

Name.....Index No...../.....

121/2

MATHEMATICS

Candidate's Signature.....

Paper 2

Date.....

2 ½ Hours

LANY ACHIEVERS JOINT EXAMINATION FORM 4 TERM 2 2018

Instructions to Candidates

1. Write your name and index number in the spaces provided above.
2. Sign and write the date of examination in the spaces provided above.
3. This paper consist **TWO** sections: section **I** and section **II**.
4. Answer all the questions in section **I** and **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 calculations, giving your answers at each stage in the spaces below each question.**
7. **Non-programmable** silent calculators and KNEC mathematical tables $\sqrt{\quad}$ may be used, except where stated otherwise.
8. *Candidates should check the question paper to ascertain that all the pages 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**

This paper consist of 15 printed pages

SECTION I (50MKS) Answer ALL the questions in this section in the spaces provided

1. If $\frac{\sqrt{3} - 2\sqrt{2}}{3\sqrt{2} + \sqrt{3}} = a\sqrt{b} + c$,

Find the values of a, b and c.

(3mks)

2. Make n the subject of the formula;

(3mks)

$$m = \frac{ax^2n}{w-n}^{1/3}$$

3. Find the constant term in the expansion;

(3mks)

$$2y + \frac{1}{y}^4$$

4. Given that $P = \begin{pmatrix} 3 & -2 \\ 0 & 2 \end{pmatrix}$ and $E = \begin{pmatrix} 6 & 0 \\ 0 & 6 \end{pmatrix}$

Find the constant K for which $P^2 + E = KP$. (3mks)

5. The n th term of a geometric progression is given by $2(1.5)^{n-1}$ for all intergral values of n . Find the common ratio and the sum of the first five terms. (3mks)

6. In triangle xyz , $xy = 7\text{cm}$, $yz = 9\text{cm}$ and $\angle xyz = 75^\circ$, calculate the length of xz and the size of $\angle yxz$. (3mks)

7. A chord AB subtends an angle of 120° at the centre of the circle as shown below.

Given that the length of the chord is 16cm, calculate the area of the minor segment. (3mks)

8. The first, the third and the seventh terms of an increasing arithmetic progression are three consecutive terms of a G.P. If the first term of the A.P is 10, find the common difference of the A.P. (3mks)

9. The points P(-6,-4) and Q(2,2) are the end points of the diameter of a circle.
(a) Find the coordinates of the centre of the circle. (1mk)

(b) Hence find the equation of the circle giving your answer in the form;
 $ax^2 + by^2 + cx + dy + k = 0$ (2mks)

10. Find the equation of the normal to the curve. (3mks)
 $y = x^2 + 3x + 1$ at (2, 11)

11. Solve for Θ in the equation; (3mks)
 $6\cos^2 \Theta - \sin \Theta - 4 = 0$ in the range $0^\circ \leq \Theta \leq 180^\circ$

12. There are two grades of the coffee, grades x and y. Grade x costs sh.160 per kg while grade y costs sh.120 per kg. In what ratio must the two be mixed in order to produce a blend worth sh. 150 per kg? (3mks)
13. A city P is (30°N, 31°E). Another city Q is located a distance of 4365 nautical miles East of P. Find the position of Q. (3mks)
14. If $(5x+6y):2x+10y = 22:10$, find x:y. (2mks)

15. (a) Your school is to participate in the County ball games finals. The probability of winning football and volleyball is $\frac{2}{3}$ and $\frac{1}{4}$ respectively. Find the probability of winning atleast one game. (3mks)

- (b) Solve the equation; (3mks)
 $3\sin(2x-50^\circ) = -1.5$ where $0^\circ \leq x \leq 360^\circ$.

16. Given the column vectors

$$\mathbf{a} = \begin{pmatrix} 1 \\ -2 \\ 1 \end{pmatrix} \quad \mathbf{b} = \begin{pmatrix} 6 \\ -3 \\ 9 \end{pmatrix} \quad \mathbf{c} = \begin{pmatrix} 3 \\ 2 \\ 3 \end{pmatrix}$$

and that $\mathbf{P} = 2\mathbf{a} - \frac{1}{3}\mathbf{b} + \mathbf{c}$

Express P as a column vector and hence calculate its magnitude to 3 significant figures. (3mks)

SECTION II (50 marks)

Answer any six questions in this section in the spaces provided

17. Mr. Mutuku is a civil servant and his PAYE amounts to K£ 180 per month after getting a tax relief of K£ 50 in the same month.

(a) Calculate his total tax in Ksh. per annum before the relief. (4mks)

(b) Using the table below, calculate his taxable income per annum in Kenya shillings. (3mks)

Income (K£ p.a.)	Rate (sh. per pound)
1 – 5808	2
5809 – 11280	3
11281 – 16752	4
16753 – 22224	5
22224 and over	6

(c) If every month he gets a house allowance of Ksh. 12,000, medical allowance of Ksh. 3,500 and a commuter allowance of Ksh. 1,200, calculate his basic salary per month. (3mks)

18. Draw the graph of $y = x^3 - 2x^2 - 9x + 8$ for $-4 \leq x \leq 5$. Use the graph to solve the equation $x^3 - 2x^2 - 18x = 0$. (10mks)

19. The coordinates of the vertices of rectangle ABCD are A(1,1), B(6,1), C(6,4) and D(1,4).
(a) (i) Find the coordinates of the vertices of its image A'B'C'D' under the transformation defined by the matrix.

(3mks)

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

- (ii) Draw the object and its image on the same grid. (3mks)

- (iii) On the same grid draw the image A''B''C''D'' of A'B'C'D' under the transformation given by

$$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$$

(2mks)

- (b) Find a single matrix which will map A''B''C''D'' onto ABCD. (2mks)

20. The following table shows the distribution of marks obtained by 50 students.

Marks	45-49	50-54	55-59	60-64	65-69	70-74	75-79
No. of students	3	15	13	9	4	1	5

(a) By using an assumed mean of 60, calculate:

(i) The mean mark

(4mks)

(b) The variance

(4mks)

(c) The standard deviation.

(2mks)

21. A certain uniform supplier is required to supply two types of shirts: one for girls labeled G and the other for boys labeled B. The total number of shirts must not be more than 400. He has to supply more of type G than of type B. However the number of type G shirts must not be more than 300 and the number of type B shirts must not be less than 80. By taking x to be the number of type G shirts and y the number of type B shirts,
- (a) Write down in terms of x and y all the inequalities representing the information above. (4mks)

- (b) On the grid provided draw the inequalities and shade the unwanted regions. (4mks)

- (c) Given that type G costs Shs. 500 per shirt and type B costs Shs. 300 per shirt
- (i) Use the graph in (b) above to determine the number of shirts of each type that should be made to maximize profit. (1mk)
- (ii) Determine the maximum profit (1mk)

22. The figure below is a triangle OPQ in which $OP = \mathbf{p}$ and $OQ = \mathbf{q}$. M and N are points on OQ and OP respectively such that $ON:NP = 1:3$ and $OM:MQ = 2:1$

- (a) Express the following vectors in terms of \mathbf{p} and \mathbf{q} .
- (i) PM (1mk)
- (ii) QN (1mk)
- (iii) PQ (1mk)
- (b) Lines PM and QN intersect at X such that $PX = hPM$ and $QX = kQN$. Express OX in the two different ways and find the value of h and k. (6mks)

- (c) OX is produced meets PQ at Y, such that $PY:YO = 3:2$. Find OY in terms **p** and **q**. (1mk)

23. Complete the table below, giving the values correct to 2 decimal places. (2mks)

x°	0	30	60	90	120	150	180	210	240	270	300	330	360
Sin 2x	0		0.87		- 0.87		0	0.87	0.87				0
$3 \cos x - 2$	1	0.6			-3.5			- 4.60			- 0.5		1

- (b) On the grid provided, draw the graphs of $y = \sin 2x$ and $y = 3\cos x - 2$ for $0^\circ \leq x \leq 360^\circ$ on the same axis. Use a scale of 1cm to represent 30° on the x-axis and 2cm to represent 1 unit on the y-axis. (5mks)

(c) Use the graph in (b) above to solve the equation; $3\cos x - \sin 2x = 2$. (2mks)

(d) State the amplitude of $y = 3\cos x - 2$.
(1mk)

24. (a) A die and a coin (both fair) are thrown on a horizontal floor.

(i) List all the possible outcomes. (2mks)

(ii) Find the probability of getting even number on the die and a tail on the coin or an odd number on the die and a head on the coin. (3mks)

(iii) Find the probability of getting a number greater than or equal to 3 on the die and a head on the coin. (2mks)

(b) The probability that a student gets grade A in mathematics is $\frac{9}{10}$. If she gets grade A in mathematics then the probability that she gets grade A in physics is $\frac{4}{5}$. If she does not get grade A in mathematics, then the probability that she gets

grade A in physics is $\frac{3}{8}$.

Calculate the probability that she gets grade A in physics only.

(3mks)

This is the last printed page.