

The University of the West Indies, Mona

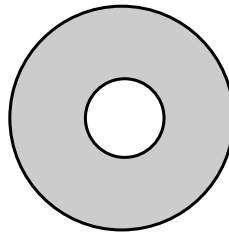
presents

2024-2025 Senior Mathematical Olympiad

Final Round Examination (Grades 7 and 8) - 11:00am

Provide complete solutions to all 10 questions (2.5 hours)

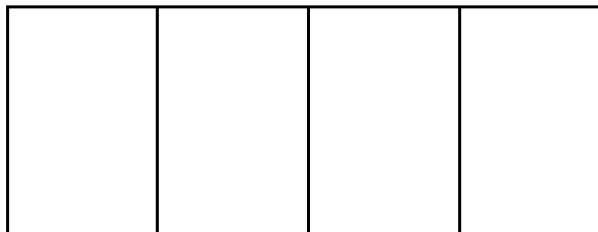
1. A bead selling store sells a popular bead for \$10 each or 7 beads for \$60. Sue wants to buy 2025 of the beads. Determine the smallest amount of money she can pay for the 2025 beads?
2. Morgan started with one piece of paper that he cuts into 8 pieces. He then takes one of the 8 pieces, and cuts it into 8 smaller pieces. Morgan then takes one of the 8 smallest pieces and cuts it into 8 pieces, and continues in this manner, making exactly n cuts. In terms of n , what is the total number of pieces of paper Morgan now has?
3. Concentric circles have a common centre. The diagram shows two concentric circles where the radius of the smaller circle is a third of the radius of the larger circle.



What is the ratio of the grey shaded area to the area of the smaller circle?

4. There are 2000 marbles in a pile. Two percent of the marbles are green and the rest are red. Fiona removes one red marble each day until the pile contains 20% green marbles. How many red marbles does Fiona remove?

5. A rectangle, called L for large, is divided into 4 identical smaller rectangles as shown below.



- The perimeter of L is 18 metres more than the perimeter of each of the smaller rectangles. The area of L is 18 m^2 more than the area of each of the smaller rectangles. What is the perimeter, in metres, of L ?
6. The two-digit number mn is called *easy* if $m^2 + n^2 = 65$. Determine all the easy numbers.
7. Anya and Britany live 25 km apart and plan to meet at 1:00 pm. They decide to leave their respective homes at the same time and cycle towards each other until they meet (at 1:00 pm). Anya cycles at an average speed of 8 kmh^{-1} and Britany cycles at an average speed of 7 kmh^{-1} . What time should they leave their homes?
8. You are given that
- $$7200 = 2^a \times 3^b \times 4^c \times 5^d,$$
- where a, b, c and d are all positive integers. Given that $a + b + c + d = 7$, determine the value of c ?
9. A *perfect square* is a number that may be written in the form n^2 where n is an integer. Examples of perfect squares are 9 ($= 3^2$) and 2025 ($= 45^2$).
- Determine the smallest possible value of the positive integer m , for which the product $120m$ is a perfect square?
10. A block of wood is in the form of a rectangular prism of dimension $5 \text{ cm} \times 8 \text{ cm} \times 13 \text{ cm}$. All six of its faces are painted pink. If the wooden block is cut into 1 cm^3 cubes, how many of these cubes would have some pink paint on them?