

# Lessons in Maths Olympiads

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## 1 Introduction

This document aims to summarise all of the lessons that I've learnt and the mistakes I've made during my preparation for the 2025 IMO.

## 2 Lessons

### 2.1 Hands Dirty

### 2.2 Wishful Thinking

“Ohhhh... wouldn't it be SOOOOOO nice if this was true?”

Often times it is beneficial to employ this technique to look “into the future”, to try and find conjectures that we wish to prove that would further our investigation.

This comes in many forms: Hoping that four points are cyclic, this sequence is bounded, the function is injective ...

Let's look at an example:

**Example 2.1 – 2021 ISL N1** Find all positive integers  $n \geq 1$  such that there exists a pair  $(a, b)$  of positive integers, such that  $a^2 + b + 3$  is not divisible by the cube of any prime, and

$$n = \frac{ab + 3b + 8}{a^2 + b + 3}.$$

### 2.3 Visualisation

This will come pretty naturally in most combinatorics questions, however we are not restricted to just that. As a learn-by-picture guy myself I often times find turning things such as sequences into something that I can see in my head helps me solve problems much faster.