



# The Scottish Mathematical Council

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## MATHEMATICAL CHALLENGE 2016-2017

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 2

- J1.** Colin and Tom are on a camping holiday and, at their campsite, they make friends with Fiona. They ask her when her birthday is but, being a bit of a joker, Fiona tells them only that it is one of the following dates.

May 14,	May 15,	May 18,	June 16,	June 19,
July 12,	July 15,	August 12,	August 14,	August 16.

She then tells Colin the month of her birthday, but not the day in the month, whilst she tells Tom the day in the month, but not the month.

Immediately, Colin declares "Well, Tom certainly cannot know for sure when Fiona's birthday is" to which Tom replies "Ah, but now I do." "And now I know when it is as well," comes back Colin. When is Fiona's birthday? Explain your reasoning.

- J2.** The pages of George's book are numbered from 1. The page numbers have a total of 555 digits. How many pages does the book have?  
How many of the digits are a 5?

- J3.** Given

$$\begin{array}{r} \phantom{+} \phantom{c} \phantom{d} \\ \phantom{+} \phantom{c} \phantom{d} \\ \phantom{+} \phantom{c} \phantom{d} \\ \hline e \phantom{f} \phantom{g} \end{array} \quad \begin{array}{r} \phantom{+} \phantom{e} \phantom{d} \\ \phantom{+} \phantom{e} \phantom{d} \\ \phantom{+} \phantom{e} \phantom{d} \\ \hline c \phantom{b} \phantom{a} \end{array}$$

where  $a, b, c, d, e, f, g$  are all single digits not necessarily all different. Find the values of  $a, b, c, d, e, f$  and  $g$  which makes **both** sums correct.

- J4.** Peter is walking through a train tunnel when he hears a train approaching. He knows that on this section of track trains travel at 60 mph. The tunnel has equally spaced marker posts, with post 0 at one end and post 12 at the other end. Peter is by post 7 when he hears the train. He quickly works out that whether he runs to the nearer end or the further end of the tunnel as fast as he can (at constant speed) he will just exit the tunnel before the train reaches him.

How fast can Peter run?

- J5.** An old fashioned tram starts from the station with a certain number of men and women on board.

At the first stop, a third of the women get out and their places are taken by men. At the next stop, a third of the men get out and their places are taken by women. There are now two more women than men and as many men as there originally were women.

How many men and women were there on board at the start?

**END OF PROBLEM SET 2**