r l$

$$\pi = 3.142 \times 5 \times 13 \text{ M.I.}$$
$$= 204.23 \text{ cm}^2 \text{ A.I.}$$

M.I
A.I

$$204.23 \text{ cm}^2$$
$$204.23 \text{ cm}^2$$

8. Total distance = $40 + 100 = 140 \text{ km}$ B.I.

$$\text{Total time taken} = \frac{1}{2} + \frac{1}{4} + \frac{5}{4}$$
$$= \frac{2+1+5}{4}$$

$$= \frac{8}{4}$$

$$= 2 \text{ hrs}$$

B.I

distance



Average for the whole journey =

$$\frac{140}{2} = 70 \text{ km/hr}$$

$$19.4 \text{ m/s}$$

B.I

time taken

M.I A.I

9. $I = 20000 \times 21 \times \frac{3}{200} = 6300 \text{ M.I.A.I.}$

$$I = 20000 \times \frac{1.5}{100} \times 21$$

$$\text{Amount} = 20000 + 6300 = 26300 \text{ M.I.A.I.}$$

$$M.I.A.I. = 20000 \times \frac{18}{100} \times \frac{7}{4}$$

10. Total ratio = $1 \times 6 + \frac{1}{2} \times 6 + \frac{1}{3} \times 6$

$$= 6 + 3 + 2$$

$$= 11$$

$$\text{or } \frac{1}{6}$$

$$1 + \frac{1}{2} + \frac{1}{3} = \frac{1}{6} \text{ B.I.}$$

11. Smallest = $\frac{1}{11} \times 4895000$

$$= 890.000$$

$$1.83$$

M.I.M.I.

$$\frac{1}{3} \times \frac{6}{11} \times 4,895,000 = 890,000$$

$$\frac{2}{11} \times \frac{18}{11} = 88110$$

SECTION B

11(a) $y = a + kx$

$$x = 2, y = 16$$

$$16 = a + 2k$$

$$- 31 = a + 7k$$

$$15 = 5k$$

$$3 = k$$

$$16 = a + 6$$

$$16 - 6 = 10$$

$$10 = a$$

B.I

equation

B.I

for both

~~M.I.~~

A.I

~~168.5~~
~~125~~
~~43.5~~
~~OPPOSITE SIDE~~

A.I B.I

$$y = 10 + 3x$$

$$x = 4$$

$$y = 10 + 3 \times 4$$

$$y = 10 + 12$$

$$y = 22$$

When $y = 18$

$$18 = 10 + 3x$$

$$18 - 10 = 3x$$

$$8 = 3x$$

$$\frac{8}{3} = x$$

(b) $t = \frac{kd^2}{h}$

$$t = 2, d = 12 \text{ and } h = 6$$

$$2 = \frac{k \times 12^2}{6}$$

$$12 = 144k$$

$$\frac{12}{144} = k \quad k = \frac{12}{144}$$

$$\frac{1}{12} = k$$

$$t = \frac{\frac{1}{12} d^2}{h}$$

$$t = \frac{\frac{1}{12} \times 18 \times 18}{15}$$

$$t = 18.$$

12(a) i) $f(x) = ax^2 + b$

$$f(1) = a + b = 9$$

$$f(2) = 4a + 2b = 30$$

$$2a + 2b = 18$$

$$4a + 2b = 30$$

$$2a = 12$$

$$a = 6$$

$$6 + b = 9$$

$$b = 9 - 6$$

$$b = 3$$

B1 ✓

B1

B1

~~M1~~

M1

A1

~~M1~~

A1

B1

B1

M1

A1

A1

②

$$(i) f(x) = 6x^2 + 3x$$

$$\begin{aligned}f(5) &= 6(5^2) + 3 \times 5 \\&= 150 + 15 \\&= 165\end{aligned}$$

$$(b) f(-2) = (-2)^2 + 1 = 5$$

$$g(5) = 5 + 1 = 6$$

$$gf(-2) = 6.$$

M1

$$gf(x) = x^2 + 2$$

$$gf(-2) = (-2)^2 + 2 = 6$$

M1

A1

$$(c) y = \frac{24}{x} + 4 = \frac{24+4x}{x}$$

$$y \cdot x = 24 + 4x$$

$$yx - 4x = 24$$

$$x(y-4) = 24$$

$$x = \frac{24}{y-4}$$

$$\therefore f^{-1}(x) = \frac{24}{x-4}$$

M1

M1

A1

$$B \underline{F} = \underline{B} \underline{A} + \underline{A} \underline{F}$$

$$= -2\underline{s} + 2\underline{t}$$

$$= 2(\underline{t} - \underline{s})$$

B1

B1

$$(ii) C \underline{E} = \frac{1}{2} \underline{B} \underline{F} : \quad \frac{1}{2} \underline{F} \underline{B} + \underline{B} \underline{A} + \underline{A} \underline{F}$$

$$= \frac{1}{2} \times 2(\underline{t} - \underline{s})$$

$$= \underline{s} - \underline{t} - 2\underline{s} + 2\underline{t}$$

$$= \underline{t} - \underline{s}$$

M1

A1

$$(iii) \underline{A} \underline{C} = \underline{A} \underline{B} + \underline{B} \underline{C}$$

$$= 2\underline{s} + \underline{t} - \underline{s}$$

$$= \underline{s} + \underline{t}$$

M1

A1

$$(iv) \underline{F} \underline{E} = \frac{1}{2} \times 2\underline{t}$$

$$= \underline{t}$$

B1

$$\underline{AD} = \underline{AC} + \underline{CD}$$

$$= \underline{s} + \underline{t} + p\underline{t}$$

$$= \underline{s} + (1+p)\underline{t}$$

B1

- 7

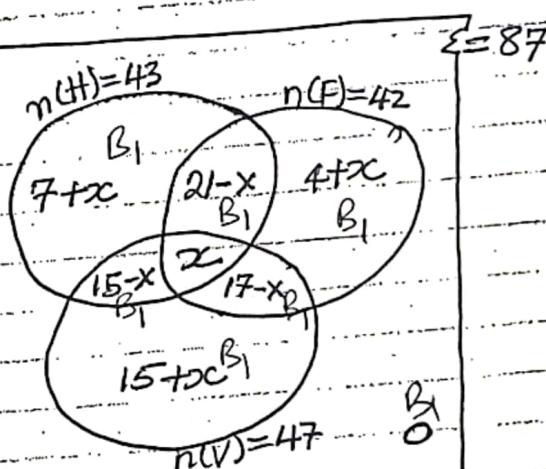
$$\begin{aligned} AB &= AE + ED \\ &= 2t + t + 9s \\ &= 3t + 9s \end{aligned}$$

$$S + t + pt = 3t + 9s$$

$$S = 9s$$

$$\begin{aligned} I &= 9 \\ t + pt &= 3t \\ 2t &= pt \\ 2 &= p \end{aligned}$$

14 (a)



$$\begin{aligned} n(A \text{ only}) &= 43 - (15-x+x+21-x) \\ &= 43 - (36-x) \\ &= 43 - 36 + x \\ &= 7+x \end{aligned}$$

$$\begin{aligned} n(B \text{ only}) &= 42 - (21-x+x+17-x) \\ &= 42 - (38-x) \\ &= 42 - 38 + x \\ &= 4+x \end{aligned}$$

$$\begin{aligned} n(C \text{ only}) &= 47 - (15-x+x+17-x) \\ &= 47 - (32-x) \\ &= 47 - 32 + x \\ &= 15+x \end{aligned}$$

$$(b) 43 + 7+x + 17-x + 15+x = 87$$

$$79 + x = 87$$

B1

BF A1

BF A1

M1

A1

12

- B1 for $7+x$
- B1 for $21-x$
- B1 " $4+x$
- B1 " $15-x$
- B1 " $17-x$
- B1 for $15+x$
- B1 for zero

$$\begin{aligned} \text{Flow rate} &= x \text{-Area pixel} \\ &= \pi r^2 \times v \\ &= \pi (0.1)^2 \times 0.16 \\ &= 0.0251 \text{ m}^3 \text{s}^{-1} \end{aligned}$$

$$\begin{aligned} \text{Time} &= \frac{\text{Vol of tank}}{\text{flow}} \\ &= \frac{562.5 \text{ M1}}{0.0251} \\ &= 22381.165 \end{aligned}$$

= 6 hrs 13 m

M1 B1 for inclusion of all regions of all regions

$$(c) \frac{18+7+9}{87} = \frac{29}{87} = \frac{1}{3}. \quad 0.3333$$

for 13,749.
MIAI

$$15(a) 75,000,000 = x \left(\frac{100+15}{100} \right)^t$$

$$\frac{75,000,000}{1.15} = x$$

$$60,000,000 \cdot 65,217,391.304$$

$$(b) \text{Instalment} = \text{Deposit} \\ = 36 \times 2,100,000 + 11,250,000 \quad M_1, M_1 \\ = 75,600,000 + 11,250,000 \quad M_1 \\ = 86,850,000 = A_1$$

$$(c) 86,850,000 - 75,000,000 = 11,850,000 = M_1 A_1$$

$$(d) A = 75,000,000 \left(\frac{100+14}{100} \right)^2 \quad M_1$$

$$= 75,000,000 (1.14)^2$$

$$= 75,000,000 \times 1.2996$$

$$= 97,470,000 \quad A_1$$

$$97,470,000 - 75,000,000 = 22,470,000$$

$$22,470,000 - 11,850,000 = M_1$$

$$= 10,620,000 = A_1$$

$$M_1 \\ \frac{115 \times x}{100} = 75,000,000$$

$$x = 65,217,391.304$$

$$(b) \text{Deposit} = \frac{15}{100} \times 75,000,000$$

$$= 11,250,000 \quad M_1$$

$$\text{Instalment} = 36 \times 2,100,000 = 75,600,000$$

$$= 11,250,000 + 75,600,000$$

$$= 86,850,000 - 75,000,000$$

$$= 11,850,000 \quad A_1$$

$$A = P(1 + r)^n \\ = 75,000,000 \left(1 + \frac{14}{100} \right)^2 \quad M_1$$

$$= 97,470,000 \quad A_1$$

$$B_L = 97,470,000$$

$$M_1 = 86,850,000 \quad M_1$$

$$A_1 = 10,620,000 \quad A_1$$

12

$$17(b) V = \frac{1}{2} \times 15 (2.25 + 0.75) \times 25 \\ = \frac{15 \times 3 \times 25}{2}$$

$$\text{Ans} = 562.5 \text{ m}^3$$

$$\text{Cross-sectional area} = 5(25 \times 0.75) + (\frac{1}{2} \times 15 \times 15 \times 25) \\ = 281.25 + 281.25 \quad M_1$$

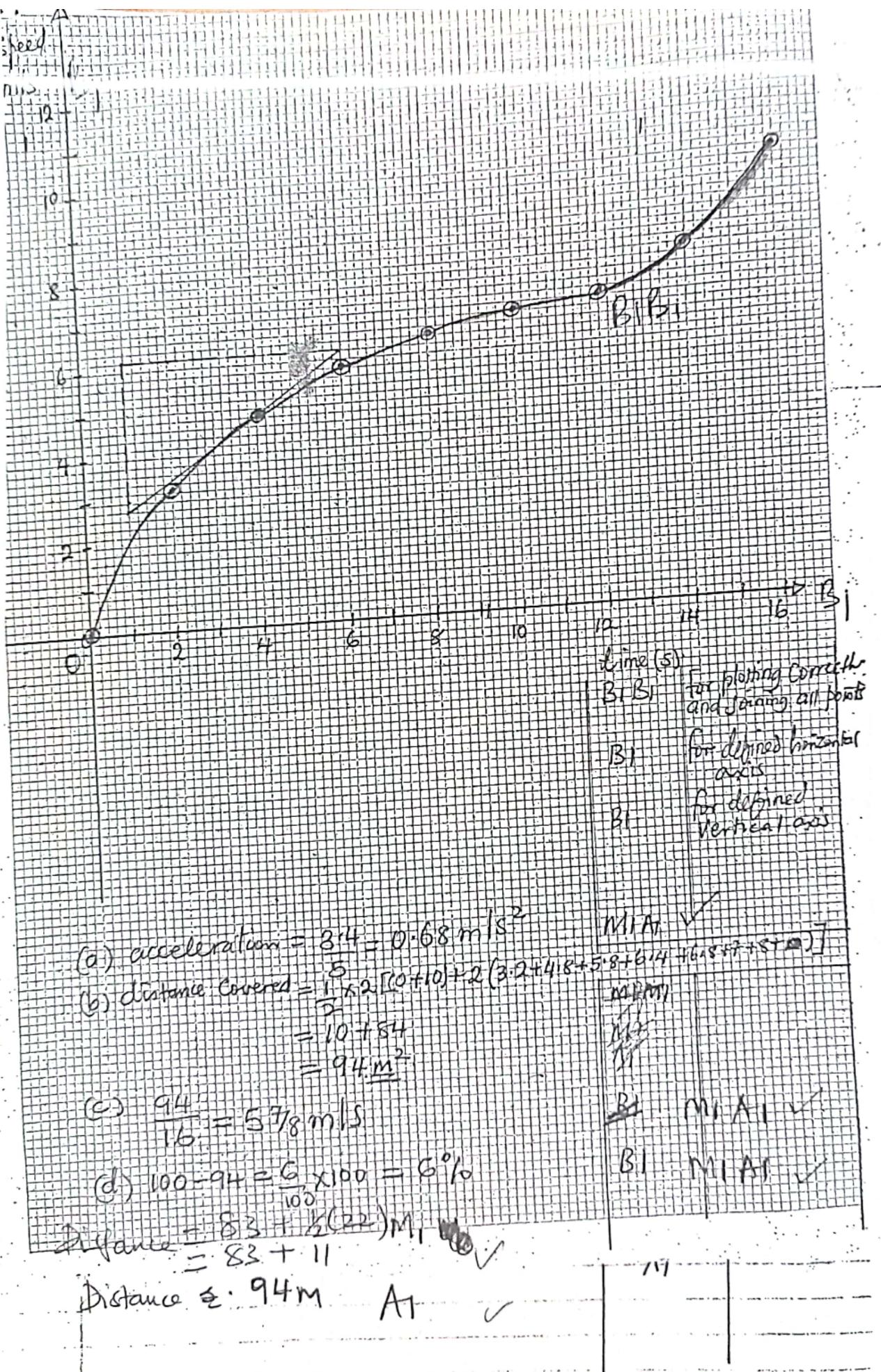
$$= 562.5 \text{ m}^3 \quad A_1$$

$$(ii) \text{Volume of water poured in the pool in } \frac{\text{m}^3}{\text{second}} \\ = 3.142 \times 0.1 \times 0.1 \times 0.8 \\ = 0.025136 \text{ m}^3 / \text{second}$$

$$\text{Time taken} = \frac{562.5}{0.025136}$$

$$MIMIB_1 \quad B_1 \text{ for } 0.1$$

$$A_1 \quad B_1 \text{ for } 3600$$



(8)

456/1
MATHEMATICS
Paper 1
July/August, 2023
2 $\frac{1}{2}$ hours

ASIJIMWE ELIZABETH
U08281062

ASSHU ANKOLE JOINT MOCK EXAMINATIONS 2023

Uganda Certificate of Education

MATHEMATICS

Paper 1

2 Hours 30 Minutes

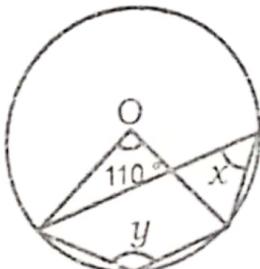
Instructions to candidates

- Answer all questions in Section A and any five questions from section B.
- any additional question(s) answered will not be marked.
- All necessary calculations must be done in the answer booklet(s) provided.
- Graph papers are provided.
- Silent, non-programmable scientific calculators and mathematical tables with a list of formulae may be used.

SECTION A (40 MARKS)

Answer all questions in this section

1. Find the value of x and y given that $\begin{pmatrix} 2 & x \\ 3 & 4 \end{pmatrix} \begin{pmatrix} 3 \\ y \end{pmatrix} = \begin{pmatrix} 7 \\ 5 \end{pmatrix}$ (4 marks)
2. In a class of 80 students, the average mark of 30 girls is 17 marks while that of the boys is 18.5 marks. Determine the average mark for the whole class (4 marks)
3. Make P , the subject of the formula $M = \frac{2P}{5} + \frac{7P+1}{4}$ (4 marks)
4. Given that $\tan \theta = \frac{4}{3}$, for $180^\circ < \theta < 270^\circ$, find the value of $15 \cos \theta + 10 \sin \theta$. (4 marks)
5. The circle below has its centre at O



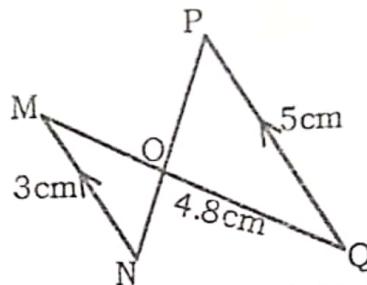
- Calculate angles x and y . (4 marks)
6. Solve for x in the inequality $2(5x - 1) \geq 3(4x - 2)$ and illustrate the solution on a number line. (4 marks)
 7. Solve the simultaneous equations;

$$3x + y = 10$$

$$5x - 2y - 2 = 0$$

8. Solve for n : $\frac{3n+2}{5} - \frac{2n-4}{3} = 1$ (4 marks)

9. MN and PQ are parallel lines. NP and QM intersect at O. Given that NM = 3 cm, and PQ = 5 cm and RQ = 4.8 cm, find the length of MO.



(4 marks)

10. The table below represents the marks scored by 78 students in mathematics contest.

Marks	1-25	26-50	51-75	76-100
No. of students	7	17	40	14

Draw a histogram to represent the above information. Hence estimate the modal mark. (4 marks)

2x2 2x1

SECTION B (60 MARKS)

Answer any five questions from this section. All questions carry equal marks.

11. Katongole stays 6 km away from his school. One day, he started on his journey at 6:42 am and arrived at 7:30 am. He walked part of the journey at 5 Kmh^{-1} . He ran the rest of the journey at 10 Kmh^{-1}

- (a) What distance did he ran? (7 marks)
 (b) If the school gates close at 7:45 am, determine the number of minutes by which Katongole would have been late had he not run part of the journey (5 marks)

12. (a) Given that; $P = \begin{pmatrix} -2 & 3 \\ 5 & x \end{pmatrix}$, $Q = \begin{pmatrix} y & -z \\ -3 & 2 \end{pmatrix}$ and $QP = \begin{pmatrix} -7 & -4 \\ 16 & 5 \end{pmatrix}$,

Find the values of; x , y and z (6 marks)

- b) Three boys; Andrew(A), Peter (P) and Musa (M) visited the school canteen for breakfast. Andrew took a soda, a sandwich and a banana, Peter took two cups of tea and a sandwich while Musa took a soda, a sandwich and two bananas.

- (i) Copy and complete the matrix below

	Soda	Tea	S/which	Banana	
A	1	0	1	1	
P	0				
M	1				

- (ii) State the order of the matrix above.

- (iii) The price of a bottle of soda, a cup of tea, a sandwich and a Banana and shs 500, shs 400, shs 100 and shs.200 respectively.

Write down the prices as a column matrix. Hence find the amount to be paid by each boy. (6 marks)

13. (a) A basket contains Green Mangoes and yellow mangoes. The probability of picking a green mango is $\frac{1}{6}$. If there are 24 mangoes in the bag, find the number of yellow mangoes. (4 marks)

- b) A bag contains six white and five black balls. Two, balls are drawn one at a time without replacement.

Find the probability

- (i) the same colour (8 marks)
 (ii) different colours

14. (a) Draw on the same axes the graphs of $y = \sin x$ and $y = \cos x$ for $-180^\circ \leq x \leq 180^\circ$. Use x at intervals of 45° and 2cm to 1 unit for y. (12 marks)

- b) Solve $\sin x - \cos x = 0$.

15. A triangle ABC with vertices A(3, 2), B(4,0) and C(6,3) is reflected in the line $y = x$ to give an image triangle $A'B'C'$. The image is reflected in another line to give another image $A''(0, 1)$, $B''(-1,3)$ and $C''(-3,0)$

- (a) Draw the three triangles on the same coordinates axes using a scale of 1cm to 1 unit on both axes.

- (b) State the coordinates of A' , B' and C' .

- (c) Find the equation of the second mirror line (12 marks)

16. Two boats M and N leave a harbor at 11:00 am. M sails due SE at 40 km/h^{-1} and N sails at 30 km/h^{-1} on a bearing of 200° .
- (a) Use a scale of 1cm to represent 20 km to construct a scale drawing showing the positions of the two boats at 2:00 pm.
- (b) Find the distance and bearing of M from N at 2:00 pm (12 marks)
17. A school hired a lorry and Tipper to transport desks to school. Each trip of the lorry costs shs 40,000 and that of a Tipper costs shs 25,000. The lorry has a capacity of 42 desks and a tipper 14 desks. All the 216 desks must be ferried and there is shs 200,000 available for the transport.
- The Tipper had to make more trips than the lorry
If x and y represents the number of trips made by the lorry and tipper respectively.
- (a) Write down five inequalities representing the given information. (5 marks)
- (b) (i) Plot the inequalities on the same coordinate axes.
(ii) by shading the unwanted regions, show the region satisfying all the inequalities. (5 marks)
- (c) Use your graph to find the number of trips each vehicle should make so as to spend the least amount of money. (2 marks)

END

4561 Mathematics Paper 1 Marking Guide
ASSHU MIDWESTERN REGIONAL JOINT MOCK EXAMS, 2023

1 of 12

QN

SOLUTIONS

MARKS

REMARKS

✓ 1.

$$\begin{pmatrix} 2 & x \\ 3 & 4 \end{pmatrix} \begin{pmatrix} 3 \\ y \end{pmatrix} = \begin{pmatrix} 7 \\ 5 \end{pmatrix}$$

$$\begin{pmatrix} 6+xy \\ 9+4y \end{pmatrix} = \begin{pmatrix} 7 \\ 5 \end{pmatrix}$$

$$6+xy = 7 \quad \text{--- (i)}$$

$$xy = 1$$

$$9+4y = 5 \quad \text{--- (ii)}$$

$$4y = -4$$

$$y = -1$$

$$\Rightarrow x(-1) = 1$$

$$x = -1$$

M1 matrix multiplication

M1

M1 both equations and solving.

A1

A1

04

✓ 2.

$$\text{No. of girls} = 30$$

$$\text{Av. mark} = 17$$

$$\text{Total mark} = 30 \times 17 = 510$$

B1

$$\text{Or } \frac{30 \times 17 + 50 \times 18.5}{80} \quad \text{B1 B1}$$

$$\text{No. of boys} = (80 - 30) = 50$$

$$\text{Av. mark} = 18.5$$

$$\text{Total marks} = 50 \times 18.5 = 925$$

B1

∴ Average Mark for the whole class

$$= \frac{510 + 925}{80} = \frac{1435}{8}$$

$$= 17.9375$$

M1 (for $\frac{510 + 925}{80}$)

A1 correct only (4 dp)

04

3. 1 2 3 3.

$$M = \frac{2P}{5} + \frac{7P+1}{4}$$

M1 correct use of lcm

2 4 6 6. 12
7 8

$$M = \frac{8P+35P+5}{20}$$

$$20M = 22 \times 2P + 20(7P+1)$$

M1

7 8 9 10 11
12 13 14

$$20M = 8P + 35P + 5$$

$$43P + 5 = 20M$$

M1

14 15 16 17
18 19 20

$$43P = 20M - 5$$

$$P = \frac{20M - 5}{43}$$

M1 collecting terms

A1

04

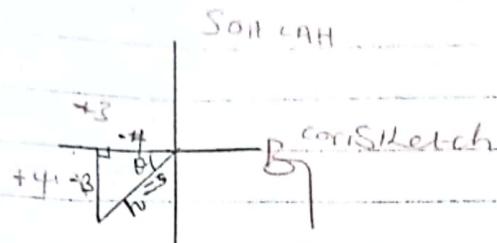
Q.N

SOLUTIONS

MARKS

REMARKS

4.



$$h^2 = (-4)^2 + (3)^2$$

$$h^2 = 25$$

$$h = 5 \quad \text{By (on sight)}$$

$$\sin \theta = -\frac{3}{5} \quad \sin \theta = \frac{4}{5}$$

$$\cos \theta = -\frac{4}{5} \quad \cos \theta = -\frac{3}{5}$$

$$\begin{aligned} 15 \cos \theta + 10 \sin \theta &= 15x - \frac{4}{5} + 10x - \frac{3}{5} \\ &= 15x + \frac{3}{5} + 10x - \frac{4}{5} \\ &= -12x + -6 \\ &= -18x - 9 + -8 \\ &= -17x \end{aligned}$$

M1

Pythagoras theorem

A1

5.

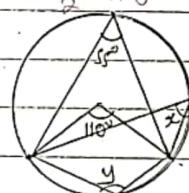
$$2x = 110^\circ \quad \text{Also} \quad x = \frac{1}{2} \times 110^\circ$$

$$x = 55^\circ$$

$$y + 55^\circ = 180^\circ$$

$$y = 125^\circ$$

$$y = \frac{1}{2}(360 - 110^\circ)$$



M1

A1

M1

corr substn.

A1

04

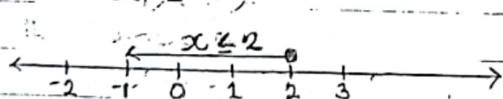
6.

$$2(5x-1) \geq 3(4x-2)$$

$$10x - 2 \geq 12x - 6$$

$$-2x \geq -4$$

$$x \leq 2$$



M1

Expansion

M1

collecting like terms for arranging the sign.

A1

Number line illustration.

04

7.

SOLUTIONS

MARKS

REMARKS

7.

$$3x+y=10 \quad \text{---(i)}$$

$$5x-2y=2 \quad \text{---(ii)}$$

$$\begin{array}{r} 2 | 3x+y=10 \\ 1 | 5x-2y=2 \\ \hline + \quad \quad \quad 6x+2y=20 \\ \quad \quad \quad 5x-2y=2 \\ \hline \quad \quad \quad 11x = 22 \\ \quad \quad \quad x = 2 \end{array}$$

Subst. 2 for x in (i):

$$3(2)+y=10$$

$$y=4$$

Note
Accept alternative
Methods and
award accordingly.

M1 2 correct multiplied
terms)
or substituting the expres
sion from Subject.

A1

M1 Substitution.

A1

04

8.

$$\frac{3n+2}{5} - \frac{2n-4}{3} = 1$$

$$3(3n+2) - 5(2n-4) = 15$$

$$9n+6 - 10n+20 = 15$$

$$-n = -11$$

$$n = 11$$

M1 correct use of LCM

M1 expansion

M1 collecting like terms/
simplifying

A1

04

9.

$$\frac{MN}{PQ} = \frac{MO}{QR}$$

$$\frac{3cm}{5cm} = \frac{MO}{4.8cm} \quad \text{B1 } M_1$$

$$MO = 4.8 \times \frac{3}{5} \text{ cm}$$

$$MO = 2.88 \text{ cm} \quad \text{A1}$$

(B1)

M1 Substitution

M1

A1

04

Signature

Subject Name (N 10)

Paper code /.....

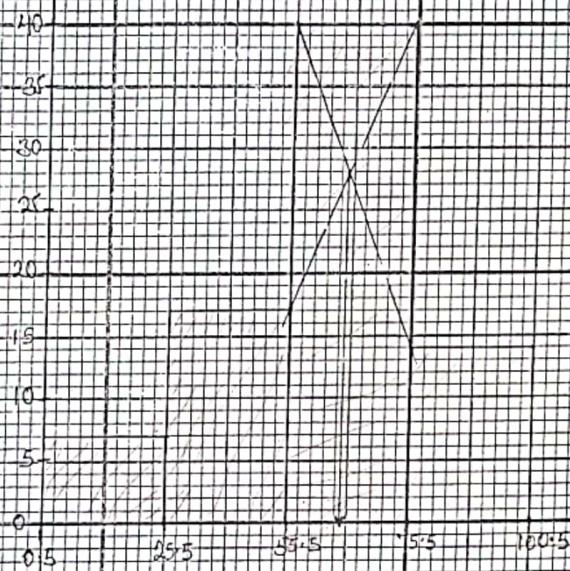
EXAMINER FMS

Personal Number

Marks	C/I/b	frequency
1-25	0.5-25.5	7
26-50	25.5-50.5	9
51-75	50.5-75.5	10
76-100	75.5-100.5	11

(frequency)

A HISTOGRAM



Modal mark = 66.75

B1 - for class boundaries

B1 - for both axes.

Well-labelled

B1 - for all terms

Correct

B1 - for locating
and stating
Modal mark

C/boundaries

C/I/b marks.

N.

11.

SOLUTIONS

MARKS: REMARKS

Distance walked = x km
Speed = 5 kmh^{-1}

Total distance = 6 km

$$t_1 = \frac{x}{5} \text{ hrs.}$$

B1

Distance ran = $(6-x)$ kmSpeed = 10 kmh^{-1}

$$t_2 = \left(\frac{6-x}{10}\right) \text{ hours.}$$

B1

Total time taken to cover 6 km = 7:30

$$- 6:42$$

$$\underline{0:48 \text{ min}}$$

B1

(Also on sight)

$$= \frac{48}{60}$$

B1

$$= \frac{4}{5} \text{ hours}$$

B1

$$\Rightarrow t_1 + t_2 = \frac{4}{5}$$

$$\frac{x}{5} + \frac{6-x}{10} = \frac{4}{5} \cdot \left(\frac{48}{60}\right)$$

M1

$$x+6 = 8$$

M1 Simplifying

$$x = 2 \text{ km}$$

Distance ran = $(6-2)$ km

$$= 4 \text{ km} \quad (\text{A0})$$

A1

(b) Time taken to walk 6 km;

$$t = \frac{6}{5} \text{ hrs}$$

B1

$$= 1 \text{ hour } 12 \text{ min.}$$

$$6:42$$

M1

$$+ 1:12$$

A1

$$\underline{7:54 \text{ am}}$$

Since the school closes the gates at 7:45 am

Katongole would be late by 7:54

$$- 7:45$$

M1

(on sight)

$$\underline{0:09 \text{ min}}$$

A1

∴ Katongole would be late by 9 minutes

12 marks

QN

SOLUTIONS

$$P = \begin{pmatrix} -2 & 3 \\ 5 & x \end{pmatrix}, Q = \begin{pmatrix} y & -z \\ -3 & 2 \end{pmatrix}; PQ = \begin{pmatrix} -7 & -4 \\ 16 & 5 \end{pmatrix}$$

$$\Rightarrow \begin{pmatrix} y & -z \\ -3 & 2 \end{pmatrix} \begin{pmatrix} -2 & 3 \\ 5 & x \end{pmatrix} = \begin{pmatrix} -7 & -4 \\ 16 & 5 \end{pmatrix}$$

$$\begin{pmatrix} -2y - 5z & 3y - zx \\ +6 + 10 & -9 + 2x \end{pmatrix} = \begin{pmatrix} -7 & -4 \\ 16 & 5 \end{pmatrix}$$

$$-9 + 2x = 5$$

$$2x = 14$$

$$x = 7$$

MARKS

REMARKS

M1 Substitution

M1 multiplication and output or signs formed

$$+ 3y - zx = -4$$

$$3y - 7z = -4 \quad * \quad \text{A1}$$

$$3 - 2y - 5z = -7$$

$$2 \quad 3y - 7z = -4$$

$$+ \quad -6y - 15z = -21$$

$$+ \quad 6y - 14z = -8$$

$$-29z = -29$$

$$z = 1$$

M1 Solving eqns Simultaneously

A1

06

Subst. 1 for z in eqn *:

$$3y - 7(1) = -4$$

$$3y = 3$$

$$y = 1$$

A1

b) i) $\begin{pmatrix} \text{Soda} & \text{Tea} & \text{Sandwich} & \text{Banana} \end{pmatrix}$

$$P \begin{pmatrix} 0 & 2 & 1 & 0 \end{pmatrix}$$

$$m \begin{pmatrix} 1 & 0 & 1 & 2 \end{pmatrix}$$

B₁

ii) 3 x 4 matrix

B₂

$$\begin{pmatrix} 500 \\ 400 \\ 100 \\ 200 \end{pmatrix}$$

B₃

$$P \begin{pmatrix} 1 & 0 & 1 & 1 \\ 0 & 2 & 1 & 0 \\ 1 & 0 & 1 & 2 \end{pmatrix} \begin{pmatrix} 500 \\ 400 \\ 100 \\ 200 \end{pmatrix}$$

M₁

core arrangement of matrices

$$\begin{pmatrix} 850 \\ 900 \\ 1000 \end{pmatrix} \begin{matrix} \text{Andrew} \\ \text{Peter} \\ \text{Kruska} \end{matrix}$$

-6-

$$(A|A)$$

correct matrix 3 names

SOLUTIONS

13(a) Let g represent no of green Mangoes

$$P(g) = \frac{g}{24} = \frac{1}{5}$$

$$g = 4$$

$$\text{No. of Yellow Mangoes} = (24 - 4) \\ = 20 \text{ Mangoes.}$$

MARKS

REMARKS

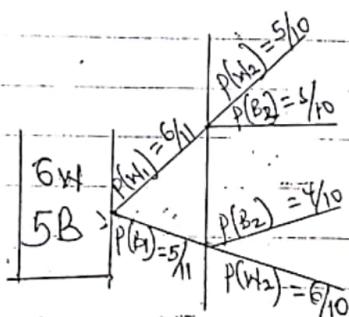
M1

A1

M1

A1

(b)



B3

B1 for each
correct branch.

(i) $P(\text{Same colour}) = P(W_1 \text{ and } W_2) \text{ or } P(B_1 \text{ and } B_2)$

$$= \left(\frac{6}{11} \times \frac{5}{10} \right) + \left(\frac{5}{11} \times \frac{4}{10} \right)$$

$$= \frac{30}{110} + \frac{20}{110}$$

$$= \frac{50}{110} = \frac{5}{11}$$

M1 M1

M1 - for substrn.

(M1) - for sum

(Mobile for (i) and (ii))

A1

(ii) $P(\text{different colours}) = P(W_1 \text{ and } B_2) \text{ or } P(B_1 \text{ and } W_2)$

$$= \left(\frac{6}{11} \times \frac{5}{10} \right) + \left(\frac{5}{11} \times \frac{6}{10} \right)$$

$$= \frac{30}{110} + \frac{30}{110}$$

$$= \frac{60}{110}$$

$$= \frac{6}{11}$$

M1

substrn.

A1

12

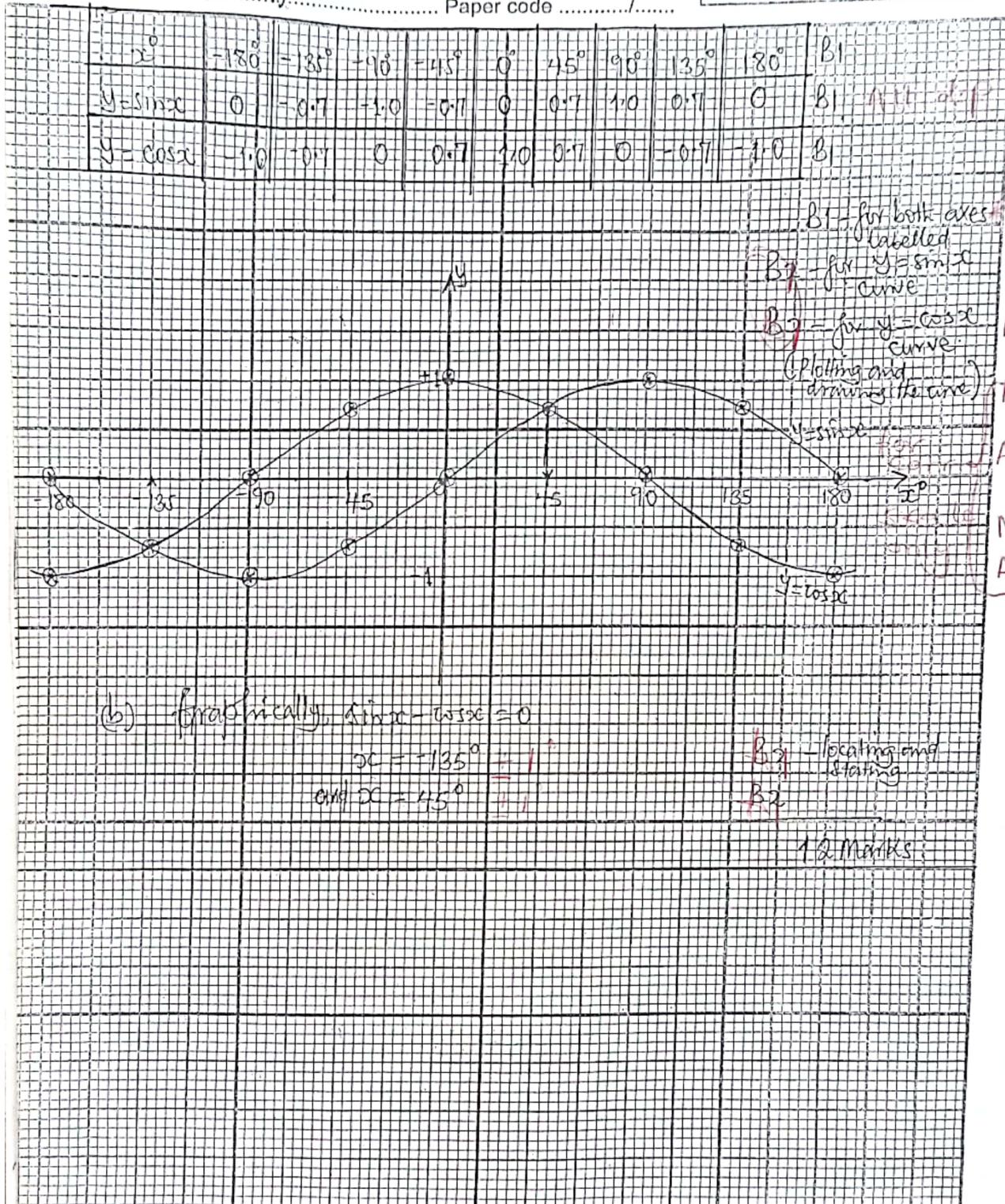
Signature

Subject Name Q.N. 14)

Paper code /.....

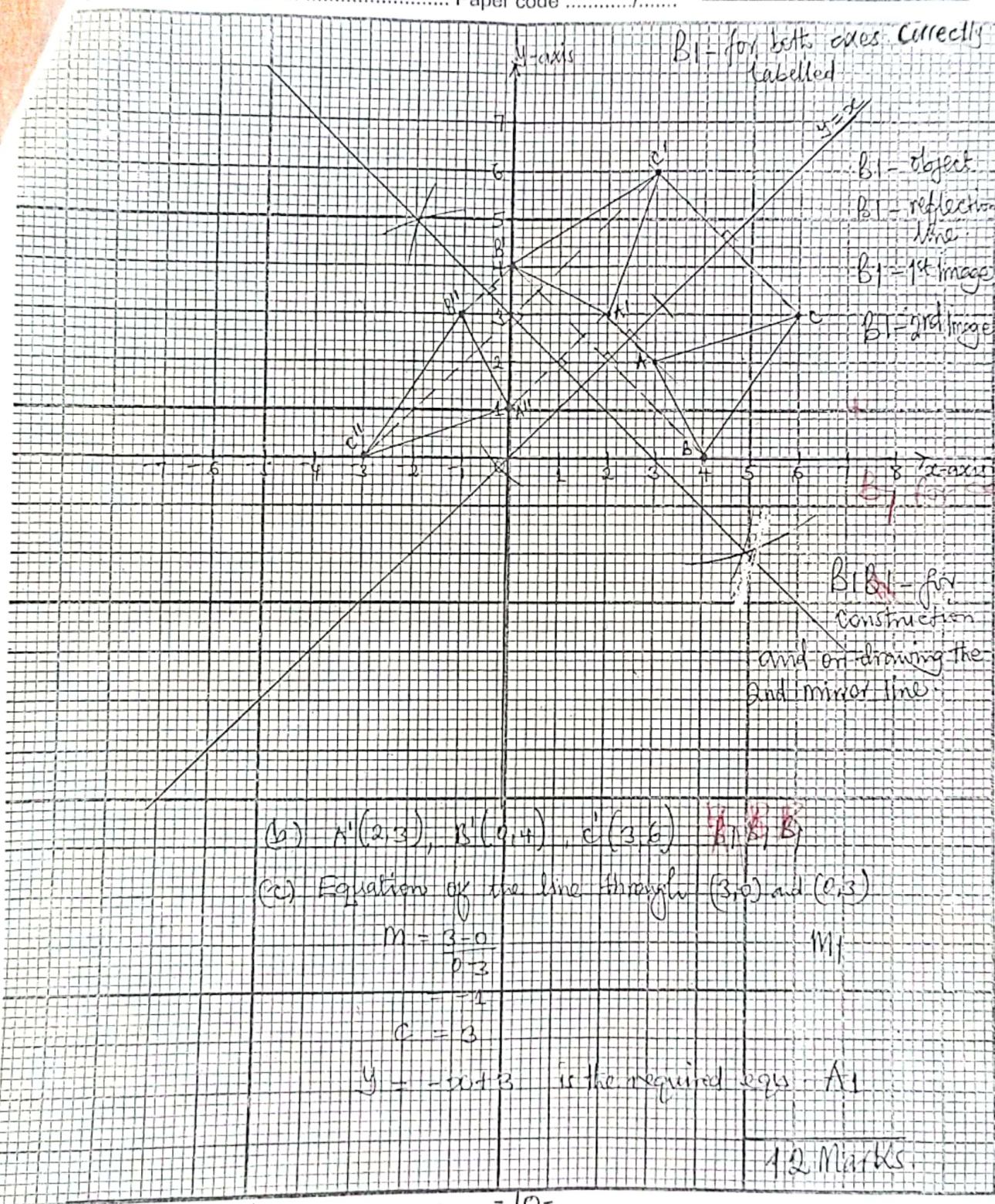
Examination No.

Personal Number



12 Marks

B1 for both axes & B1
labelledB1 for $y = \sin x$
curveB1 for $y = \cos x$
(Plotting and
Drawing the curve)M1 corr
plott
pointsA1 Smooth
curve.M1, Z } $y = \cos x$
A1]



Signature

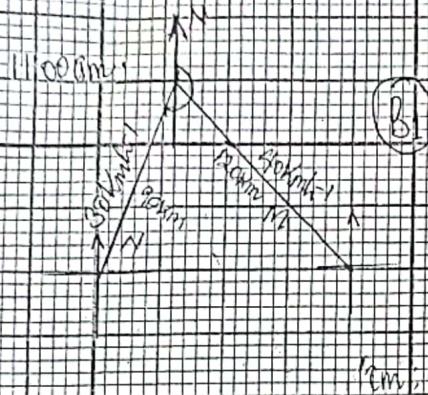
4N 16).

Subject Name

Paper code /

Random No. |

Personal Number |

Sketch

Time taken by N from 11:00am to 2:00pm

$$14:00 \text{ hrs} - 11:00 \text{ hrs}$$

$$= 3 \text{ hours}$$

(B1)

Distance covered by N

$$30 \text{ km/h} \times 3 \text{ hrs}$$

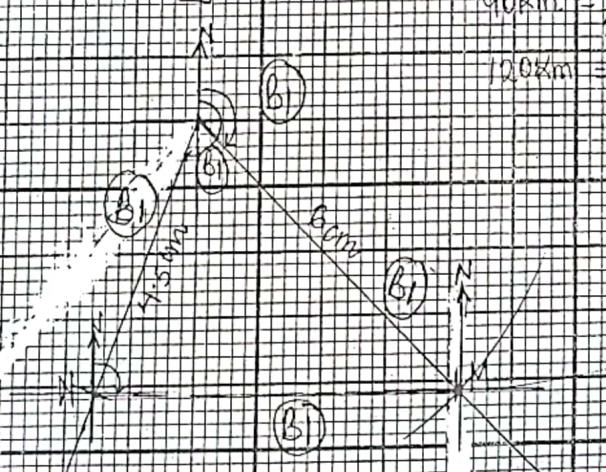
$$= 90 \text{ km}$$

(B1)

Distance covered by boat M

$$20 \text{ km/h} \times 3 \text{ hrs}$$

$$= 60 \text{ km} \quad (B1)$$

Accurate drawing

$$90 \text{ km} = 1 \times 90 = 4.5 \text{ cm}$$

20

(B1)

$$120 \text{ km} = 1 \times 120 = 6.0 \text{ cm}$$

20

(B1)

$$\text{Distance of M from N} = 5.8 \times 20 = 116 \text{ km}$$

(B1)

$$\text{Bearing of M from N} = 090^\circ \quad (B1)$$

(B1)

10 Marks

10 Marks

12 Marks

Object Name

Paper code/.....

$$40,000x + 25,000y \leq 200,000 \quad (i) \quad (B1)$$

$$8x + 5y \leq 40 \quad (ii) \quad (B1)$$

$$42x + 14y \geq 126 \quad (iii) \quad (B1)$$

$$3x + y \geq 9 \quad (iv) \quad (B1)$$

$$y > x \quad (v) \quad (B1)$$

$$x \geq 0 \quad (vi) \quad (B1)$$

$$y \geq 0 \quad (vii) \quad (B1)$$

(b) inequality Boundary line points

$$8x + 5y = 40 \quad (0, 8), (5, 0) \quad (B1)$$

$$3x + y = 9 \quad (0, 9), (3, 0) \quad (B1)$$

$$y = x \quad (0, 0), (1, 1) \quad (B1)$$

$$(c) C = 40,000x + 25,000y$$

(2, 3) is nearest to the origin (B1) (B1)

$$\therefore C = (40,000 \times 2) + (25,000 \times 3) \text{ on } y\text{-axis}$$

$$= \$155,000$$

12 Marks