THE MATHEMATICAL ASSOCIATION OF NIGERIA (MAN)

(LAGOS STATE CHAPTER)

2019 OLYMPIAD

CATEGORY: **PRIMARY**
DATE: MARCH 30, 2019
TIME: 1HR 30MINS

Instructions

1. This paper consists of TWO PARTS; answer all the questions in each part.
2. The use of CALCULATORS or any ELECTRONIC DEVICES and STATISTICAL TABLES are not allowed.
3. Make sure your answer script is signed by the invigilator.
4. Avoid tearing any part of your answer script.
5. Write your Olympiad seat number correctly on your answer script.
6. Clarity, Neatness and Orderliness are highly encouraged.
7. Check your result with your Olympiad seat number on www.manlagosstate.com from MAY 20, 2019.

DO NOT OPEN UNTIL YOU ARE TOLD TO DO SO

PART A

1a. Divide 15015 by 15

b. What is the sum of the two smallest prime factors of 250?

2a. Simplify $\frac{1}{4}of\ \left(\frac{1}{3}+\frac{1}{2}\right):\left(\frac{1}{3}\ \text{x}\frac{1}{2}+\frac{1}{3}-\frac{1}{12}\right)$

b. How many cubes of edge 3cm can be packed into a box of length 1m, width 45cm and height 12cm?

3a. The sum of the three consecutive even numbers is 36. Find the range of the numbers.

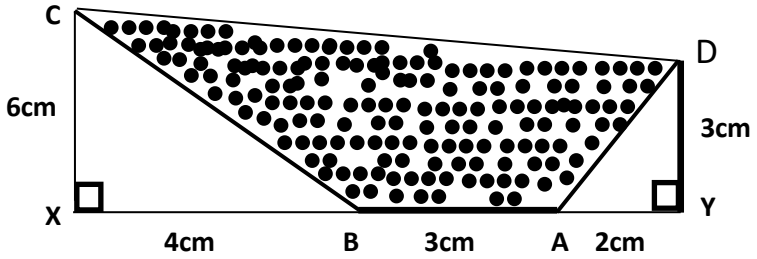
b. Evaluate 151^2 - 149^2

4a. Find the rate at which ₦280 will earn ₦21 simple interest for $2\frac{1}{2}$years.

b. The median of the list n, n + 3, n + 4, n + 5, n + 6, n + 8, n + 10, n + 12, n + 15 is 10. Find the mean of the list.

5a. Express 0.0083 in a standard form.

b. Calculate the area of the shape below



PART B

1. Calculate the value of x if the perimeter of the rectangle below is 32cm

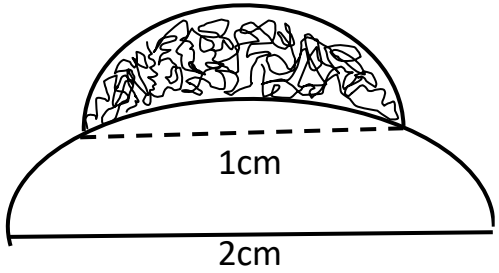
2. A cylindrical flask of height 20cm was filled with tea. If the volume of the tea in the flask is 3080cm^3. Calculate the radius of the flask. (Take $\pi = \frac{22}{7}$)

3. A square and a triangle have equal perimeter. The length of the sides of the triangle are 6.1cm, 8.2cm and 9.7cm. Calculate the area of the square.

4. $\frac{3}{5}$ of Mrs. Oludipe's Jeep was painted red while $\frac{1}{5}$ of the remaining was painted blue, the rest was painted green. What is the ratio of the part painted blue to the part painted green?

5. Solve for a and b. If $2a + b = 7$ and $a - b = 2$

5. A semi-circle of diameter 1cm sits at the top of a semi-circle of diameter 2cm as shown below. The shaded area inside the smaller semi-circle and outer the larger semi-circle is called Lune. Determine the area of the Lune, leaving your answer in π form. (Note that your answer does not depend on the position of the Lune in the semi-circle).



THE MATHEMATICAL ASSOCIATION OF NIGERIA (MAN)

(LAGOS STATE CHAPTER)

2019 OLYMPIAD

CATEGORY: **JUNIOR**

DATE: MARCH 30, 2019

TIME: 2HOURS

Instructions

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PART A

1a. An isosceles triangle has two long sides and one short side. The short side is half of the length of the long side. If the perimeter of the triangle is 15cm. Find the length of the short side.

b. Convert 344_{16} to a number in base 2.

2a. Solve for y if $(\frac{3}{4})^{2y+1} = 1$

b. What value of K makes the expression $4x^2 - 7x + K$

a perfect square?

3a. If $\frac{3}{7}$ of Mrs Sofoluwe's monthly saving is N240, 000, how much is $\frac{4}{5}$ of her savings?

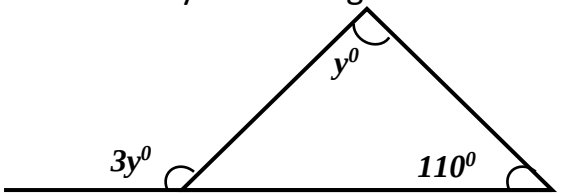
b. Jimoh counted the number of edges of a cube, Shokunbi counted the number of corners while Onafowokan counted the number of faces. What should be the sum of their results?

4a. If $(x+3)$ varies directly as y and $x=3$ when $y=12$.
What is the value of x when y = 8

b. Mr. Ayuba's present salary is N300, 000 per annum. The amount of increment per annum is 10% of his salary. What would be his salary at the end of the forth year?

5a. List the elements of $\{x : -2 \leq x \leq 1\}\ x \in Z$

b. Find the value of y in the diagram below.



PART B

1. Find the sum of the roots of the equation

(3x + 2)(x - 2) + (x - 8)(3x + 2) = 0

2. A farmer stands 30m from the foot of a palm tree. The angle of elevation of the top of the palm tree from a point 1.7m above the ground is 18^0. Calculate the height of the palm tree to the nearest metre. *($Sin\ 18^0 = 0.3090$, $Cos\ 18^0 = 0.9511$, $Tan\ 18^0 = 0.3249$)*

3. If the angles of a polygon are 90^0, $4y^0$, 100^0, 120^0 and $(7y - 34)^0$. Find the value of y.

4. In a school, 1,200 of the students are boys. If 50% of the boys and 40% of the girls have paid their school fees. Find the number of girls, given that 46% of the population has paid their school fees.

5. My cat keeps to it itself most of the time. I only heard it meow, hiss and purr on one day out of the last 23days, but I heard it make at least one of these sounds each day. I heard it hiss on 6 days, purr on 12 days and meow on 15 days. On 2 days, I heard it meow and hiss but not purr and on another 2 days, I heard it purr and hiss but not meow. On how many days did I hear it meow and purr but not hiss?

THE MATHEMATICAL ASSOCIATION OF NIGERIA (MAN)

(LAGOS STATE CHAPTER)

2019 OLYMPIAD

CATEGORY: **SENIOR**

DATE: MARCH 30, 2019

TIME: 2HOURS

Instructions

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PART A

1a. The set A,B and C are subsets of the Universal Set U

U = {1,2,3,4,…14}

A = {even numbers}

B = {factors of 24}

C = {3,6,9,12}

Illustrate the information above in a Venn diagram.

b. Make "r" the subject of the formula in $\frac{A}{\pi} = (r+t)^2 - r^2$

2a. The two shortest sides of a right angled triangle are of length $\sqrt{3cm}$ and 2cm. Let θ be the smallest interior angle of the triangle. What is the value of Sinθ?

b. What is the remainder when $f(x) = (x - 2)^{59}$ is divided by $x - 1$?

3a. Which of the following is the smallest (Clear calculation is required)

2^{600}, 3^{500}, 4^{400}, 5^{300}, 6^{200}

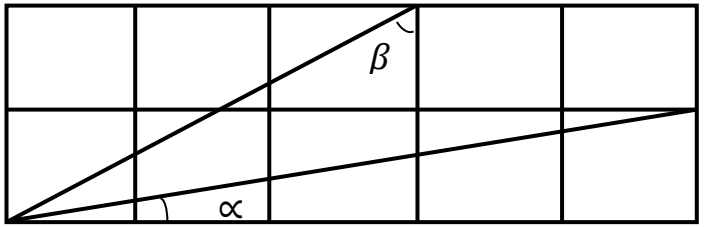
b. A sum of money was contributed by 10 people to buy an instrument. The first person paid N65, the second paid N130, the next person paid N195 and so on. Find the total amount of money contributed by the first 8 people.

4a. The mean of the numbers 2, 5, 6, 8, x and 7 is 6. Find the value of x.

b. A number is picked at random from the numbers 1 to 10. What is the probability that it is a perfect square?

5a. What is the value of x if $x > 0$ and $72x^2 = 9800$?

b. Ten squares of equal sizes are arranged in the grid below. What is the value of $\beta - \propto$?



PART B

1. Evaluate $\int_{\frac{\pi}{6}}^{\frac{\pi}{4}} \cot x \, dx$

2. Simplify $\frac{x^{3n+1}}{x^{2n+\frac{5}{2}} \cdot \sqrt{x^{2n-3}}}$

3. The log have different base, for what value of x does

$$log_{\sqrt{2}}^{\sqrt{x}} + log_2^x + log_4^{x^2} + log_8^{x^3} + log_{16}^{x^4} = 40 \text{ ?}$$

4. The two non zero real numbers x and y, satisfy $xy = x - y$. Find the possible value of $\frac{x}{y} - \frac{y}{x} - xy$