



Puzzle corner 1

Norman Do

Welcome to the inaugural installment of the Australian Mathematical Society *Gazette's* Puzzle Corner. Each issue will include a handful of entertaining puzzles for adventurous readers to try. The puzzles cover a range of difficulties, come from a variety of topics, and require a minimum of mathematical prerequisites to be solved. And should you happen to be ingenious enough to solve one of them, then the first thing you should do is send your solution to us.

In each Puzzle Corner, the reader with the best submission will receive a book voucher to the value of \$50, not to mention fame, glory and unlimited bragging rights! Entries are judged on the following criteria, in decreasing order of importance: accuracy, elegance, difficulty and the number of correct solutions submitted. Please note that the judge's decision — that is, my decision — is absolutely final. Please e-mail solutions to N.Do@ms.unimelb.edu.au or send paper entries to: Gazette of the AustMS, Birgit Loch, Department of Mathematics and Computing, University of Southern Queensland, Toowoomba, Qld 4350, Australia.

The deadline for submission of solutions for Puzzle Corner 1 is 1 May 2007. The solutions to Puzzle Corner 1 will appear in Puzzle Corner 3 in the July 2007 issue of the *Gazette*.

Fun with fuses

You are given two fuses, each of which burns for exactly one minute. However, since the fuses are not of uniform thickness, they do not burn at a uniform rate along their lengths. How can you use the two fuses to measure 45 seconds?

Is it possible to use one of the fuses to measure 20 seconds?

Fuel shortage

Due to the worldwide shortage, the fuel stations located along a circular route together contain exactly enough fuel for a car to complete one lap. Prove that a car starting at the right fuel station with an empty tank can make it around the route.

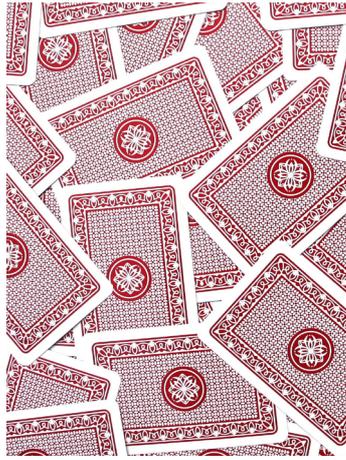


Folding quadrilaterals

Observe that the four corners of a square sheet of paper can be folded over, without overlapping, to meet at the centre of the square. In fact, the same is true for a sheet of paper in the shape of a rhombus. So we can see that a sheet of paper in the shape of a quadrilateral whose side lengths are all equal always admits such a folding. Is it possible to determine whether or not a sheet of paper in the shape of a quadrilateral admits such a folding given only its side lengths?

10. The answer to question 16 is
 (A) D (B) A (C) E (D) B (E) C
11. The number of questions preceding this one with the answer B is
 (A) 0 (B) 1 (C) 2 (D) 3 (E) 4
12. The number of questions whose answer is a consonant is
 (A) an even number (B) an odd number (C) a square (D) a prime (E) divisible by 5
13. The only odd-numbered problem with answer A is
 (A) 9 (B) 11 (C) 13 (D) 15 (E) 17
14. The number of questions with answer D is
 (A) 6 (B) 7 (C) 8 (D) 9 (E) 10
15. The answer to question 12 is
 (A) A (B) B (C) C (D) D (E) E
16. The answer to question 10 is
 (A) D (B) C (C) B (D) A (E) E
17. The answer to question 6 is
 (A) C (B) D (C) E (D) none of the above (E) all of the above
18. The number of questions with answer A equals the number of questions with answer
 (A) B (B) C (C) D (D) E (E) none of the above
19. The answer to this question is
 (A) A (B) B (C) C (D) D (E) E
20. Standardised test is to intelligence as barometer is to
 (A) temperature (B) wind velocity (C) latitude (D) longitude (E) temperature, wind velocity, latitude, and longitude

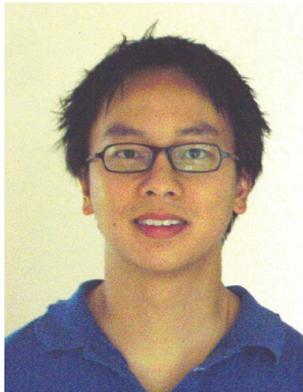
Magic card trick



A prime source for appealing mathematical puzzles is the wealth of olympiad competitions for high school students from around the world. The following is an example from the 2000 International Mathematical Olympiad.

A magician has one hundred cards numbered 1 to 100. He puts them into three boxes, a red one, a white one, and a blue one, so that each box contains at least one card. A member of the audience selects two of the three boxes, chooses one card from each and announces the sum of the numbers on the chosen cards. Given this sum, the magician identifies the box from which no card has been chosen. How many ways are there to put all the cards into the boxes so that this trick always works? (Two ways are considered different if at least one card is put into a different box.)

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