

EDUZEDCO
121/2 MATHEMATICS
Paper 2
Form 4 End Term Examination

Time: 2 ½ Hours

Name: Adm No:
 School: Class:
 Signature: Date:

INSTRUCTIONS TO CANDIDATES

- (a) Write your name and index number in the spaces provided at the top of this page.
- (b) Write your school name, 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 any **five 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) This paper consists of **8 printed pages**.
- (i) Candidates should check the question paper to ensure that all the pages are printed as indicated and no questions are missing.
- (j) Candidates should answer the questions in English.

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** questions in this section in the spaces provided.

1. Make (3 mks)

the subject of the formula

$$\frac{1}{x} = \frac{2}{y} + \frac{3}{z}$$

2. Simplify (3 mks)

$$\frac{2\sqrt{3} - \sqrt{2}}{\sqrt{3} + \sqrt{2}} \div \frac{\sqrt{3} - \sqrt{2}}{\sqrt{3} + \sqrt{2}}$$

, leaving your answer in surd form.

3. The length of a piece of string is measured as 1.26 m, correct to 2 decimal places. Calculate the percentage error in this measurement. (3 mks)

4. (3 mks)

directly as the square of

$$x$$

and inversely as

$$y$$

. When

$$x = 4 \text{ and } y = 3$$

and

$$x = 9 \text{ and } y = 2$$

,

$$x = 16 \text{ and } y = 1$$

. Find

$$k$$

when

$$x = 25 \text{ and } y = 0.5$$

and

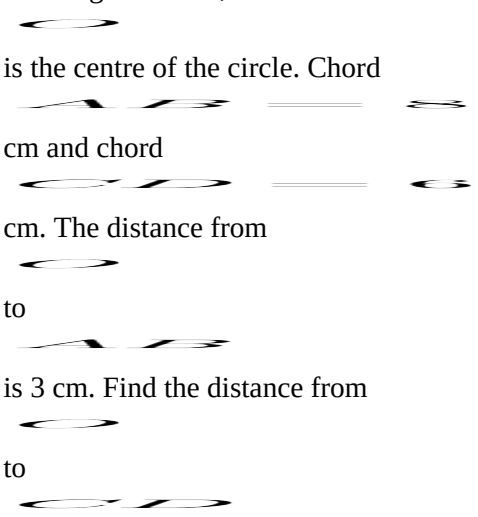
$$x = 36 \text{ and } y = 0.25$$

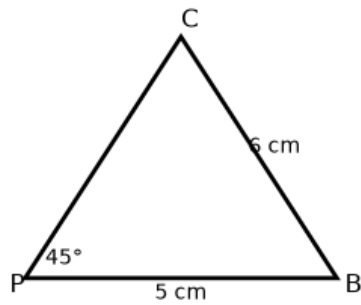
.

5. The first term of a geometric progression is 2 and the sum of the first three terms is 26. Find the common ratio. (3 mks)

6. Solve the equation (3 mks)
- $$2x^2 - 5x + 1 = 0$$
- by completing the square, giving your answer in surd form.

7. Expand (3 mks)
- $$(2 - 3x)^5$$
- up to the term in x^3 .
- Hence evaluate $(1.97)^5$ correct to 3 decimal places.

8. In the figure below, (3 mks)
- 
- O is the centre of the circle. Chord $AB = 8$ cm and chord $CD = 6$ cm. The distance from O to AB is 3 cm. Find the distance from O to CD .



9. Solve the equation (4 mks)

$$\sin 2\theta = \cos \theta$$

for

$$0^\circ \leq \theta \leq 360^\circ$$

.

10. Given vectors (3 mks)

$$\mathbf{a} = 2\mathbf{i} - \mathbf{j} + 3\mathbf{k}$$

and

$$\mathbf{b} = \mathbf{i} + 2\mathbf{j} - \mathbf{k}$$

, find

$$|\mathbf{a} \times \mathbf{b}|$$

.

11. A transformation (3 mks)

$$T$$

is given by the matrix $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$. Find the image of the point

$$(2, -1)$$

under

$$T$$

.

12. A bag contains 3 red, 4 blue, and 5 green balls. Two balls are drawn without replacement. Find the probability that one is red and the other is blue. (3 mks)

13. Evaluate (3 mks)

$$\int_0^1 (3x^2 - 4x + 2) dx$$

14. A rectangular block has dimensions 6 cm, 8 cm, and 10 cm. Find the angle between the diagonal of the block and the base. (3 mks)

15. Two places (4 mks)

A

and

B

lie on the equator with longitudes

30° E

E and

15° E

W respectively. Find the distance between them along the equator, taking the radius of the earth as 6370 km. (Give your answer to the nearest km.)

16. Construct the locus of points equidistant from two points (4 mks)

A

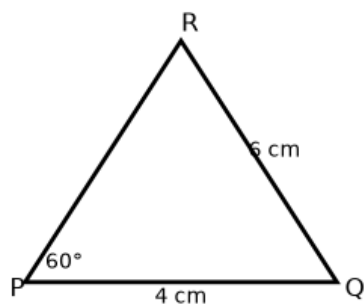
and

B

that are 5 cm apart. Also construct the locus of points that are 3 cm from

A

. Shade the region where both conditions are satisfied.



SECTION II (50 Marks)

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

17. Mr. Kamau earns a monthly basic salary of Ksh. 45,000 and a house (10 mks)

allowance of Ksh. 12,000. He is entitled to a personal relief of Ksh. 2,400 per month. Using the tax brackets below: | Monthly taxable income (Ksh) | Tax rate (%) | |-----|-----| | 0 - 24,000 | 10 | | 24,001 - 40,000 | 15 | | 40,001 - 60,000 | 20 | | 60,001 - 80,000 | 25 | | Above 80,000 | 30 |

(a) Calculate his total taxable income. (2 marks) (b) Determine his gross tax. (4 marks) (c) Calculate his net tax after relief. (2 marks) (d) If he also pays a NHIF deduction of Ksh. 500, find his net pay. (2 marks)

Calculate his total taxable income.

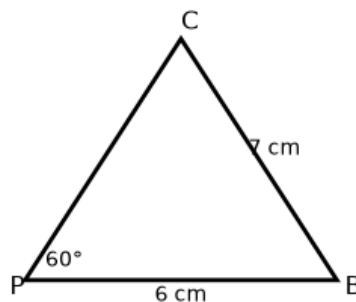
Determine his gross tax.

Calculate his net tax after relief.

If he also pays a NHIF deduction of Ksh. 500, find his net pay.

18. The table below shows the masses of 50 students in a school. | Mass (kg) | (10 mks)

Frequency | |-----|-----| | 40 - 44 | 4 | | 45 - 49 | 8 | | 50 - 54 | 12 | | 55 - 59 | 14 | | 60 - 64 | 8 | | 65 - 69 | 4 | (a) Calculate the mean mass. (3 marks) (b) Draw a cumulative frequency curve (ogive) and use it to estimate the median. (4 marks) (c) Determine the interquartile range. (3 marks)



Calculate the mean mass.

Draw a cumulative frequency curve (ogive) and use it to estimate the median.

Determine the interquartile range.

19. A transformation

(10 mks)

M
is represented by the matrix $\begin{pmatrix} 2 & 1 \\ 1 & 2 \end{pmatrix}$
and

N
by $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$. (a) Find the image of
the point

$A(2, 3)$
under the transformation

M
followed by

N
. (4 marks) (b) Find the matrix representing the combined transformation

$N \circ M$
. (3 marks) (c) Determine the inverse of the combined transformation. (3
marks)

Find the image of the point $A(2, 3)$ under the transformation M followed by N .

Find the matrix representing the combined transformation $N \circ M$.

Determine the inverse of the combined transformation.

20. In the figure below,

(10 mks)

O is the centre of the circle. Points

P,

Q,

R,

and

S

lie on the circle.

$$\angle QPS = 70^\circ$$

,

$$\angle PSR = 60^\circ$$

, and

$$\angle PRS = 50^\circ$$

. Find: (a)

$$\angle PQR$$

(3 marks) (b)

$$\angle QRS$$

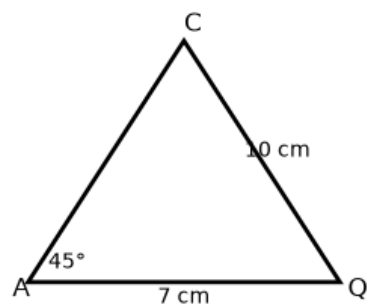
(3 marks) (c)

$$\angle QPR$$

(2 marks) (d)

$$\angle RPS$$

(2 marks)



Find $\angle PQR$

Find $\angle QRS$

Find $\angle QPR$

Find $\angle RPS$

21. Points

(10 mks)

A

,

B

, and

C

have position vectors

$$a = 2i + j - k$$

,

$$b = 3i + 4j + 2k$$

, and

$$c = 5i + 3j + k$$

. (a) Find

$\vec{AB}$

and

$\vec{AC}$

. (2 marks) (b) Show that points

A

,

B

, and

C

are collinear. (4 marks) (c) Find the ratio in which

B

divides

AC

. (4 marks)

Find AB and AC .

Show that points A , B , and C are collinear.

Find the ratio in which B divides AC .

22. (a) Sketch the graph of

(10 mks)

$$y = 2 \cos x + 1$$

for

$$0^\circ \leq x \leq 360^\circ$$

. (4 marks) (b) State the amplitude and period of the function. (2 marks) (c)

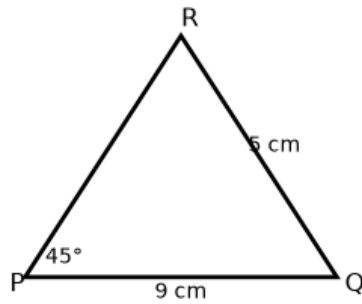
Use your graph to solve

$$2 \cos x + 1 = 0$$

for

$$0^\circ \leq x \leq 360^\circ$$

. (4 marks)



Sketch the graph of $y = 2\cos x + 1$ for $0^\circ \leq x \leq 360^\circ$.

State the amplitude and period of the function.

Use your graph to solve $2\cos x + 1 = 0$ for $0^\circ \leq x \leq 360^\circ$.

23. A ship sails from (10 mks)

$N(30^\circ$

$N,$

40°

$E)$ to

$N(10^\circ$

$S,$

40°

$E)$

at a speed of 20

(a) Calculate the d

M

and

N

in nautical miles.

(b) How long does

(c) From

, the ship sails due west

P

at

10°

$S,$

20°

(b) Find the distance f

N

to

P in nautical miles. (4 marks)

Calculate the distance between M and N in nautical miles.

How long does the journey take?

Find the distance from N to P in nautical miles.

24. A particle moves along a straight line such that its velocity (10 mks)

m/s at time

seconds is given by

. (a) Find the initial velocity. (2 marks) (b) Determine the time when the particle is momentarily at rest. (3 marks) (c) Find the acceleration when

seconds. (2 marks) (d) Calculate the displacement travelled between

and

seconds. (3 marks)

Find the initial velocity.

Determine the time when the particle is momentarily at rest.

Find the acceleration when $t = 2$ seconds.

Calculate the displacement travelled between $t = 1$ and $t = 3$ seconds.