The Scottish Mathematical Council

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MATHEMATICAL CHALLENGE 2014−2015

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, The London Mathematical Society and The Scottish International Education Trust.

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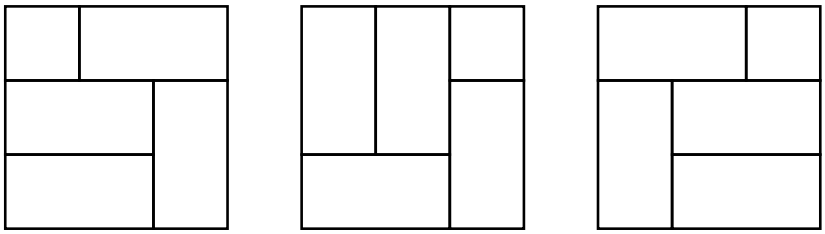
Junior Division: Problems 1

J1. How many whole numbers between 1 and 1000 do not contain the digit 1?

J2.



Three different ways of dividing a 3 × 3 square into one 1 × 1 square and four 2 × 1 rectangles are shown above. How many ways are there in all (including the ones shown above)?

J3. Simon and Paul set out on their bicycles at the same time and from the same place to ride to a nearby swimming pool. Simon rode three times as long as Paul rested on the trip. Paul rode four times as long as Simon rested. The two reached the pool at the same time. Who rode faster?
Explain your reasoning.

J4. A shop sells sweets in bags of 7 and 20. What is the largest number of sweets that cannot be purchased exactly? **Justify your answer.**

J5. If a year had only 364 days then we could use the same calendar every year. But actually most years have 365 days, and leap years have 366 days. For the relevant years, a leap year occurs when the year is divisible by 4.

I was just about to throw away my calendar for 2014 when I wondered when I would first be able to reuse it. In which year will that be? **Justify your answer.**

END OF PROBLEM SET 1