**Name …………………………………………………………………………………………….….. Index No. ………………. Class …….**

**121/1**

**MATHEMATICS**

**STAREHE BOYS’ CENTRE & SCHOOL**

**MOCK EXAMINATION 2015**

**Paper 1**

**Time: 2½ Hours**

## Instructions to candidates

1. Write your name, admission number and class in the spaces provided above.
2. The paper contains two sections: **Section I** and **Section II**.
3. Answer **ALL** the questions in **Section I** and **ANY FIVE** questions from **Section II**.
4. All working and answers must be written on the question paper in the spaces provided below each question.
5. Marks may be awarded for correct working even if the answer is wrong.
6. Negligent and slovenly work will be penalized.
7. Non-programmable silent electronic calculators and mathematical tables are allowed for use.

### 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 booklet contains 17 printed pages. Please confirm that all the pages exist and are properly printed before starting the exam.***

##### Section I (50 marks)

**Answer all the questions in this section in the spaces provided**

1. Without using calculators evaluate 1/3 of  {2 marks}

2. Use the method of completing the square to solve the quadratic equation

 2x2 – 13x + 15 = 0 {3 marks}

3. Solve for θ in the equation 6 cos2 θ - Sin θ - 4 = 0 in the range 0o < θ < 180o. {3 marks}

4. The sides of a rectangle are x cm and (x + 1) cm. A circle has radius of (x + 2) cm. If the sum of the area of the rectangle and the circle is 184 cm2. Using π as find the value of x. {4 marks}

5. Use binomial expansion to evaluate  {3 marks}

6. A line L1 passes through point (1, 2) and has a gradient of 5. Another line L2 is perpendicular to L1 and meets it at a point where x = 4. Find the equation for L2 in the form y = mx + c. {4 marks}

7. Find the value of x in the following equation. {3 marks}

 9x + 32x – 1 = 53

8. The first and the last terms of an AP are 2 and 59 respectively. If the sum of the series is 610, find the number of terms in the series and the common difference. {4 marks}

9. The equation of a circle is 2x2 + 2y2 + 12x – 20y – 4 = 0. Determine the coordinates of the centre of the circle and state its radius. {3 marks}

10. Make b the subject of the formula a =  {3 marks}

11. Solve the inequality 3 – 2x < x <  and show the solution on the number line. {4 marks}

12. Solve for x given that log2 5x – log4 2x = 3 {3 marks}

13. A salesman earns a basic salary of sh. 9,000 per month. In addition he is also paid a commission of 5% for sales above sh. 15,000. In a certain month he sold goods worth sh. 120,000 at a discount of 2½%. Calculate his total earnings that month. {3 marks}

14. A small cone of height 8 cm is cut off from a bigger cone to leave a frustum of height 16 cm. If the volume of the smaller cone is 160 cm3, find the volume of the frustum. {3 marks}

15. Vector **OP** = 6i + j and **OQ** = -2i + 5j. A point N divides **PQ** internally in the ratio 3:1. Find **PN** in terms of i and j. {3 marks}

16. Without using mathematical tables or calculators express in surd form and simplify

  {3 marks}

**SECTION II (50 MARKS)**

**Answer any five questions in this section**

17. In the figure below, vector **OP** = **p** and **OR** = **r**. **OS** = 2r and **OQ** : **OP** = 3 : 2

 a) Express the following vectors in terms of **p** and **r**.

 i) **QR** {1 mark}

 ii) **PS** {1 mark}

 b) The lines QR and PS intersect at K. By expressing **OK** in two different ways, find the ratio PK : KS

 {8 marks}

18. On the graph paper provided, plot the triangle

 a) whose co-ordinates are A(1, 2) B(5, 4) and C(2, 6) {1 mark}

 b) On the same axes

 i) Draw the image A1B1C1 of ABC under a rotation of 90o clockwise about origin. {2 marks}

 ii) Draw the image A11B11C11 of A1B1C1 under a reflection in the line y = -x. State the

coordinates of A11B11C11. {3 marks}

 c) A111B111C111 is the image of A11B11C11 under the reflection in the line x = 0. Draw the image

 A111B111C111 and state its coordinates. {2 marks}

 d) Describe a single transformation that maps A111B111C111 onto ABC. {2 marks}



19. A bus left Kitale at 10.45 a.m and travelled towards Nairobi at an average speed of 60 km/h. A Nissan left Kitale on the same day at 1.15 p.m and travelled along the same road at an average speed of 100 km/h. The distance between Kitale and Nairobi is 500 km.

 a) Determine the time of the day when the Nissan overtook the bus. {6 marks}

 b) Both vehicles continued towards Nairobi at their original speed. Find how long the Nissan had to wait in Nairobi before the bus arrived. {4 marks}

20. The table below shows how income tax was charged in a certain year.

|  |  |
| --- | --- |
| (Kenya pounds) | (Ksh. per Kenya pound) |
| 1 – 3630 | 2 |
| 3631 - 7260 | 3 |
| 7261 - 10890 | 4 |
| 10891 - 14520 | 5 |
| 14521 - 18150 | 6 |
| 18151 - 21780 | 7 |
| 21781 and above | 7.5 |

 During the year Mwadime earned a basic salary of Ksh. 25,200 and a house allowance of Ksh. 12,600 per month. He was entitled to a personal tax relief of Ksh. 1,162 per month.

 a) Calculate:

 i) Mwadime’s taxable income in Kenya pounds per annum. {2 marks}

 ii) The net tax he pays per month. {6 marks}

 b) Apart from income tax he also contributes monthly NHIF Ksh. 1600, WCPS Ksh. 1000. Calculate his net monthly pay. {2 marks}

21. X, Y and Z are three quantities such that X varies directly as the square of Y and inversely as the square root of Z.

 a) Given that X = 18 when Y = 3 and Z = 4, find X when Y = 6 and Z = 16. {5 marks}

 b) If Y increases by 10% and Z decreases by 19%, find the percentage increase in X. {5 marks}

22(a) A port B is on a bearing 080o from a port A and a distance of 95 km. A Submarine is stationed at a port D, which is on a bearing of 200o from A, and a distance of 124 km from B. A ship leaves B and moves directly Southwards to an Island P, which is on a bearing of 140o from A. The Submarine at D on realizing that the ship was heading to the Island P, decides to head straight for the Island to intercept the ship. Using a scale of 1 cm to represent 10 km, make a scale drawing showing the relative positions of A, B, D and P. {4 marks}

 Hence find:

 b) The distance from A to D. {2 marks}

 c) The bearing o the Submarine from the ship when the ship was setting off from B. {1 mark}

 d) The bearing of the Island P from D. {1 mark}

 e) The distance the Submarine had to cover to reach the Island P. {2 marks}

23. The data below represent the heights taken to the nearest centimeters of 40 lemon trees in a garden. (NB: A = Assumed mean)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Height (cm) | f | x | d = x - A | fd | d2 | fd2 |
| 131 – 140 | 3 |  |  |  |  |  |
| 141 – 150 | 4 |  |  |  |  |  |
| 151 – 160 | 7 |  |  |  |  |  |
| 161 – 170 | 11 |  |  |  |  |  |
| 171 – 180 | 9 |  |  |  |  |  |
| 181 – 190 | 5 |  |  |  |  |  |
| 191 – 200 | 1 |  |  |  |  |  |

 a) Complete the table. {6 marks}

 b) Using 165.5 as the assumed mean, calculate the mean height. {2 marks}

 c) Calculate the standard deviation of the distribution. {2 marks}

24. The line segment BC = 7.5 cm long is one side of triangle ABC.

 a) Use a ruler and compasses only to complete the construction of triangle ABC in which

 ∠ABC = 45o, AC = 5.6 cm and angle BAC is obtuse. {3 marks}

 b) Draw the locus of a point P such that P is equidistant from a point O and passes through the vertices of triangle ABC. {3 marks}

 c) Locate point D on the locus of P equidistant from lines BC and BO. Q lies in the region enclosed by lines BD, BO extended and the locus of P. Shade the locus of Q. {4 marks}