

# SUNSHINE SECONDARY SCHOOL



**MATHEMATICS  
PAPER 2  
PRE- MOCK I 2017  
TIME: 2 ½ HOURS**

Name..... Adm number .....

Candidate's class:..... Date: .....

**Instructions to candidates**

1. Write your name, index in the spaces provided above.
2. Sign and write the date of examination in the spaces provided above.
3. This paper consists of two sections: *section I* and *section II*.
4. Answer **all** the questions in **section I** and any **five** in **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 electronic calculators and KNEC Mathematical table may be used except where state 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

## SECTION I (50 MARKS)

Answer all the questions in the spaces provided.

1. In this question, show all the steps in your calculations, giving your answers at each stage. using logarithms, correct to 4 decimal places, evaluate: (4 marks)

$$\sqrt[3]{\frac{36.72 \times (0.46)^2}{185.4}}$$

2. Make  $s$  the subject of the formula (3 marks)

$$\sqrt{p+r} + \sqrt{1-as^2}$$

3. In the figure below  $R$ ,  $T$  and  $S$  are points on a circle centre  $O$ .  $PQ$  is a tangent to the circle at  $T$ .  $POR$  is a straight line and  $\angle QPR = 20^\circ$ . Find the size of  $\angle RST$ . (2 marks)

4. By correcting each number to one significant figure, approximate the value of  $788 \times 0.006$ . Hence calculate the percentage error arising from this approximation. (3 marks)

5. The data below represents the ages in months at which 6 babies started walking: 9, 11, 12, 13, 11 and 10. Without using a calculator, find the exact value of the variances. (3 marks)

6. Without using a calculator or mathematical table, simplify  $\frac{3\sqrt{2}-\sqrt{3}}{2\sqrt{3}-\sqrt{2}}$  (3 marks)

7. The figure below is a sketch of the graph of the quadratic function  $y = k(x + 1)(x - 2)$

Find the value of k.

(3 marks)

8. The table below is a part of tax table for monthly income for the year 2004.

<b>Monthly taxable income in (Kshs)</b>	<b>Tax rate percentage (%) in each shilling</b>
Under Ksh 9681	10%
From Ksh 9681 but under 18801	15%
From Ksh 18801 but 27921	20%

In the tax year 2004, the tax of Kerubo's monthly income was Kshs 1916. Calculate Kerubo's monthly income. (3 marks)

9. Given that  $q \mathbf{i} + \frac{1}{3} \mathbf{j} + \frac{2}{3} \mathbf{k}$  is a unit vector, find  $q$ . (2 marks)

10. The points with coordinates (5,5) and (-3,1) are the ends of a diameter of a circle centre  $a$ . Determine:

(a) The coordinates of  $A$  (1 mark)

(b) The equation of the circle, expressing it in form  $x^2 + y^2 - ax + by + c = 0$  where  $a$ ,  $b$ , and  $c$  are constants. (3 marks)

11. Use binomial expression to evaluate: (4 marks)

$$\left[2 + \frac{1}{\sqrt{2}}\right]^5 + \left[2 - \frac{1}{2}\right]^5$$

12. Three quantities  $t$ ,  $x$  and  $y$  are such that  $t$  varies directly as  $x$  and inversely as the square root of  $y$ . Find the percentage change in  $t$  if  $x$  decreases by 4% when  $y$  increases by 44%.  
(4 marks)

13. The figure below is drawn to scale. It represents a field in the shape of an equilateral triangle of side 80m.

The owner wants to plant some flowers in the field. The flowers must be at most 60m from A and nearer to B than to C. If no flower is to be more than 40m from BC show by shading, the exact region where the flowers may be planted.  
(4 marks)

14. Solve for  $y$  in the equation  $\log_{10}(y - 4)$

(3 marks)

15. Five people can build 3 huts in 21 days. Find the number of people, working at the same rate that will build 6 similar huts in 15 days.

(2 marks)

16. Find all the integral values of  $x$  which satisfy the inequality  
 $3(1 + x) < 5x - 11 < x + 45$

(3 marks)

**SECTION II (50 MARKS)**

**Answer any 5 questions only in this section**

17. Halima deposited Ksh 109375 in a financial institution which paid simple interest at the rate of 8% p.a. At the end of 2 years, she withdrew all the money. She then invested the money in shares. The value of the shares depreciated at 4% p.a. during the first year of investment. In the next 3 years, the value of the shares appreciated at the rate of 6% every four months.

(a) Calculate the amount Halima invested in shares. (3 marks)

(b) Calculate the value of Halima's shares:

(i) At the end of the first year (2 marks)

(ii) at the end of the fourth year, to the nearest shilling (3 marks)

(c) Calculate Halima's gain from the share as a percentage. (2 marks)

18. (a) (i) Construct a triangle ABC in which  $AB = 6$  cm,  $BC = 7$  cm and angle  $ABC = 75^\circ$   
(3 marks)

Measure:

- (i) Length of AC (1 mark)
- (ii) Angle ACB (1 mark)
- (b) The locus of P is such that  $BP = PC$ . Construct P. (1 mark)
- (c) Construct the locus of Q such that Q is on one side of BC, opposite A and angle  $BQC = 30^\circ$  (1 mark)
- (d) (i) Locus of P and locus of Q meet at X. Mark x. (1 mark)  
(ii) Construct locus R in which angle  $BRC = 120^\circ$  (1 mark)  
(iii) Show the locus s inside triangle ABC such that  $XS \geq SR$ . (1 mark)

19. Plot triangle ABC with vertices A (-6,5), B(-4,1) and C (3,2) in the grid provided. (1 mark)

(a) Given that A (-6,5) is mapped into A' (-6,-4) by a shear with y- axis invariant  
(i) draw triangle A'B'C', the image of triangle ABC under the shear (2 marks)

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

(b) Triangle A B C is mapped on to A''B''C'' by a transformation defined by the matrix

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

(i) Draw triangle A''B''C'' (3 marks)

(ii) Describe fully a single transformation that maps ABC onto A''B''C'' (2 marks)

20. (a) Two integers  $x$  and  $y$  are selected at random from the integers 1 to 8. If the same integer may be selected twice, find the probability that:

(i)  $x - y = 2$  (3 marks)

(ii)  $x > y$  (3 marks)

(b) A bag contains 3 black balls and 6 white ones. If two balls are drawn from the bag one at a time, find the probability of drawing a black ball and a white ball.

(i) without replacement (2 marks)

(ii) with replacement (2 marks)

21. A trader deals in two types of rice; type A and type B. type A costs Ksh 400 per bag and type B costs Ksh 350 per bag.

(a) The trader mixes 30 bags of type A with 50 bags of type B. If he sells the mixture at a profit of 20% calculate the selling price of one bag of the mixture. (4 marks)

(b) The trader now mixes type A with type B in the ratio  $x:y$  respectively. If the cost of the mixture is Ksh 383.50 per bag, find the ratio  $x:y$ . (4 marks)

(c) The trader mixes one bag of the mixture in part (a) with one bag of the mixture in part (b). Calculate the ratio of type A rice to type B rice in this mixture. (2 marks)

22. The product of the first three terms of geometric progression is 64. If the first term is  $a$ , and the common ratio is  $r$ .

(a) Express  $r$  in terms of  $a$  (3 marks)

(b) Given that the sum of the three terms is 14:

(i) Find the value of  $a$  and  $r$  and hence write down two possible sequences each up to the 4<sup>th</sup> term. (5 marks)

(ii) Find the product of the 50<sup>th</sup> terms of two sequences. (2 marks)

23. Mwanjoki flying company operates a flying service. It has two types of aeroplanes. The smaller one uses 180 litres of fuel per hour while the bigger one uses 300 litres per hour. The fuel available per week is 10,000 litres. The company is allowed 80 flying hours per week while the smaller aeroplane must be flown for  $y$  hours per week.

(a) Write down all the equations representing the above information. (3 marks)

(b) On the grid provided, draw all the inequalities in (a) above by shading the unwanted regions. (4 marks)

(c) The profits on the smaller aeroplane is Ksh 4000 per hour while that on the bigger one is Ksh 600 per hour.

Use the graph drawn in (b) above to determine the maximum profit that the company made per week. (3 marks)

24. Given that  $y$  is inversely proportional to  $x^n$  and  $k$  as the constant of proportionality;

(a) (i) Write down a formula connecting  $y$ ,  $x$ ,  $n$  and  $k$ . (1 marks)

(ii) If  $x = 2$  when  $y = 12$  and  $x = 4$  when  $y = 3$ , write down two expressions for  $k$  in terms of  $n$ .

Hence, find the value of  $n$  and  $k$ . (7 marks)

(b) Using the value of  $n$  obtained in (a) (ii) above, find  $y$  when  $x = 5 \frac{1}{3}$ . (2 marks)