THE MATHEMATICAL ASSOCIATION OF NIGERIA (MAN)

(LAGOS STATE)

2024 OLYMPIAD

CATEGORY: **PRIMARY**

DATE: 11th MAY, 2024

TIME: 1½hrs

Instructions:

1. This paper consists of two parts; PART A and PART B. 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 invigilator signs your answer booklet.
4. There is NO PROVISION for any *extra* answer sheet. All extra sheet will not be marked. Do not tear any part of your answer booklet.
5. Write your NAMES, your SCHOOL and your EXAMINATION number correctly on each page of your answer booklet.
6. CLARITY, NEATNESS and ORDERLINESS are highly encouraged.
7. Check your result with your Olympiad registration pin on www.manlagosstate.com from Monday, June 10, 2024.

DO NOT OPEN UNTIL YOU ARE TOLD TO DO SO

PART A

1a. How many hours and minutes are there from 6:14am and 8:02pm of the same day?

b. If A:B=3:4, B:C=5:7 and C:D=8:9. Find the value of A:D.

2a. Simplify: $\frac{0.016\ X\ 0.084}{0.48}$

b. If the angles $(5y+62)^0$ and $(22+y)^0$ are supplementary. Find the value of y.

3a. What is the value of $(\sqrt{13})^4$

b. Given that $23_x + 123_4 = 40$. Find the value of x.

4a. If the mean of -1, 0, 9, 3, k, 5 is 2. Find the value of k.

b. Simplify:

$$\frac{2}{2+\frac{2}{3+\frac{2}{3+\frac{2}{3}}}X\ 0.39}$$

5a. The area of a circle is increased by $22cm^2$ when its radius in increased by 1cm. Find the original radius of the circle.

b. Find the HCF of 2, 3, 5 and 7

PART B

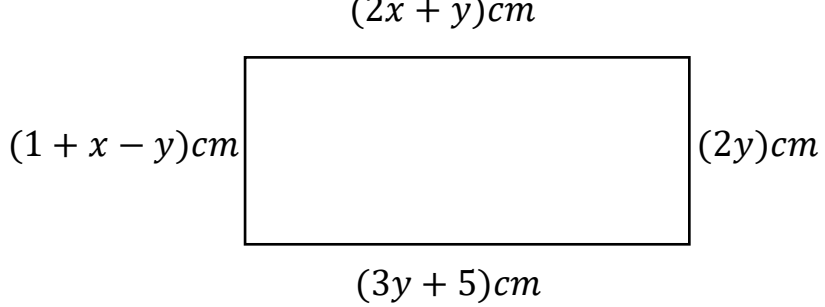
1. The side of an equilateral triangle is y unit. If the length of its altitude is x unit, show that $4x^2 = 3y^2$

2. The cost of 12kg mangoes and 24kg of watermelon is ₦43,200.00, while the cost of 24kg mangoes and 12kg of watermelon is ₦36,000.00. Find the cost of 3kg of mangoes and 2kg of watermelon.

3. Simplify: $\frac{y+2}{y+4} \div \frac{3x+6}{x^2-16}$

4. Miss. Adedoyin has 1,000kg of sugar, part of which she sells at 8% profit and the rest at 18% profit. She gained 14% on the whole. What is the quantity of sugar she sold at 18% profit?

5. Find the area of the rectangle below to 2 significant figures.



THE MATHEMATICAL ASSOCIATION OF NIGERIA (MAN)

(LAGOS STATE)

2024 OLYMPIAD

CATEGORY: **JUNIOR**

DATE: 11TH MAY, 2024

TIME: 2hrs

Instructions:

1. This paper consists of two parts; PART A and PART B. Answer all the questions in each part.
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1a. If $(14)^3$ is added to the square of a number, the result is 4425. Find the number.

b. Find the sum of all the natural numbers between 100 and 200 which are multiples of 3.

2a. The angles of a pentagon are x^0, $2x^0$, $(x+60)^0$, $(x+10)^0$ and $(x-10)^0$. Find the value of x^0.

b. The average of $y+6,\ y-2,\ y+3,\ y+2,$

$y-1,\ y+3,\ y+4$ and $y-5$ is 10. Find the range.

3a. A fair six-sided die is thrown once. What is the probability of obtaining odd numbers?

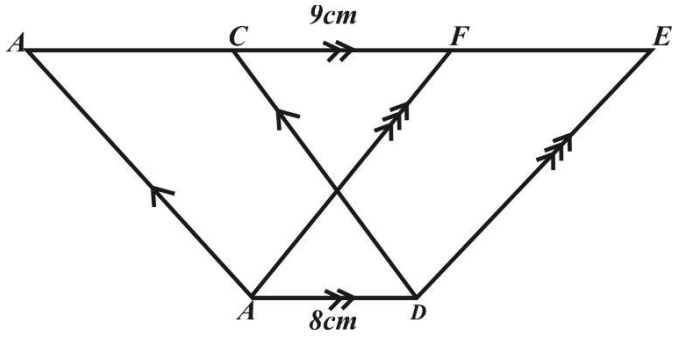
b. Dr. Gaji bought two fans each at ₦1,200.00. He sold one fan at a loss of $5\%$and the other fan at a gain of 10%. Find the total profit or loss percent.

4a. Three cubes with sides in the ratio 3:4:5 were melted to form a single cube whose diagonal is 12√3cm. Find the side of the three cubes.

b. If $-3x+6=-24$. Find the value of x.

5a. Given that p=3 cos θ and that q=2sin θ. Show that $4p^2+9q^2=36$.

b. In the diagram below, AD = 8cm, CF = 9cm. if the area of the parallelogram ABCD is 48cm^2, find the area of the trapezium ABED.



PART B

1. In an examination paper of five questions, 5% of the candidates answered all the questions and 5% answered none of the questions. Of the rest, 25% of the candidates answered only one question and 20% answered four questions. If 396 candidates answered either 2 questions or 3 questions. How many candidates appeared for the examination?

2. If $2^p+3^q=17$ and $2^{p+2}-3^{q+1}=5$. Find the value of p and q.

3. Given that $223_x=53_8$. Find the value of x.

4. Solve for x and y in the simultaneous equation below:

$$\frac{1}{3}x-\frac{1}{5}y=1 \quad \text{and} \quad \frac{1}{4}x+\frac{1}{3}y=8$$

5. If $a=\frac{\sqrt{3}}{2}$. Find the value of $\sqrt{1+a}+\sqrt{1-a}$.

THE MATHEMATICAL ASSOCIATION
OF NIGERIA (MAN)
(LAGOS STATE)

2024 OLYMPIAD

CATEGORY: **SENIOR**
DATE: 11th MAY, 2024
TIME: 2hrs

Instructions:

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PART A

1a. For what values of x are both the inequalities

$$8 + 4x > 0 \text{ and } 7 - 3x > 0$$

b. The operation * on the set R of real number is defined as $x * y = \frac{2x+2y+1}{2}\ for\ x, y\ \in R$. Calculate the inverse element given that the identity element is $-\frac{1}{2}$.

2a. Solve for x if $\log_5 x + 6\log_x 5 = 5$

b. If $r\sin\theta = \frac{7}{2}$ and $r\cos\theta = \frac{7\sqrt{3}}{2}$. Find the value of θ.

3a. Calculate the variance of the frequency distribution below.

Score	1	2	3	4	5
Frequency	2	1	2	1	2

b. Solve for n if 2 X ${}^nC_4 = {}^nP_n$

4a. Find the finite area enclosed by the curve $y^2 = 4x$.

b. Find the area of an equilateral triangle of side 16cm.

5a. Twenty Premier League football teams are to play in a league on a home and away-basis. How many matches are possible?

b. Solve for x if $3^x + 3^{2x} = 3^{3x}$

PART B

1. On a certain day in my life, I spent 70% eating, 50% reading and 40% watching movies. At a time, I did two activities together; 30% eating and reading, 30% reading and watching movies, while I spent 20% eating and watching movies. If an activity is to be selected at random, what percentage of my day did I use in the doing the three activities together?

2. If αand β are the roots of the equation $ax^2 + x + c = 0$. Find the equation whose roots are $\frac{1}{\alpha+3\beta}$ and $\frac{1}{\beta+3\alpha}$, hence find the equation with a=c=2.

3. A large tank in the shape of a cuboid is to be made from 54m^2 of sheet metal. The tank has a horizontal base and has no top. The height of the tank is $x$metres. Two of its opposite vertical faces are square. Show that the volume; Vm^3 of the tank is given by $V = 18x - \frac{2}{3}x^3$

4. Given that $x * y = x + \frac{y}{2}$ that $x°y = \frac{x^2}{y}$ and $(3 * b)°48 = \frac{1}{3}$. Find the value of b when b>0

5. Prove the identity: $2tan^{-1}x = cos^{-1}(\frac{1-x^2}{1+x^2})$

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