



# Junior Mathematical Olympiad 2022

## Marker's Report

### Comments from the Marking Team

Overall, there was excellent engagement with this year's paper and perfect solutions were submitted to every question.

Section A was attempted by the majority of the candidates, although some of the strongest candidates chose not to attempt it in order to concentrate on the section B

The mean mark for section A was 5.71.

The mean mark for section B was 15.4 out of 60 which illustrates the relative difficulty of some of the section B questions.

**General Comments about section B questions.** There were a number of correct answers that did not receive full marks. The main reasons for this were that algebra, labelled diagrams or extended prose may be needed,. It is clear to the markers that some candidates sitting the JMO are unfamiliar with the competition and the requirements of Section B in particular. We would recommend that teachers encourage candidates to look at previous papers, the official solutions and the sample student solutions in preparation for future events, these may be accessed via the UKMT website.

<https://www.ukmt.org.uk/competitions/solo/junior-mathematical-olympiad/archive>.

### Question B1

This was attempted by almost all candidates and there were many well structured and completely correct solutions which suggests that some excellent work is being done in schools.

There were two main approaches, the first and most preferable was to translate the words into simultaneous equations and solve them. The second was a variation of trial and improvement, although this was certainly not what is expected, some credit was given when correct answers were arrived at then checked in both equations.

A simple statement of the correct answers attracted little credit.

### Question B2

This question proved a little more taxing than anticipated and many candidates missed the  $10x+y$  breakdown of a two digit number  $xy$  which in many ways was critical to making progress. The main approach to a solution was to form an equation linking the digits  $a$ ,  $b$ ,  $c$  and  $d$  together and use this in conjunction with a series of inequalities. Several candidates identified a single solution and stated without proof that it was unique which it clearly was not.

### Question B3

It is essential that a clear and reasonably accurate diagram is drawn and labelled. Candidates should be aware of the convention of labelling diagrams as there were a few incorrect diagrams which made solutions impossible.



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Many candidates managed to find the correct answer, however they failed to achieve full marks as adequate reasoning was missing.

### Question B4

Many candidates found this question difficult to answer, perhaps the observation that opposite faces of a dice add up to seven was unfamiliar.

There were many candidates who managed to arrive at the correct answer, however a simple statement attracted only a single mark. Some candidates produced convincing arguments to justify the solution that 'n' is even works, however they failed to justify why 'n' is odd did not work (a single example does not suffice).

### Question B5

A small number of candidates attempted this and there were a few well structured and correct solutions. Many attempts obtain results for either the odd or the even case but not both and this certainly limited the marks which could be obtained. As a general principle, candidates should ensure that all cases were covered. Candidates were given some credit for outlining a general method.

### Question B6

The majority of candidates managed to obtain a solution for (i) and concluded incorrectly that the solution was unique. Several candidates attempted to list all the alternative solutions which may work for a small number of cases but this particular question required a well reasoned set of arguments rather than a 'scatter gun' approach. The small number of candidates produced some really excellent solutions.