

Name Class.....

Index Number:

121/2

MATHEMATICS

Paper 2

July/August 2014

TIME: 2 1/2 Hours

KAMUKUNJI DISTRICT KCSE EVALUATION

Instructions to candidates

- Write your name, index number, admission number and class in the spaces provided above.
- Sign and write the date of examination in the spaces provided above.
- The paper contains **TWO** sections: **Section I** and **Section II**.
- Answer **ALL** the questions in **Section I** and any **five** questions from **Section II**
- All answers and working must be written on the question paper in the spaces provided below each question.
- **Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.**
- Non – programmable silent electronic calculators and KNEC Mathematical tables may be used, except where stated otherwise.

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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This paper consists of **15** printed pages
Candidates should check the question paper to ascertain
that all the pages are printed as indicated and no questions are missing.

SECTION I

ANSWER ALL THE QUESTIONS IN THE SPACES PROVIDED

1. Simplify without using tables

$$\frac{3}{\sqrt{6} - \sqrt[2]{3}} = \frac{4}{\sqrt{6} + \sqrt[2]{3}}$$

(3 marks)

2. The data below shows the marks obtained by ten students in a test.

71, 55, 69, 45, 65, 57, 71, 82, 55, 50

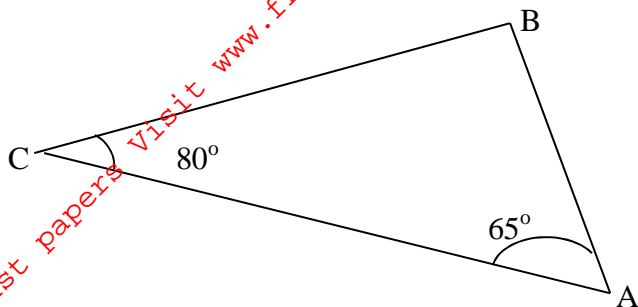
Find the quartile deviations.

(4 marks)

3. The dimensions of a cuboid are recorded as 30 cm by 25 cm by 22 cm to the nearest 1 cm.
Find the percentage error in its volume.

(3 marks)

4. In the figure below, calculate the length of AC if the radius of the circle that passes through its vertices is 2.5 cm. (3 marks)



5. Find the inverse of the matrix $\begin{pmatrix} 2 & 5 \\ 3 & 4 \end{pmatrix}$. Hence solve the equations. (4 marks)

6. It takes Peter 10 days to read a 300 pages novel when reading 2 hours per day. How many hours should he read per day in order to read a similar novel of 480 pages in 8 days? (3 marks)

7. A shear parallel to the x – axis maps point (11, 2) onto a point (5, 2). Determine the shear factor and hence state the shear matrix. (3 marks)

8. Determine the two possible values of a for which

$$\int_0^a \left(\frac{x^2-1}{x+1} \right) dx = 12$$

(3 marks)

9. Use the first four terms of the expansion $(1 + x)^5$ to estimate the value of $(1.03)^5$ to 2 decimal places. (3 marks)

10. The eleventh term of an arithmetic progression is four times its second term. The sum of the first seven terms of the same progression is 175. Find the first term and the common difference of the progression. (3 marks)

11. A quantity P is partly constant and partly varies inversely as the square root of Q. Given that P = 6 when Q = 9 and P = 10 when Q = 16, find P when Q is 4. (3 marks)

12. Use logarithms to evaluate:

$$\sqrt[5]{\frac{(0.6873)^2 \times 438.7}{396.8}}$$

(3 marks)

13. Solve for x in the equation for $0^\circ < x < 360^\circ$

$$\tan x + \frac{1}{\tan x} = 2$$

(3 marks)

14. Make y the subject of the formula

$$r = \sqrt{\frac{ay - bx}{mx - ny}}$$

(3 marks)

15. Find, without using mathematical tables, the values of x which satisfy the equation

$$\log_2(x^2 - 9) = 3 \log_2 2 + 1$$

(3 marks)

16. Find the centre and radius of the circle whose equation is

$$3x^2 + 12x + 3y^2 - 15 = 0 \quad (3 \text{ marks})$$

17. Mr. Yusuf, in addition to his basic salary got a house allowance of Ksh. 6,000 per month. After deducting a tax relief of Ksh. 1,056, Yusuf paid an income tax of Ksh. 2274. Calculate his:

(a) (i) Monthly taxable income (4 marks)

(ii) Basic salary (2 marks)

(b) In the course of the year, Yusuf's taxable income increased by 25%. Calculate the percentage increase in income tax. (4 marks)

18. Plot and draw a triangle whose coordinates are A (-6, 5), B (-4, 1) and C (3, 2)

(a) Given that A (-6, 5) is mapped onto A^1 (-6, -4) by a shear with y – axis invariant:

(i) Draw triangle $A^1B^1C^1$, the image of triangle ABC under the shear (2 marks)

(ii) Determine the matrix representing the shear (2 marks)

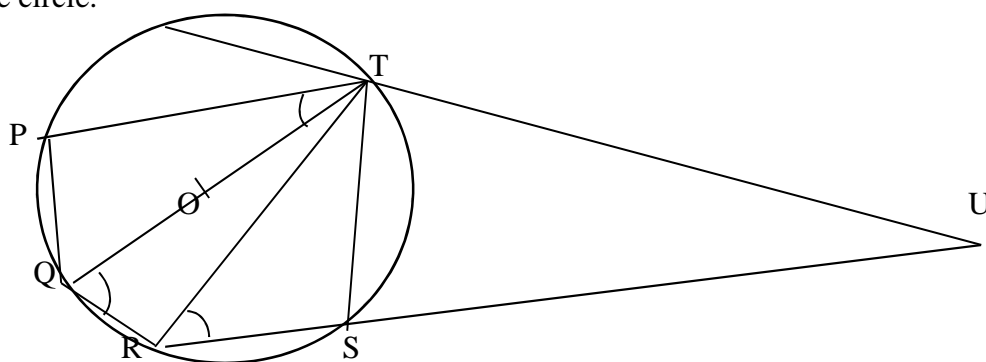
(b) Triangle $A^1B^1C^1$ is mapped onto $A^{11}B^{11}C^{11}$ by a transformation derived by the matrix

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

(i) Draw triangle $A^{11}B^{11}C^{11}$ (3 marks)

(ii) Describe fully a single transformation that maps ABC onto $A^{11}B^{11}C^{11}$ (2 marks)

19. In the figure below, angle $TQR = 75^\circ$, angle $TRS = 38^\circ$, angle $QTP = 46^\circ$ and O is the centre of the circle.



Determine the following giving reasons in each case.

(i) Angle RST (2 marks)

(ii) Angle SUT (2 marks)

(iii) Angle PST (2 marks)

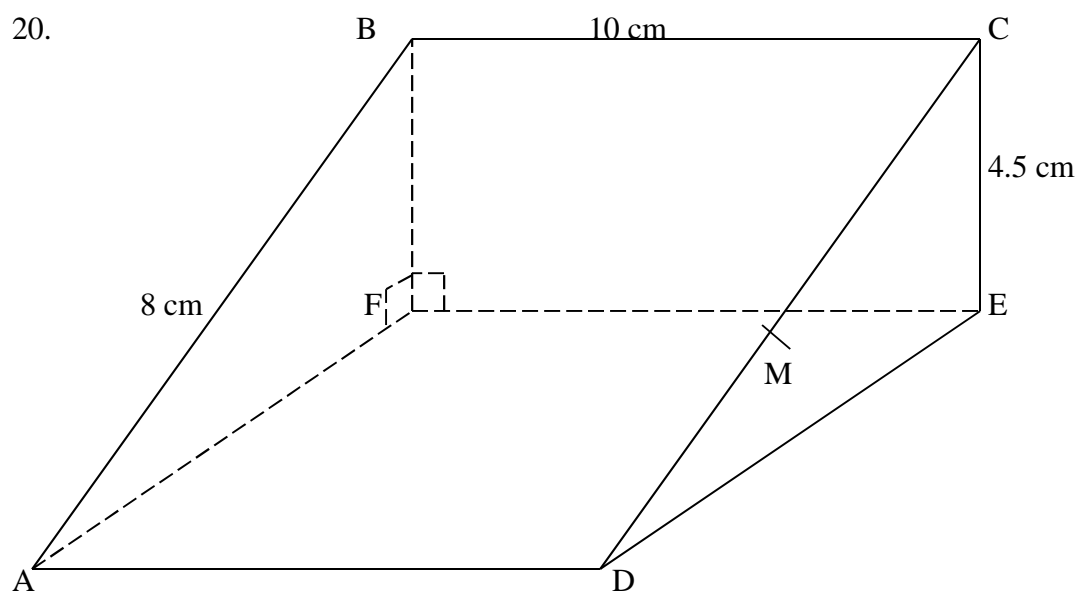
(iv) Obtuse angle ROT

(2 marks)

(v) Angle SQT

(2 marks)

20.



The above diagram represents a wooden prism. ABCD is a rectangle. Points E and F are directly below C and B respectively. M is the mid-point of CD. $AB = 8$ cm, $BC = 10$ cm and $CE = 4.5$ cm.

(a) Calculate the size of angle CDE (2 marks)

(b) Calculate the
(i) Length of AC (2 marks)

(ii) Angle CAE makes with the plane ADEF (2 marks)

(c) Find the:
(i) Length of MB (2 marks)

(ii) Angle CBM (2 marks)

21. A steel manufacturing factory had a sample of 5 iron rods of various lengths. The lengths of the rods were measured and recorded as shown in the table below:

Length in cm	8 – 10	11 – 13	14 – 16	17 – 19	20 – 22	23 – 25	26 – 28
Number of rods	4	7	11	15	8	5	3

(a) State the frequency of the modal class (1 mark)

(b) Using 18 as an assumed mean, calculate the:

(i) Actual mean (5 marks)

(ii) Variance (3 marks)

(iii) Standard deviation (1 mark)

22. A factory producing foot balls has two types of machines, A and B. The type A machine needs 3 workers to operate it and produces 200 balls per week each of which is sold at a profit of Ksh. 150. The type B machine needs 4 workers to operate it and produces 300 balls per week each of which brings a profit of Ksh. 100. The factory operates under the following conditions:

(i) The number of type A machines must not exceed 10 while that of type B must not exceed 8

(ii) The total number of workers available to operate the machines is 48

(iii) At least 2400 balls must be produced per week

(a) Taking x to be the number of type A machines and y to be the number of type B machines, write down the inequalities to represent the above conditions. (4 marks)

(b) Draw a graph to show the region that satisfies the inequalities (4 marks)

(c) Determine the maximum profit the factory can make in one week. (2 marks)

23. A particular species of fish makes an annual migration in a river. The probability that an observer goes to the river on a Monday is 0.6. There is a probability of 0.4 that migration will start on Monday. If it does start, an observer will have to wait for an hour before seeing a fish. The probability of an observer staying for an hour is 0.8 and the probability of seeing a fish is 0.3.

If the observer goes to the river on any other day, there is a probability of 0.1 that migration will start. If it does start, an observer will have to wait for an hour before seeing a fish. The probability of an observer staying for an hour is 0.2 and the probability of seeing a fish is 0.1.

If migration has not started no fish will be seen.

(i) Represent this information on a tree diagram (4 marks)

(ii) What is the probability that migration has started? (3 marks)

(iii) What is the probability of an observer not seeing the fish and migration has started? (3 marks)

24. The table below gives corresponding values of y and x which obey the law $y = ax^2 + bx$ where a and b are constants.

x	0.52	2.58	5.25	8.00	9.5
y	4.6	38.5	121.3	235.1	324.5

(i) State the linear equation connecting x and y

(3 marks)

(ii) Draw a suitable linear graph and hence estimate the values of a and b. (7 marks)