

END-TERM EXAMINATIONS – TERM TWO

121/2- MATHEMATICS ALT. A

Paper 2

FORM 3

Time - 2½ Hours



Name: **Adm No:**

School: **Class:**

Candidate's Signature: **Date:**

INSTRUCTIONS TO CANDIDATES

- (a) Write your name, admission number, school and class in the spaces provided at the top of this page.
- (b) Sign and write the date of the examination in the spaces provided above.
- (c) This paper consists of **two** sections: **Section I** and **Section II**.
- (d) Answer **ALL** questions in **Section I** and **all** the questions from **Section II**.
- (e) Show **all the steps** in your calculations, giving your answers at each stage in the spaces provided below each question.
- (f) Marks may be given for correct working even if the answer is wrong.
- (g) **Non-programmable** silent electronic calculators and KNEC Mathematical Tables may be used.
- (h) Candidates should check the question paper to ensure that all, the pages are printed as indicated and no questions are missing.

For Examiners' 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 1: (50 MARKS) ANSWER ALL QUESTIONS

Answer all questions in this section in the spaces provide.

1. Use logarithms to evaluate to 4 significant figures

(3 marks)

$$\frac{(0.5241)^2 \times 83.59}{\sqrt[3]{0.23 + 0.126}}$$



2. The height of a cone is exactly 12cm. Calculate the percentage error in the volume if the radius is 7cm correct to the nearest centimeter. (3 marks)



3. Make h the subject of the formula

(3 marks)

$$V = \sqrt[3]{\frac{ax^2h}{b-h}}$$

4. **Z** is directly proportional to x^2 and inversely proportional to y . If x is increased by 20% and y is decreased by 20%. Find the percentage change in **Z**. (3 marks)

5. Given that $\vec{OA} = 3\vec{i} + 2\vec{j} - 4\vec{k}$ and $\vec{OB} = 4\vec{i} + 5\vec{j} - 2\vec{k}$ and a point **P** divides line **AB** externally in the ratio 3:2, determine the magnitude of **OP** to 2 decimal places (3 marks)



6. Given that $2\cos(2x - 30^\circ) = -\frac{6}{5}$ find x where $180^\circ \leq x \leq 360^\circ$ (3 marks)

7. Irene buys a printer on hire purchase. She pays a deposit of sh.4000 and 12 monthly installments of sh.1500 each. Calculate the cash price if a compound interest of 5% per month is charged on the amount borrowed.

(3 marks)



8. Find the value of x in the equation

$$\log(15 - 5x) - \log(3x - 2) - 2 = 0$$

(3 marks)



9. Rationalize the denominator and simplify

(3 marks)

$$\frac{4}{\sqrt{5} + \sqrt{2}} - \frac{3}{\sqrt{5} - \sqrt{2}}$$

10. Given that $\mathbf{A} = \begin{bmatrix} 1 & 0 & 1 \\ 3 & 0 \end{bmatrix}$ and $\mathbf{B} = \begin{bmatrix} 4 & 2 \\ 9 & 6 \end{bmatrix}$

Find $\mathbf{A}^{-1}\mathbf{B}$

(3 marks)



11. Solve the equation $2x^2 + 3x = 5$ by completing the square method.

(3 marks)



12. The number of birds in a sanctuary was originally 1.2million. Due to a mysterious diseases this number halved itself after every one week. Determine the number of birds remaining in the sanctuary at the end of the 5th week.

(3 marks)

13. Simplify the expression

$$\frac{3x^2 - 4xy + y^2}{9x^2 - y^2}$$

(3 marks)



14. Construct triangle PQR with PQ = 5.8 cm, QR = 3.4 cm and PR = 4.1 cm. Construct a circle passing through P, Q and R. Measure its radius (4 marks)



15. The cost of an article is sh. 1,200. Find the rate of inflation if the cost of the article after 5 years is sh. 1,932.60. (3 marks)

16. The product of the third and fourth terms of an arithmetic sequence is 3000. Find the first term if the common difference is 10. (3 marks)



SECTION II: (50 MARKS) ANSWER FIVE QUESTIONS ONLY

Answer any five questions from this section in the spaces provided after each.

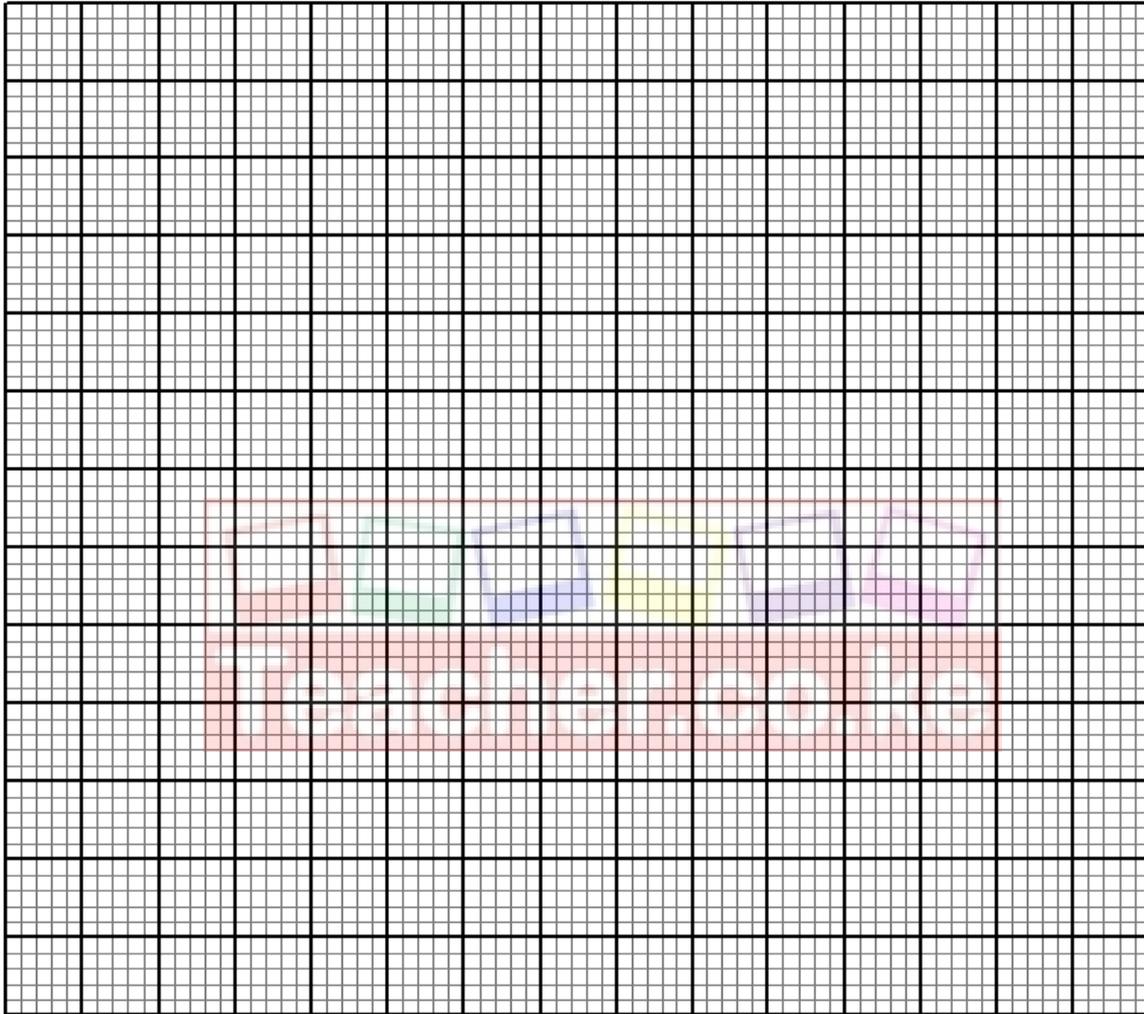
17. (a) Complete the table below for the function $y = 2x^2 + 4x - 3$

(2 marks)

X	-4	-3	-2	-1	0	1	2
$2x^2$	32		8	2	0	2	
$4x-3$			-11		-3		
Y			-3			3	13



(b) Draw the graph of the function $y = 2x^2 + 4x - 3$ on the grid provided. Use the scale: 2cm rep 1 unit on the x-axis and 1cm rep 2 units on the y-axis. (3 marks)



(c) Use your graph to estimate the roots of the equation $2x^2 + 4x - 3 = 0$

(1 mark)

(d) Use your graph to obtain the roots of the equation $2x^2 + x - 5 = 0$ to 1 decimal place.

(3 marks)

(e) Draw the line of symmetry to pass through the turning point of this curve.

(1 mark)



18. The table below shows how income tax was charged on income earned in a certain year.

Taxable income per year(Kenyan shillings)	Rate
1-72,600	10%
72,601- 145,200	15%
145,201 -217,800	20%
217,801 - 290,400	25%

Mr. Mwangula is an employee of a certain company and earns a salary of ksh.15,200 per month. He is housed by the company and pays a nominal rent of Ksh. 1050 per month. He is married and is entitled to a family relief of ksh. 450 per month.

i. Calculate his taxable income in Ksh p.a

(2 marks)

ii. Calculate his gross tax per month.

(4 marks)



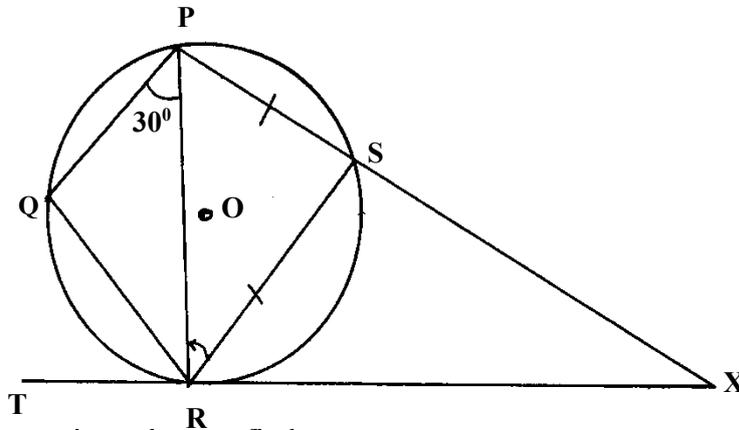
iii. Calculate his net tax per month

(2 marks)

iv. Calculate his net salary per month

(2 marks)

19. The figure below is a cyclic quadrilateral PQRS. Given that TRX is a tangent at R and O is the centre of the circle and that PSX is a straight line. Angle PRS = 50° and angle QPR = 30° and chord RS = PS.



(a) Giving reason in each case, find;

(i) Angle SRX

(2mks)

(ii) Angle RXS

(2mks)

(iii) Angle PQR

(2mks)

(iv) Reflex angle QOR

(2mks)

(b) Given that $RX = 12\text{cm}$, $SX = 8\text{cm}$, find the length of chord PS

(2mks)

20. The first term of a **G.P** is 1 while the first term of an **AP** is 4. The third term of the **G.P** is the first term of the **AP**. The ratio of the common difference to the common ratio of the progression is 3:2 the (Common ratio is greater than 0). Find;

(a) The common ratio of the **G.P** and common difference of the **A.P** (4mks)

(b) The fifth term of the **A.P** (2mks)

(c) The 6th term of the **G.P** (2mks)

(d) The sum of the first four terms of the **G.P**. (2mks)



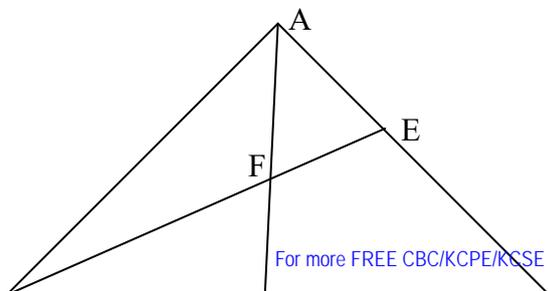
(c) Use your graphs to solve:

(I) $3 \sin (2x - 30)^\circ = 0$ (1 mark)

(II) $\cos (x + 60)^\circ = 0$ (1 mark)

(III) $3 \sin (2x - 30)^\circ - \cos (x + 60)^\circ = 0$ (1 mark)

22. In the figure below, E is the midpoint of AB, OD:DB=2:3 and f is the point of intersection of OE and AD.



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O D B

Given $\mathbf{OA} = \mathbf{a}$ and $\mathbf{OB} = \mathbf{b}$

a) Express in terms of \mathbf{a} and \mathbf{b}

i. \mathbf{AD}

(1 mark)

ii. \mathbf{OE}

(2 marks)

b) Given that $\mathbf{AF} = s\mathbf{AD}$ and $\mathbf{OF} = t\mathbf{OE}$ find the values of s and t

(5 marks)



c) Show that E, F and O are collinear.

(2 marks)

23. (a) A quantity P varies directly as the cube of Q and inversely as the square root of R . When $P = 189$, $Q = 6$ and $R = 16$. (i) Determine the value of P when $Q = 8$ and $R = 25$. (3 marks)

- (ii) Find the percentage change in Q when P is increased by 15% and R is decreased in the ratio 4:5.
(3 marks)

- (b) The charge C shillings per person for a seminar in a hotel is partly fixed and partly varies inversely as the total number of persons attending the seminar. When 100 people attend, the charge is Ksh 2 036 per person while when 80 people attend, the charge is Ksh 2 045 per person. Calculate the charge per person when 200 people attend the seminar.
(4 marks)

24. In an n -sided polygon, two angles are right angles and each of the remaining angles is 150° .

a) Find the value of n hence the sum of interior angles of this polygon.

(4 marks)



b) Name the polygon.

(1 mark)

c) Find the area of a regular octagon of sides 4cm to 5 s.f.

(5 marks)



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