

TTMO 2023-2024, Fatima College

R1 Problem Handouts & Contest Info.

§1 Contest Information

§1.1 Round 1

- Takes place in September/October with around 2500 students participating each year.
- 90 minutes & 30 questions with a maximum score of 135 points. First 25 questions are MCQ, final 5 questions are non-MCQ.
 - Questions 1-10: 3 Points
 - Questions 11-20: 4 Points
 - Questions 21-25: 5 Points
 - Questions 26-30: 6,7,8,9,10 Points in ascending order
- Prizes will be awarded to students who do well in the competition, these range from certificates to store vouchers & medals.

§1.2 Round 2

- In January/February, 15% of the top students from round 1 are invited to participate in the second round of the competition held at UWI St. Augustine. The second round is split into two levels with ~200 students in each level.
- Forms 3, 4 & 5 write the level 1 paper while Form 6 writes the level 2 paper.
 - Students are given 3 hours to attempt 4 computation/proof questions in ascending difficulty worth 25 marks each for a maximum score of 100.

§1.3 Round 3

- Once round 2 has been marked, the 10 highest scoring students from each level are invited for a 3-month training camp where they will be coached by past IMO medalists in preparation for the 2024 IMO scheduled to take place in Bath, UK.

§2 R1 Problem Handouts

§2.1 Algebra

A1) Alex chooses two numbers, if the sum of the two numbers is 26 and the difference is 14 then what is the product of the two numbers?

A2) After choosing four consecutive odd numbers, the largest one is less than twice the smallest. What is the minimum value of the sum of these four numbers?

A3) If k and n are positive integers, and $\sqrt{10n + k} = k$, then what is the smallest possible value for k ?

A4) Express the product $(1 - \frac{1}{2^2})(1 - \frac{1}{3^2})(1 - \frac{1}{4^2})\dots(1 - \frac{1}{15^2})$ as a fraction in simplest form.

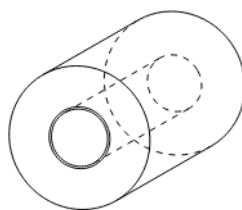
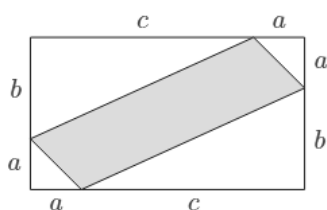
A5) Determine the minimum value of $(x^2 - 4x + 3)(x^2 + 4x + 3)$

§2.2 Geometry

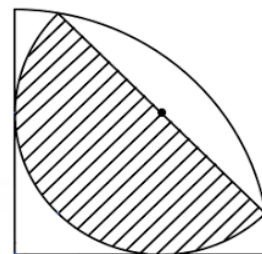
G1) A square ABCD has a center O. If ABO has an area of 16, what is the length of AB?

G2) Ten points Q, R, S, T, U, V, W, X, Y, Z are equally and consecutively spaced around the circumference of a circle. What is the measure of the angle QTW?

G3) Express the area of the shaded rectangle below in terms of a , b and c .



G4) A roll of tape shown below. Initially, the diameter of the roll is 12cm and the diameter of the hole is 4cm. What is the diameter of the roll after using half of it?



G5) What fraction of the quarter circle above is shaded?

§2.3 Bonus

B1) Is it possible for the sum of two consecutive prime numbers to be twice a prime?

B2) A machine adds 5 to a number if it's odd and 11 if it's even. If 2024 is put in the machine 101 times, what will the final value be?

B3) In the equation $ax - b = c$ and $dy + e = f$, the variables a , b , c , d , e and f are integers ranging from 1 to 9 and are all different. What is the smallest possible value of $x + y$?

B4) If $\frac{1}{1} + \frac{1}{4} + \frac{1}{9} + \frac{1}{16} \dots = \frac{\pi^2}{6}$, then find the exact value of $\frac{1}{1} + \frac{1}{9} + \frac{1}{25} + \frac{1}{49} \dots$

B5) How many elements can you take from the set $\{1, 2, 3, \dots, 2024\}$ such that no three numbers will form the side lengths of a triangle? (Eg. 2, 3, 5 can form a triangle but 1, 4, 17 can't)

B6) How many positive integers less than 2024 are in the form $2^a - 2^b$?