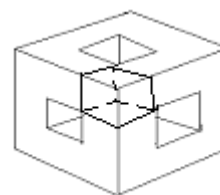# 2003 QAMT Competition
Year 8 SOLUTIONS

Question 1: What is the largest possible number of people at a party if no two of them have birthdays in the same month?

    A 11   **B** 12   **C** 13   **D** 23   **E** 334

Answer: B, 12.

Solution. You can have 12 people with different birthmonths: 1 for Jan, 1 for Feb, 1 for March, etc. If there are 13 people in the room, then two of them must share a birthmonth. Hence the answer is B, 12.

Question 2. A cube of side 3 metres has three holes, each with a side of 1 metre, running from the centre of one face to the centre of the opposite face. What is the total surface area of the solid?

    A 24   **B** 48   **C** 72   **D** 78   **E** 84

Answer: C, 72

Solution: Consider the figure as a collection of 1-by-1 cubes. One of them is shown in the figure. There is a total of 8 corner blocks (as shown) and 12 middle blocks (between the corner blocks). Each corner block shows 3 surfaces. Each middle block shows 4 surfaces. Hence there is a total of 72 surfaces showing.

Question 3: A rat can move around the maze shown by moving into any adjacent square. Each time it enters a square, add the number in the square to your total. What is the lowest possible total score for the rat to move from **Bed** to **Food**?

10	7	6	Food
8	11	5	9
Bed	9	8	3

    A 26   **B** 28   **C** 29   **D** 30   **E** 34

Answer: B, 28

Solution: Going Bed, 9, 8, 5, 6, Food gives the lowest score,

Question 4: Four students: Antony, Birgit, Catherine and Dharma are arguing over which one of them stole the test solution. Birgit says Catherine stole it. Catherine and Dharma say they do not know who stole it. Only the guilty student was lying. Who stole the solution?

    A Antony   **B** Birgit   **C** Catherine   **D** Dharma   **E** Not conclusive.

If B was guilty and lying then: C did not do it, C does not know, D does not know. This would be consistent with B stealing the solution.
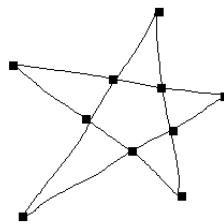
If C was guilty and lying then: C knows who did it, D does not know, B says C did it, and it must be true, so this is consistent with C stealing the solution.

If D was guilty and lying then: D knows who did it, C does not know, but B says C did it, and it must be true, so then D can't have stolen the solutions, so it can't be D.

Hence the problem is not conclusive.

Question 5: A scientist is laying out 10 lights on the ground to attract an alien spacecraft. The lights lie in 5 straight lines with 4 lights in each line. Sketch the arrangement of the lights.

Solution:

Question 6: If a number with two or more digits has all of its digits in increasing order (when reading from left to right), then we call it a rising number. For example, 378 and 12 are rising numbers, but 802 and 388 are not. What is the 101st rising number?

Answer: 456

Solution:

12, .., 19	8	8
23,.., 29	7	15
34,…,39	6	21
45,..,49	5	26
56	4	30
67	3	33
78	2	35
89	1	36
123,..129	7	43
134,…,139	6	49
145,…,149	5	54
156,	4	58
167	3	61
178	2	63
189	1	64
234,…,239	6	70
245	5	75
256	4	79
267	3	82
278	2	84
289	1	85
345,..,349	5	90
356	4	94
367	3	97
378	2	99
389	1	100

| 456,..459 | 4 | 104 |

Hence the answer is 456