



The Scottish Mathematical Council

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MATHEMATICAL CHALLENGE 2022–2023

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.

Junior Division: Problems 1

- J1.** Twenty-seven unit cubes are each coloured completely blue or completely yellow. All twenty-seven unit cubes are assembled into a larger cube. If half of the surface area of the larger cube is blue, what is the largest number of unit cubes that could have been coloured blue?
- J2.** One morning in the staff room, the coffee jar was empty! The headteacher asks the four teachers who used the last of the coffee?
Andrew: “It wasn’t me”
Brian: “It wasn’t me”
Carol: “It was Diane”
Diane: “It was Brian”
It turns out exactly one of them did not tell the truth – who used the last of the coffee?
- J3.** An unusual type of die in the form of a cuboctahedron has 6 identical square faces and 8 identical equilateral triangular faces. It is twice as likely to land on a square face as on a triangular face. What is the probability that when the die is thrown that it lands on a triangular face?
- J4.** On one type of car, a Goodrock tyre lasts for 20,000 miles on a front wheel or 30,000 miles on a rear wheel. By interchanging the front and rear tyres, what is the greatest distance that can be driven on one set of four tyres?
What is the most efficient way to interchange the tyres?
- J5.** During training, five ladies of the Lightweight Rowing Team went on the scales two at a time and every possible combination of two ladies was recorded which resulted in 10 separate weighings. The 10 weighings were as follows:
110 kg, 112 kg, 113 kg, 114 kg, 115 kg, 116 kg, 117 kg, 118 kg, 120 kg, 121 kg.
What was the weight of each lady?

END OF PROBLEM SET 1