



NATIONAL MATHEMATICS CONTEST
PRIMARY-LEVEL PAPER 2.

NAMES: _____ DATE OF BIRTH: _____

SCHOOL/INSTITUTION: _____

CLASS: _____ GENDER: _____ DISTRICT: _____

INSTRUCTIONS TO CANDIDATES AND SUPERVISORS:

Do not turn this page until you have been instructed to do so. This competition is conducted on the assumption that proper security is maintained. Uganda Mathematical Society reserves the right, should there be evidence of any breach of security or any suspicion, to reject scripts from a particular school/institution.

PLEASE, NOTE CAREFULLY:

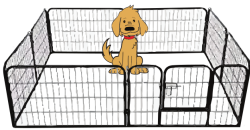
1. **WRITE YOUR ANSWERS IN THE SPACES PROVIDED. MORE SPACE IS AVAILABLE AT THE END.**
2. Date: Saturday, 24th June, 2023.
3. Time: Exactly 2 hours and 15 Minutes (from 9 : 00am to 11 : 15am)
4. Type:
 - (a) This paper consists of two sections and each section carries 50 marks.
 - (b) Attempt as many questions as you can. The total marks scored from all the questions you attempt will be your final score.
 - (c) No marks will be awarded for an answer if **no** clear and logical layout of the working is shown.
5. **Indicate your names, school and district on all your answer sheets in capital letters.**
6. All diagrams/figures in this contest are not to scale.
7. Immediately the paper is done, the answer script(s) must be forwarded to:

Hassan Wasswa Kayondo,
Contest Coordinator, Uganda Mathematical Society,
c/o Department of Mathematics, Makerere University,
P.O. Box 7062, Kampala.
Telephone contact: +256-414-540692.
8. Answer scripts should be received **latest, Monday 26th June, 2023.**
9. **ALL** participants who have done Paper 2 are cordially invited to the certificate and prize giving ceremony on Saturday 22nd July, 2023 at 9.00 am at Makerere University, Kampala.
10. **UGANDA MATHEMATICAL SOCIETY** wishes you success in this year's contest.

SECTION A : 5 marks each

1. Mary was born on January 1, 2000. Her mother was born on January 1, 1985 and her father was born on January 1, 1980. In what year was the sum of their ages 104?

2. Mr. Otim's dog outgrew its rectangular pen that measured 3 metres by 5 metres. To make it larger, he increased each side by an equal amount, which increased the pen's area by 9 square metres. What is the greater side length of the larger pen?



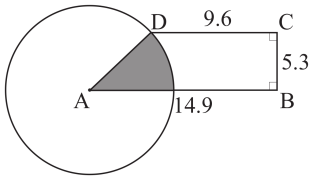
3. How many ways are there to arrange the four integers 1, 2, 3 and 4 in a row so that no two adjacent numbers have a sum of 5?

4. A triangle ABC has an area of 40 units². A point D drawn on side AC such that AD:DC = 3:2. What is the area of triangle BDC?

5. Suppose x & y are positive real numbers and a & b are integers such that $(x^{3b+4}y^{3a-2})^4 = x^{b-6}y^{a+3}$, determine the value of $a - b$.

6. Everyday, Mr. Wafula walks to the market 4 km away at a speed of 3 km/h and then rides back home on a boda bike at twice this speed using a route that is 800 metres longer. How long does Mr. Wafula's journey to the market and then back home last (in minutes)?

7. In trapezoid ABCD, below, vertex A is the center of the circle, vertex D lies on the circle, and vertices B and C are right angles. If $AB = 14.9$ cm, $BC = 5.3$ cm and $DC = 9.6$ cm, what is the area (as a decimal to the nearest tenth) of the shaded sector of the circle?



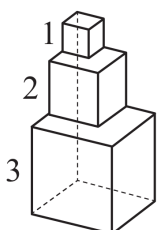
8. The International Standard Book Number (ISBN) is a numeric commercial book identifier that is intended to be unique. It is usually a 13 digit number that is given to each new book which is published. If the sum of the 2nd, 4th, 6th, 8th, 10th and 12th digits is tripled and then added to the remaining digits (1st, 3rd, 5th, 7th, 9th, 11th and 13th), the total will always be divisible by 10. For example, in this case of the ISBN 978-31-6148-410-0 given below, we have $3 \times (7 + 3 + 6 + 4 + 4 + 0) + (9 + 8 + 1 + 1 + 8 + 1 + 0) = 72 + 28 = 100$, which is divisible by 10. What digit is represented by # in the ISBN 9#8-0-90-658898-7 if this ISBN satisfies the above property?



9. A cylinder whose height is 5 times its radius is inscribed in a cone whose height is 7 times its radius. What fraction of the cone's volume lies inside the cylinder?
10. The operation $*$ is defined by $x * y = xy - x - y + 2$. If $7 * b = 13$, what is the value of $b * b$?

SECTION B : 10 marks each

11. Three solid cubes of edge lengths 1 cm, 2 cm and 3 cm respectively are stacked together vertically with the largest at the bottom and the smallest at the top (along the same vertical axis). What is the surface area of the solid object formed?



12. If two standard, fair 6-sided dice are rolled, what is the probability that the product of the two numbers rolled is a perfect square? Express your answer as a common fraction.
13. A satellite is an object in space that circles/orbits around a bigger object, for example the moon is an Earth bound satellite. A satellite, located 400 km above Earth's surface, travels at a speed of 32,000 km/h. For simplicity, assume that the Earth is a perfect sphere with circumference of any great circle of 40,000 km. How many minutes does it take the satellite to orbit Earth one time? Express your answer as a decimal to the nearest tenth.
14. An hour ago, a subaru forester driver heading to Lira observed 78987 km on his odometer reading. This number is palindromic, meaning that it reads the same whether backwards or forwards. How fast was he driving during the last hour if the current number on his odometer is also palindromic?



15. A trime is a three-digit integer for which any two digits of the integer, ordered as they appear in the original integer, form a two-digit prime number. For example, 137 is a trime because 13, 17 and 37 are all two digit prime numbers. However, 211 is not a trime because 21 is not prime (much as 11 is a two digit prime). What is the greatest trime?

END