MATHEMATICAL CHALLENGE 2015-2016

Entries must be the unaided efforts of individual pupils.

Solutions must include explanations and answers without explanation will be given no credit.

Do not feel that you must hand in answers to all the questions.

*CURRENT AND RECENT SPONSORS OF MATHEMATICAL CHALLENGE ARE*

The Edinburgh Mathematical Society, The Maxwell Foundation, Professor L E Fraenkel,

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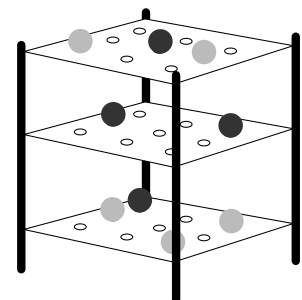
Junior Division: Problems 2

J1. The diagram represents a rectangular net. The net is made from string knotted together at the points shown. The strings are cut a number of times; each cut severs precisely one section of string between two adjacent knots. What is the largest number of such cuts that can be made without splitting the net into two separate pieces?
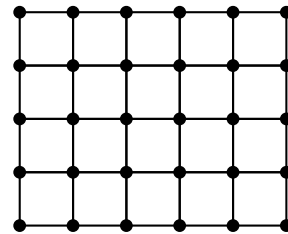
J2. In a diving competition, five judges each award a whole-number score from 1 to 10 and an average mark is then calculated. However there are three different ways of measuring the average: mean, mode and median. After a particular set of scores were given, an argument arose as to which measure should be used, as this would lead to three different final marks being awarded: 7, 8 or 9. Work out all the different possible scores that could have been awarded. Which mark would match with each measure?

J3. An artist who lived in the Outer Hebrides wished to replenish his larder and paid a visit to the local farmer.

"You have some fine birds there", he said, "what do they weigh?"

"Well sir", said the farmer, "a turkey and a duck together weigh twice as much as a goose. A goose and a chicken together weigh twice as much as a duck. A goose, a duck and a chicken together weigh twice as much as a turkey. And a duck weighs 8 ½ pounds."

The artist thanked him and went home to work out the weight of the others.

Find the weight of each of the birds.

J4. A pairs jousting tournament in which each knight would fight every other knight in the competition (unless he had to withdraw due to serious injury) was just about to start. Some unknown knights rode up and asked to be allowed to take part in the tournament. It was decided to include the unknown knights and 26 more pairs competitions had to be scheduled.

How many knights were taking part originally and how many unknown knights arrived?

J5. Imagine a three-dimensional version of noughts and crosses: two players take it in turn to place different coloured marbles in a $3 \times 3 \times 3$ cube arrangement as shown in the diagram. cube in a box made from 27 transparent cubes. The object of the game is to create as many lines of three marbles of your own colour as possible.

How many different possible lines are there?

END OF PROBLEM SET 2