

MATHEMATICAL CHALLENGE 2021–2022

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 2

- J1.** Four nearby primary schools each have a basketball team – the Plodders, Ramblers, Galumphers and Wanderers. Their colours are purple, red, green and white and the captains are Parker, Richards, Grainger and Watson.

In no case is the first letter of either colour or captain's name the same as that of the team. Similarly, in no case is the first letter of a captain's name the same as that of their colour.

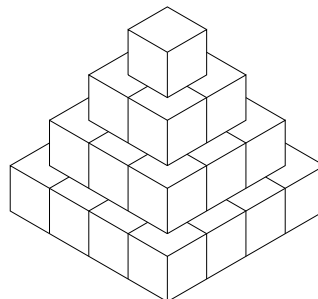
The Wanderers play in green.

Grainger is the captain of the Plodders.

The first letter of the colour in which Watson plays is the first letter of the name of the captain who plays in red.

Who is the captain of the Wanderers?

- J2.** The diagram shows a pyramid made up of 25 cubes, each measuring 1 cm by 1 cm by 1 cm. The centre of the pyramid is a pyramid-shaped hollow, with each layer having edges one cube thick. What is the total surface area of the whole pyramid (including its hollow base)?



- J3.** A number of aliens, who have just dropped in from another planet, emerge from their spacecraft.

- (1) There is more than one alien.
- (2) Each alien has more than one finger.
- (3) Each alien has the same number of fingers.
- (4) The total number of fingers on all the aliens is between 200 and 300.
- (5) If you knew the total number of fingers of all the aliens you would know the number of aliens.

How many aliens were there?

- J4.** Three expert logicians played a game with a set of 11 cards each with a different two-digit prime number below 50. Each drew a card and held it up so that they could only see the number on their own card but could not see the other numbers. Ali, Bobby and Charlie in turn were then asked two questions, namely “Is your number the smallest of the three?” and “Is your number the largest of the three?”. In the first round all three answered “Don't know” to both questions. The same happened in rounds two and three. In round 4 Ali answered “No” to the first question.

What numbers did each logician have?

- J5.** Alistair and Jonny cross a lake by swimming and using a one-seat canoe. Each swims at 2 km/hour and paddles the canoe at 7 km/hour. They set off from the same point at the same time, heading straight for the boathouse at the opposite side, with Alistair swimming and Jonny paddling the canoe. After a while Jonny stops paddling, gets out of the canoe and immediately starts swimming. When Alistair reaches the canoe, which has not moved since Jonny started swimming, Alistair climbs in and immediately starts paddling. After 90 minutes they both arrive at the boathouse together. For how long was the canoe stationary?

END OF PROBLEM SET 2