

**ST. MARY'S GIRLS- RUNDA – APRIL HOLIDAY
ASSIGNMENT**

FORM 3

121/1

Paper 1

MATHEMATICS ALT A

APRIL 2024 - $2\frac{1}{2}$ hours

NAME.....ADM NO.....

SIGNATURE.....DATE.....

INSTRUCTION TO CANDIDATE'S:

1. Write your **name, index number** and **school** in the spaces provided above.
2. **Sign** and write the **date** of examination in spaces provided.
3. This paper consists of **two** Sections; **Section I** and **Section II**.
4. Answer all the questions in **Section I** and any **five** questions from **Section II**.
5. All answers and working must be written on the question paper in the spaces provided below each question.
6. Show all the steps in your calculation, giving your answer at each stage in the spaces provided **below** each question.
7. Marks may be given for correct working even if the answer is wrong.
8. Non-programmable silent electronic calculators and KNEC Mathematical tables **may be** used, except where stated otherwise.
9. Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.
10. Candidates should answer the questions in **English**
11. This paper consists of **14 printed pages**

FOR EXAMINER'S USE ONLY:

SECTION I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL

SECTION II

17	18	19	20	21	22	23	24	TOTAL

GRAND TOTAL

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SECTION I (50 marks)

*Answer **all** the questions in this section in the spaces provided.*

1. Evaluate $\frac{-4\{(-4+-15\div 5)+-3-4\div 2\}}{84\div -7+3--5}$ (3 marks)

2. Simplify completely the expression: $\frac{6x^2y^2-20xy+16}{2x^2y^2-8}$ (3 marks)

3. Given that $\sin (x + 60)^\circ = \cos (2x)$, find $\tan (x + 60)^\circ$ (3 marks)

4. A triangle whose vertices are P(1, 1), Q(2, 1) and R(1.5, 2) is first rotated about (0, 0) through 180° followed by an enlargement scale factor 3 with the centre at the origin. Find the co-ordinates of the vertices of the final image.
(4 marks)

5. List all the integral values of x that satisfy the inequalities; (3 marks)

$$x - \frac{3}{2} \leq 2x + 1 < 5$$

6. A bus travelling at an average speed of x km/h left station at 8.15 am. A car, travelling at an average speed of 80km/h left the same station at 9.00 am and caught up with the bus at 10.45 am. Find the value of x.
(3 marks)

7. Find the size of angle RPQ of a triangle PQR in which PQ = 9 cm, QR = 12 cm and RP = 6 cm
(3 marks)

8. Use squares, square roots and reciprocals tables to evaluate, to 4 significant figures, the expression:

$$\frac{1}{\sqrt{27.56}} + \frac{3}{(0.071)^2}$$

(3 marks)

9. From a point 20m away on a level ground the angle of elevation to the bottom of the window is 27° and the angle of elevation of the top of the window is 32° . Calculate the height of the window. (3 marks)

10. Solve for x in the equation: $3^{2x+1} + 4 \times 3^{2x+1} - 45 = 0$

(3 marks)

11. Three spacecrafts in different orbits go around the earth at intervals of 3, 6 and 7 hours respectively. An engineer at an observatory on earth first observes the three crafts cruising above one another at 6.35 a.m. At what time in a similar configuration if the all revolve around the earth from east to west?

(3 marks)

12. Simplify:

(3 marks)

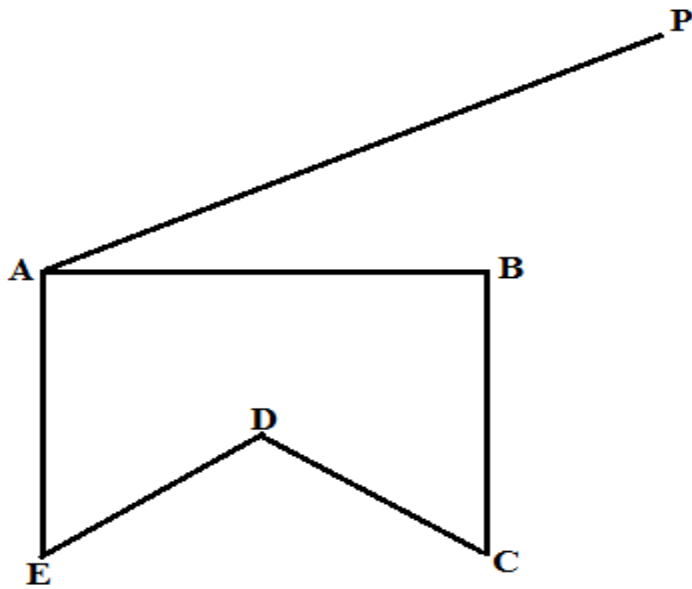
$$\left[\frac{x^3 - xy^2}{x^4 - y^4} \right]^{-1}$$

13. A piece of wire 18 cm long is to be bent to form a rectangle. If its length is x cm, obtain an expression for its area. Hence calculate the dimensions of the rectangle with maximum area from the expression
(4 marks)

14. The cost of providing a commodity consists of transport, labour and raw materials in the ratio 8:4:12 respectively. If the transport cost increases by 12%, labour cost by 18% and raw materials by 40%, find the percentage increase of producing the new commodity.
(3 marks)

15. Vector $\mathbf{OP} = 6\mathbf{i} + \mathbf{j}$ and $\mathbf{OQ} = -2\mathbf{i} + 5\mathbf{j}$. A point N divides \mathbf{PQ} in the ratio 3:-1. Find \mathbf{ON} in terms of \mathbf{i} and \mathbf{j} .
(3 marks)

16. In the figure below ABCDE is a cross-section of a solid ABCDEPQRST. The solid has a uniform cross-section. Given that AP is an edge of the solid, complete the sketch showing the hidden edges with a broken lines.
(3 marks)



SECTION II (50 Marks)

Answer only five questions from this section in the spaces provided.

17. A carpenter constructed a closed wooden box with internal measurements 1.5m long, 0.8m wide and 0.4m high. The wood used in constructing the box was 1.0cm thick and had a density of 0.6g/cm^3 .

a) Determine:-

(i) Volume of the wood used in constructing the box in cm^3 . (4 marks)

(ii) Mass of the box in kilograms. Give answer to one decimal place. (2 marks)

b) Identical cylindrical tins of diameter 10cm, height 20cm with a mass of 120g each, were packed into the box.

Calculate:-

i) the maximum number of the tins that can be packed. (2 marks)

ii) The total mass of box and the tins in kg. (2 marks)

18. Two friends Jane and Bob live 40 km apart. One day Jane left her house at 9.00 a.m. and cycled towards Bob's house at an average speed of 15 km/h. Bob left his house at 10.30 a.m. on the same day and cycled towards Jane's at an average speed of 25 km/h.

(a) Determine :

(i) The distance from Jane's house to where the two friends met. (4 marks)

(ii) The time they met. (2 marks)

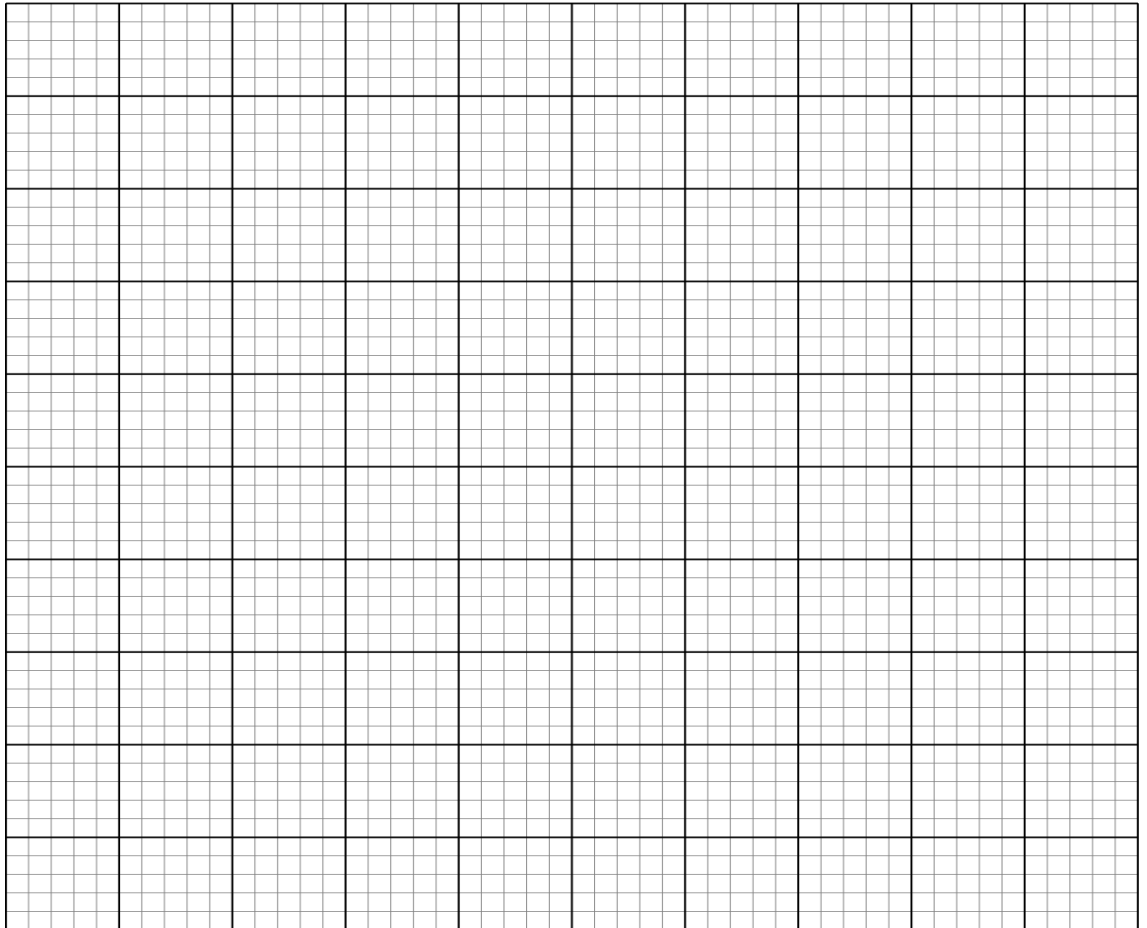
(iii) How far from Jane's house when they met. (2 marks)

(b) The two friends took 10 minutes at the meeting point and then cycled to Bob's house at an average speed of 12 km/h. Find the time they arrived at Bob's house. (2 marks)

19. The masses to the nearest kilogram of some students were recorded in table below.

Mass(kg)	41-50	51-55	56-65	66-70	71-85
Frequency	8	12	16	10	6
Height of rectangle					0.2

- a) Complete the table above to 1 decimal place. (2 marks)
- b) On the grid provided below, draw a histogram to represent the above information. (3 marks)



- c) Use the histogram to:
- i) State the class in which the median mark lies. (1 mark)
- ii) Estimate the median mark (2 marks)
- iii) The percentage number of students with masses of at least 74kg. (2 marks)

20. (a) a straight line L_1 whose equation is $9y - 6x = -6$ meets the x-axis at Z. Determine the coordinates of Z (2 marks)

(b) A second line L_2 is perpendicular to L_1 at Z. Find the equation of L_2 in the form $ax + by = c$, where ,b and c are integers. (3 marks)

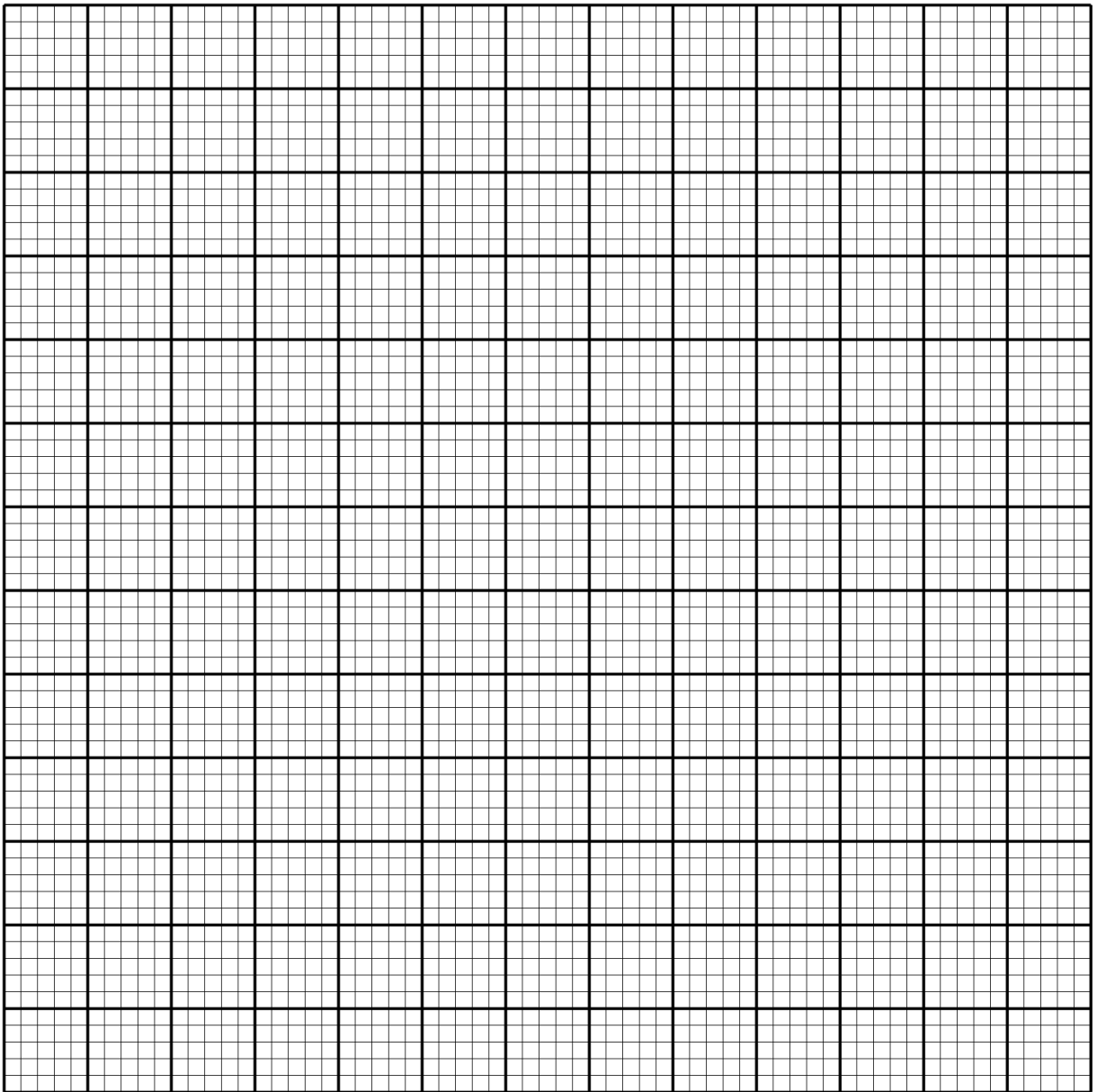
(c) a third line L_3 passes through the point (2,5) and is parallel to L_1 . Find:
i) The equation of L_3 in the form $ax + by = c$, where a, b and c are integers (2 marks)

ii) The coordinate of point R at which L_2 intersects L_3 . (3 marks)

21. (a) Complete the table below for the equation $y = 2x^2 + 3x - 11$ (2 Marks)

x	-4	-3	-2	-1	0	1	2	3
$2x^2$	32							
$3x$	-12							
-11	-11	-11	-11	-11	-11	-11	-11	-11
y			-9					16

(a) On the grid paper provided draw the graph of $y = 2x^2 + 3x - 11$ (3 Marks)



(b) On the same axes draw the graph of $y = 2x + 1$

(2 Marks)

(c) Use your graph to solve the quadratic

(i) $2x^2 + 3x - 11 = 0$

(1 Mark)

(ii) $2x^2 + x - 12 = 0$

(2 Marks)

22. Five points, P, Q, R, V and T lie on the same plane. Point Q is 53km on the bearing of 055° of P. Point R lies 162° of Q at a distance of 58km. Given that point T is west of P and 114km from R and V is directly south of P and $S40^{\circ}E$ from T.

- a) Using a scale of 1:1,000,000, show the above information in a scale drawing.
(3 marks)

b) From the scale drawing determine:

i) The distance in km of point V from R. (2 marks)

ii) The bearing of V from Q. (2 marks)

iii) Calculate the area enclosed by the points PQRVT in squares kilometers.
(3 marks)

23. Use a ruler and compass only for all the constructions in this question.

a) Construct a triangle XYZ in which $XY = 6\text{cm}$, $YZ = 5\text{cm}$ and angle $XYZ = 120^\circ$.

(2marks)

b) Measure XZ and angle YXZ.

(2 marks)

c) Construct the perpendicular bisector of XZ and let it meet XZ at M.

(1 mark)

d) Locate a point W on the opposite of XZ as Y and that $XW = ZW$ and $YW = 9\text{cm}$ and hence complete triangle XZW.

(2 marks)

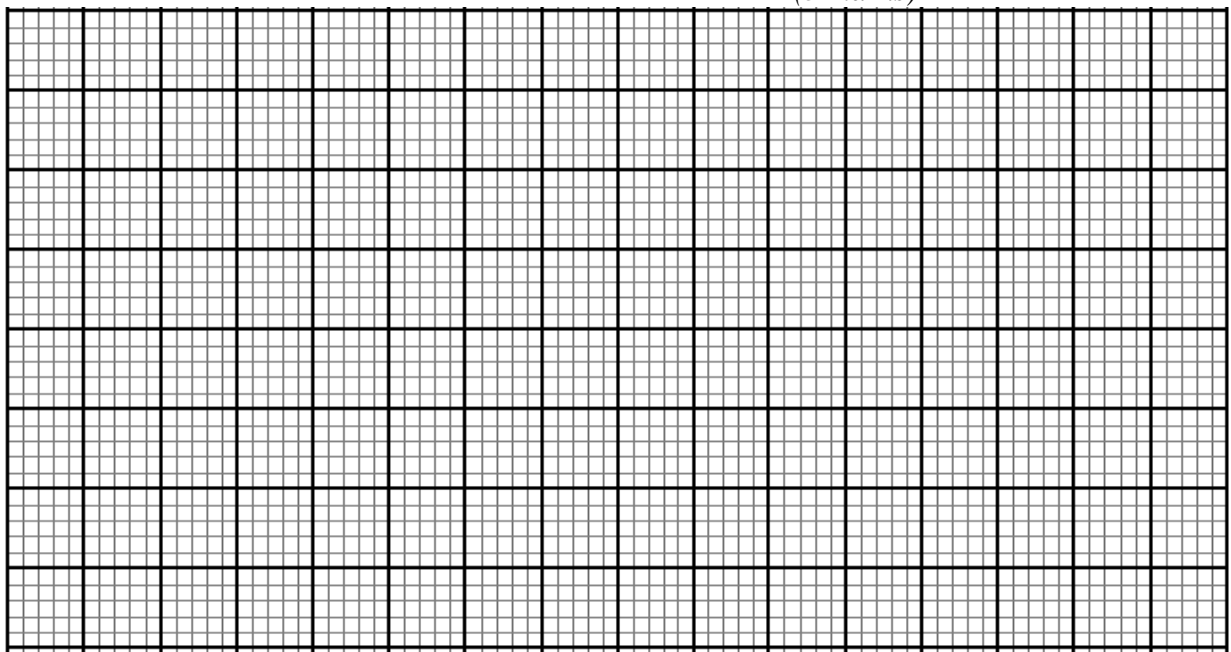
e) Measure WM and hence calculate the area of triangle XZW.

(3 marks)

24..a) Complete the table below for the functions of $y = 2 \sin \frac{1}{2}x$ and $y = \sin x$ to 2 d.p
(3 marks)

x°	0	90	180	270	360	450	540	630	720	810	900
$y = 2 \sin \frac{1}{2}x$											
$y = \sin x$											

(b) On the same axes, draw the graphs of $y = 2 \sin \frac{1}{2}x$ and $y = \sin x$ (use 2 units to represent one unit on the y- axis and 1 unit to represent 90° on the x axis)
(5 marks)



(c) Use the graph to solve the equation $\sin \frac{1}{2}x - \frac{1}{2} \sin x = 0$. (2 marks)