

### Qld Pre Olympiad Program Stage 1 2024

Problem Sheet 4 - Algebra Due 6pm Monday May 20

*Submit your answers via link. You will need your Program student ID from the document called 2024 Term2 - Stage1 Pre Olympiad Program Dates.*

Link to submit: <https://forms.gle/zwdJmXMDhbgWEanq7>

*All Number answers are integers between 2 and 1000. Submit 0 if you are unable to solve and submit 1 if you did not attempt the question.*

1. At a Scout camp there are 8 students who like both Frisbee and hopscotch. But 7 students like neither Frisbee nor hopscotch, 13 students only like hockey and 19 students only like Frisbee. How many students are at the Scout camp?
2. What is the smallest positive integer  $n$  for which  $90 \times n$  is a perfect cube?
3. Reading from left to right, a sequence consists of 6 A's, followed by 24 B's, followed by 96 A's. After the first  $n$  letters (from left to right), one letter has occurred twice as many times as the other letter. What is the sum of all the possible values of  $n$ ?
4. In a sequence of numbers, each term after the first two terms is the average of all the terms which come before that term. If the first term is 10 and the twelfth term is 28, what is the sum of the second and the fifth term?
5. A green and a red ball start at opposite ends of a snooker table and do not hit each other and keep a constant speed whilst continuously bouncing back and forth, end to end, on the table. The green ball crosses the table in 6 seconds. The red ball crosses the table in 9 seconds. How many times do they pass each other in the first 12 minutes and 19 seconds (in either the same or opposite direction)?
6. \*\* Alan using identical square cards makes a rectangle measuring  $m$  cards by  $n$  cards. After Alan is done, Cath comes and adds a border of width one card and the area of the border is equal to the original area of Alan's rectangle. What is the sum of all possible values of  $m$ ?

Note: \*\* indicates this question is particularly difficult.