NAME _____ INDEX NO. _____

SIGNATURE _____

DATE _____

121/2
MATHEMATICS
PAPER 2
TIME: 2½ HOURS
JULY, 2017

KITUI COUNTY MOCK

END OF TERM II FORM FOUR EXAMINATION, 2017

Kenya Certificate of Secondary Education (K.C.S.E)

121/2
MATHEMATICS
PAPER 2
TIME: 2½ HOURS

INSTRUCTIONS TO CANDIDATES

a) Write your **name** and **index number** in the spaces provided above.
b) Sign and write the **date** of examination in the spaces provided above.
c) This paper consists of **two** sections, **section I** and section II.
d) Answer **ALL** the questions in **section I** and only **five** questions from **section II**.
e) **All** answers and working **must** be written on the question paper in the spaces provided below each question.
f) Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
g) Marks may be given for correct working even if the answer is wrong.
h) Non- programmable silent calculators and KNEC mathematical tables may be used except where stated otherwise.
i) This paper consists **16** printed pages.
j) Candidates should check the question paper to ascertain that all the papers are printed as indicated and that no questions are missing.

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	

SECTION I (50 MARKS)

Answer ALL the questions from this section.

1. Use logarithms to evaluate, (4 marks)

$$\sqrt[3]{\frac{45.3 \times 0.00697}{0.534}}$$

2. Make P the subject of the formula

$$d = \sqrt[3]{\frac{P}{q-P}}$$ (3 marks)

3. Find the circle centre and radius whose equation is

$3x^2 + 3y^2 + 18x - 6y + 18 = 0$ (3 marks)

4. The volumes of two similar cylindrical containers are $27cm^3$ and $64cm^3$ respectively. Given that the height of the smaller container is 12cm, find the height of the larger container. (2 marks)

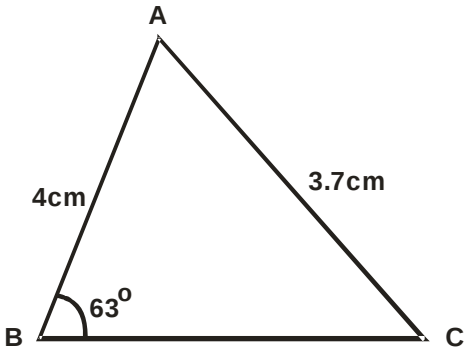
5. $3cm^3$ of water is added to $2cm^3$ of a certain medicine which costs sh.12 per cm^3.
The chemist sells the diluted medicine at sh.6 per cm^3. Calculate the percentage profit. (3 marks)

6. Given that $4y = 3\sin\frac{2}{5}$ for $0 < \theta < 360^o$. Determine

   a) The amplitude of the curve (1 mark)

   b) The period of the curve. (1 mark)

7. Find the length BC of the following triangle if AC = 3.7cm, AB = 4cm and angle ABC = 63°. (3 marks)

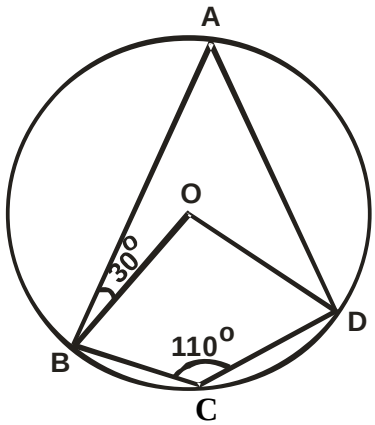


8. Solve for x in the equation

$27^{x-1} \times 3^{x+1} = 729$ (3 marks)

9. In the figure below ABCD is a cyclic quadrilateral. Point O is the centre of the circle.

∠ABO = 30° and ∠BCD = 110°.



Calculate the size of angle ADB. (2 marks)

10. Three people Mutua, Wanza and Kiilu contributed money to start a business. Mutua contributed a quarter of the money and Wanza two fifths of the reminder. Kiilu's contribution was one and a half times that of Mutua. They borrowed the rest of the money from a bank which was sh.60,000 less than Kiilu's contribution. Find the total amount required to start the business. (4 marks)

11. Simplify $\frac{\sqrt{3}}{\sqrt{3}-\sqrt{2}}$ (3 marks)

12. Expand $\left(2-\frac{1}{4}x\right)^5$ and use the first three terms to find the value of 1.975^5 to four significant figures.

(4 marks)

13. The radius of a spherical ball is measured as 7cm correct to the nearest centimeter. Determine to 2 decimal places, the percentage error in calculating the surface area of the ball. (3 marks)

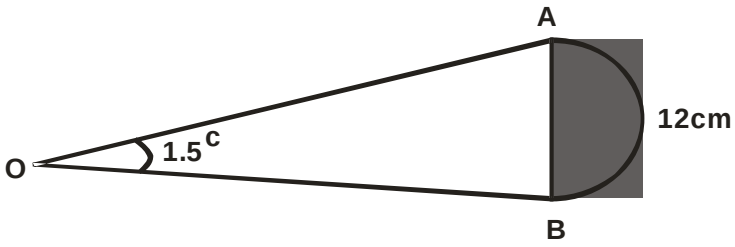
14. Given that $\tan\theta = \frac{1}{\sqrt{5}}$ where θ is an acute angle, find without using tables or calculator $\sin(90-\theta)$ leaving your answer in the simplified surd form. (4 marks)

15. Given that a = 1.2, b = 0.02 and c = 0.2, express ac ÷ b in the form $\frac{m}{n}$ where m and n are integers.

(3 marks)

16. The diagram below shows sector AOB of a circle centre O.

$\angle AOB = 1.5^C$ and arc AB is of length 12cm.



a) Determine the radius OA of the circle. (1 mark)

b) Calculate the area of the shaded region. Give your answer correct to 3 s.f. (3 marks)

SECTION II (50 MARKS)

Answer any FIVE questions from this section

17. The table below shows the taxation rates.

Income (£ per month)	Rate %
0 – 382	10
383 – 754	15
755 – 1126	20
1127 – 1498	25
1499 – 1870	30
1871 – 2242	35
Over 2242	40

Mueni is housed by her employer but pays a nominal rent of sh.1200 per month. She is entitled to a personal relief of sh.950 per month. If her monthly P.A.Y.E is sh.7024,

a) Calculate her gross income. (5 marks)

b) In addition to the tax the following monthly deductions are also made

Sacco shares	Ksh. 1200
Coop loan	Ksh.1500
Union dues	Ksh.300

Calculate

i) Her monthly salary. (3 marks)

ii) Net monthly salary (2 marks)

18. Use a ruler and compasses only for all construction in this question.

a) Construct a triangle ABC in which AB = 8cm, BC = 7.5cm and $\angle ABC = 112\frac{1}{2}^{o}$. (3 marks)

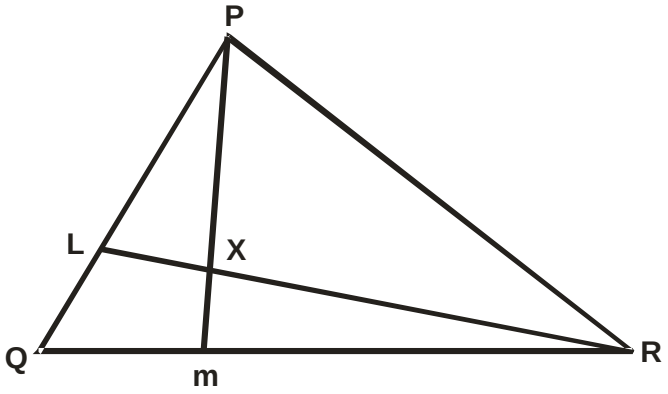
b) Measure the length of AC. (1 mark)

c) By shading the unwanted region show the locus of P within the triangle ABC such that AP ≤ BP, AP > 3cm. Mark the required region as P. (3 marks)

d) Construct a normal from C to meet AB produced at D. (1 mark)

e) Locate the locus of R in the same diagram such that the arc of triangle ARB is $\frac{3}{4}$ the arc of the triangle ABC. (2 marks)

19. In the triangle PQR below, L and M are points on PQ and QR respectively such that PL : LQ = 1 : 3 and Qm : mR = 1 : 2. Pm and RL intersect at X. Given that $\underset{\sim}{PQ} = \underset{\approx}{b}$ and $\underset{\sim}{PR} = \underset{\approx}{c}$



a) Express the following vectors in terms of $\underset{\approx}{b}$ and $\underset{\approx}{c}$.

i) $\underset{\sim}{QR}$ (1 mark)

ii) $\underset{\sim}{Pm}$ (1 mark)

iii) $\underset{\sim}{RL}$ (1 mark)

b) By taking $\underset{\sim}{PX} = h\underset{\sim}{Pm}$ and $\underset{\sim}{RX} = k\underset{\sim}{RL}$ where h and k are constants. Find two expressions of $\underset{\sim}{PX}$ in terms of h, k, $\underset{\approx}{b}$ and $\underset{\approx}{c}$. Hence determine the values of the constants h and k. (6 marks)

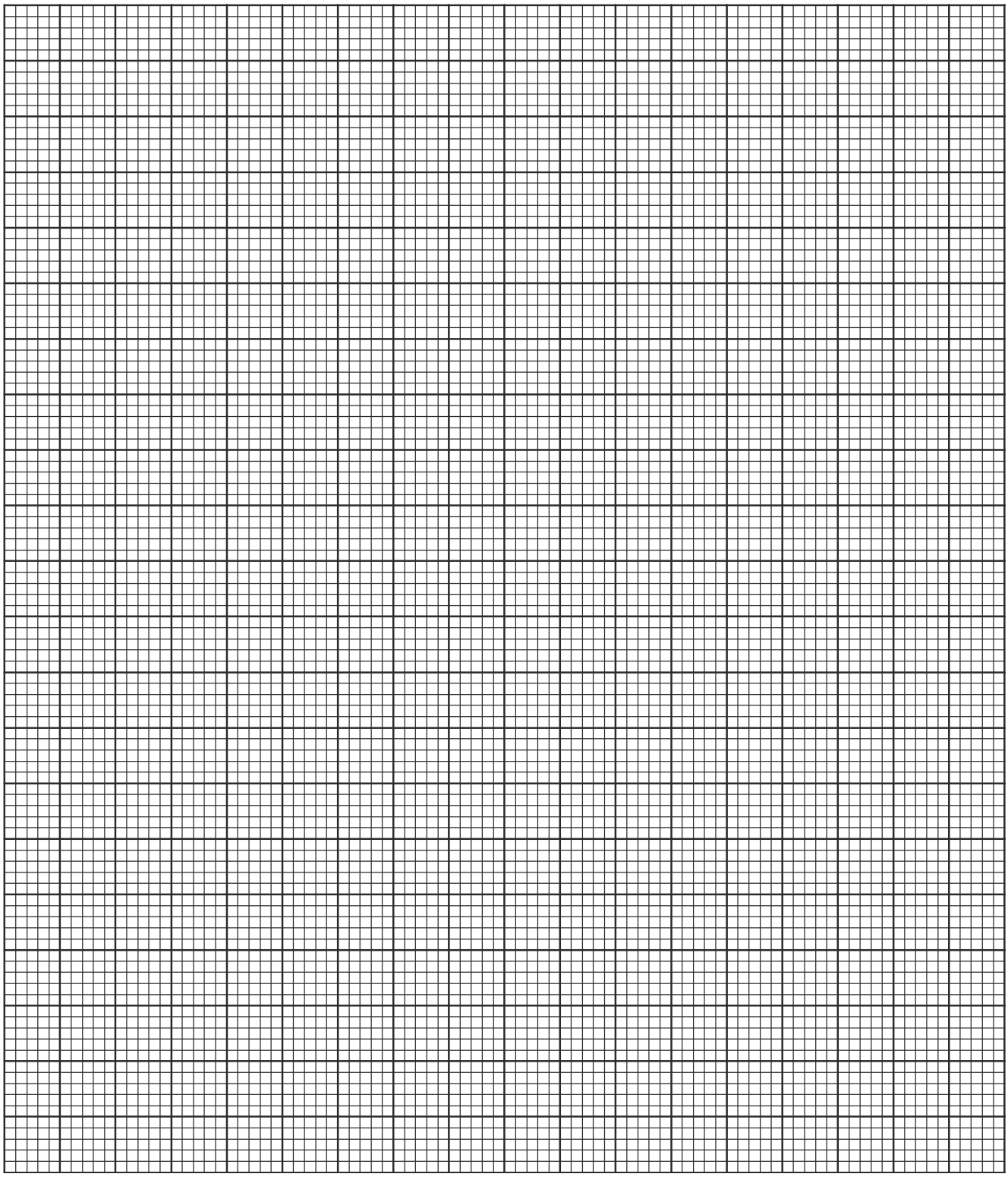
c) Determine the ratio $\underset{\sim}{LX} : \underset{\sim}{XR}$. (1 mark)

20. OABC is a parallelogram with vertices O(0, 0), A(2, 0), B(3, 2) and C(1, 2).

$O^IA^IB^IC^I$ is the image of OABC under a transformation matrix $\begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}$.

a) i) Find the coordinates of $O^IA^IB^IC^I$ (2 marks)

ii) On the graph provided, draw OABC and $O^IA^IB^IC^I$ (2 marks)



b) i) Find $O^{II}A^{II}B^{II}C^{II}$, the image of $O^{I}A^{I}B^{I}C^{I}$ under the transformation matrix $\begin{pmatrix} 1 & 0 \\ 0 & -2 \end{pmatrix}$. (2 marks)

ii) On the same grid, draw $O^{II}A^{II}B^{II}C^{II}$. (1 mark)

c) Find the single matrix that maps $O^{II}A^{II}B^{II}C^{II}$ onto OABC. (3 marks)

21. An aircraft leaves town P (30°S, 17°E) and moves directly towards Q (60°N, 17°E). It then moved at an average speed of 300 knots for 8 hours Westwards to town R. Determine

a) The distance PQ in nautical miles. (2 marks)

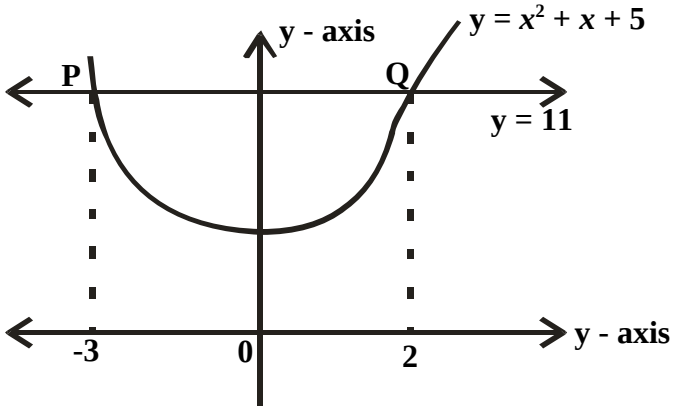
b) The position of town R. (4 marks)

c) The local time at R if local time at Q is 3.12p.m (2 marks)

d) The total distance moved from P to R in kilometers. (Take 1nm = 1.853km) (2 marks)

22. The figure below is a sketch of a curve whose equation is $y = x^2 + x + 5$.

It cuts the line $y = 11$ at points P and Q.

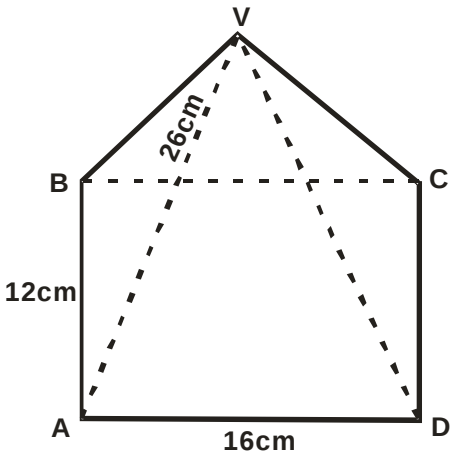


a) Find the area bounded by the curve $y = x^2 + x + 5$ and the line $y = 11$ using the trapezium rule with 5 strips. (5 marks)

b) Calculate the difference in the area if the mid-ordinate rule with 5 ordinates was used instead of the trapezium rule. (5 marks)

23. The figure below represents a rectangular based pyramid VABCD. AB = 12cm and AD = 16cm.

Point O is vertically below V and VA = 26cm.



Calculate:

a) The height, VO, of the pyramid. (4 marks)

b) The angle between the edge VA and the plane ABCD. (3 marks)

c) The angle between the planes VAB and ABCD. (3 marks)

24. The distances S metres from a fixed point O, covered by a particle after t seconds is given by equation $S = t^3 – 6t^2 + 9t + 5$

a) Calculate the gradient to the curve at t = 0.5 seconds. (3 marks)

b) Determine the values of S at the maximum and minimum turning points of the curve. (4 marks)

c) On the space provided, sketch the curve of $S = t^3 – 6t^2 + 9t + 5$. (3 marks)