**FORM 3**

**MATHEMATICS**

**MID TERM EXAM - JUNE 2016**

**TIME: 2 ½ HOURS**

**NAME:………………………………………………….CLASS: ……... ADM. NO: ……….**

**INSTRUCTIONS TO CANDIDATES**

1. Write your Name, Adm. No and Class in the spaces provided on the top of this page.
2. This paper contains two sections: Section A and B. Answer all questions in both sections.
3. All answers and workings must be written on the question paper in the spaces provided below each question.
4. Negligence and slovenly work will be penalized.
5. Electronic calculators and mathematical tables may be used.

**For Examiners 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** | Total |
|   |  |  |  |  |  |

1. Simplify: (3 mks)

$$ \frac{3}{3-2\sqrt{3}}- \frac{4}{3+2\sqrt{3}}$$

1. Make h the subject of the formula: (4 mks)

E = 1 – $π \sqrt{\frac{h-0.5}{1-h}}$

1. Given that M = $\left(\begin{matrix}\frac{1}{8}&\frac{1}{8}\\\frac{1}{4}&\frac{1}{4}\end{matrix}\right)$ and B = $\left(\begin{matrix}32&24\\16&64\end{matrix}\right)$ . Find MB (3 mks)
2. Expand (1 + 2x)4 upto the term in x3 hence evaluate (1.02)4 correct to 4 decimal places. (4 mks)
3. The volumes of two similar solids are 20 cm3 and 270cm3 respectively. Determine the surface area of the smaller solid, if the surface area of the larger solid is 54cm2.(3 mks)
4. Solve for x in long (3x + 4) – log (3 –x) = 1 (3 mks)
5. The resistance of an electrical conductor is partly constant and partly varies as the temperature. When the temperature is 200c, the resistance is 55 ohms. When the temperature is 280c, the resistance is 58 ohms. Find the resistance when the temperature is 600c. (3 mks)
6. Two ships put out to sea from the same port at the same time. One ship sails at 12 km/h on a bearing of 1050 while the other sails at 18 km/h on a bearing of 3300. How far apart are the ships after they have been sailing for 1 ½ hours? (3 mks)
7. In the figure below O is the centre of the circle. AB = 16cm and MC = 4 cm. find the radius of the circle. (3 mks)
8. Given that $\vec{OA}$ = -6**i** + 5**j**, $\vec{OB}$ = 2**i** + 9**j** and $\vec{OC}$ = 10**i** + 13**j**. Express in terms of **i** & **j**.(4 mks)
9. $\vec{AB}$
10. $\vec{AC}$
11. Find the mode, median and the mean of the following numbers. (3 mks)

4, 4, 0, 7, 3, 5, 3, 2, 4, 1, 6, 5, 4, 8, 3, 7, 1, 6, 4, 5

1. If a and b are two measurements stated as a = 5.45 cm and b = 3.5 cm, find the percentage error in $\frac{a-b}{a+b}$ (3 mks)
2. The simple interest on a given sum of money borrowed for 4 years at 10% p.a. exceeds the simple interest on the same sum borrowed for 2 ½ years at 12% p.a. by Kshs 12,960. What was the sum of money borrowed? (3 mks)
3. Factorise completely: (3 mks)

9x2 – 16y2 - (3x – 4y)2

1. The L.C.M. of 15, 18 and a third number is 1260. Find the square of the third number. (3 mks)
2. The vertices of a kite are A (0,0), B (5,2), C (9,9) and D (2,5). Find the equation of the line of symmetry of the kite. (2 mks)

**SECTION II**

1. A ball is thrown into the air from a cliff. The height of the ball above the cliff is given by the equation S = 20t – 5t2, where S is the height in metres and t is the time in seconds that has elapsed since the ball was thrown.
2. Using values of t from 0 to 5, plot a graph of S against t. (5 mks)
3. From your graph, find:
4. The greatest height reached by the ball. (1 mk)
5. The value of t when the ball reached its greatest height. (1 mk)
6. The number of seconds that elapsed before the ball returned to its original height above the ground. (1 mk)
7. What’s the position of the ball at t = 5 seconds. (2 mks)
8. OAB is a triangle. M and N are points on AB and OB respectively such that AM = 1/3 AB and ON = ¾ OB. Given that $\vec{OA}$ = **a** and $\vec{OB}$ = **b**. P is the intersection of OM and AN.
9. Express in terms of **a** and **b.**
10. $\vec{AN}$ (1 mk)
11. $\vec{OM}$ (2 mks)
12. By taking $\vec{AP}$ = t $\vec{AN}$ and OP = k$\vec{OM}$, express $\vec{OP}$ in terms of:
13. a, b, & t (1 mk)
14. a, b & k (1 mk)

Hence find the values of t & k. (5 mks)

1. A twenty-litre tin container is full of seeds. The probability that a seed picked at random gives a white flower is 9/20, that of a seed giving a red flower is ¼ and that of a seed giving a yellow flower is 3/10. If two seeds are planted:
2. Illustrate the possibilities above on a tree diagram (3 mks)
3. Find the probability of getting:
4. A white flower and a red flower. (2 mks)
5. A white and a yellow flower. (2 mks)
6. Flowers of the same colour. (3 mks)
7. Three consecutive terms of a G.P are x + 2, x – 2 and x – 5. Find:
8. The value of x (3 mks)
9. The common ratio (1 mk)

 If x + 2 is the third term of the G.P find:

1. The first term, giving your answer in fraction form. (3 mks)
2. The sum of the first six terms correct to 2 decimal places. (3 mks)
3. (a) Find A-1, the inverse of matrix A = $\left(\begin{matrix}5&6\\7&9\end{matrix}\right)$ (2 mks)

(b) Okello bought 5 physics books and six mathematics books for a total of Ksh 2440. Ali

 bought 7 physics books and 9 mathematics books for a total cost of Ksh 3560.

1. Form a matrix equation to represent to represent the above information. (1 mk)
2. Use matrix method to find the price of a physics book and a mathematics books. (3 mks)
3. A school bought 36 physics books and50 mathematics books. A discount of 5% was allowed on each physics book whereas a discount of 8% was allowed on each mathematics book. Calculate the percentage discount on the cost of all the books bought. (4 mks)