

MATHEMATICAL CHALLENGE 2018–2019

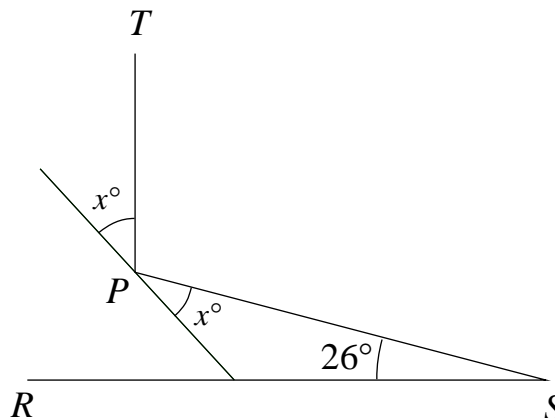
Entries must be the unaided efforts of individual pupils.

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.

Middle Division: Problems 1

- M1.** A beam of light shines from point S , reflects off a reflector at point P , and reaches point T so that PT is perpendicular to RS and $\angle RSP = 26^\circ$ as shown below. Find angle x° .



- M2.** Emma started with a rectangle of paper. With one straight cut she divided it into a rectangle and a square. She took the rectangle and with one straight cut divided it into a rectangle and a square, which was smaller than the previous one. She kept repeating this process until eventually the final rectangle was a square with sides 1 centimetre and she was left with a pile of squares of paper. The average area of the squares was a two digit number of square centimetres.

What were the dimensions of the original rectangle?

- M3.** A party of 30 villagers decided to hire a bus to take them to a show in the city. The tickets for the show cost 50p for children, £2.50 for pensioners and £5 for others. The number of "others" attending was more than the number of children but less than twice the number of children. There were more children than pensioners on the bus.

The total cost of the tickets was £100. How many children and how many pensioners attended the show?

- M4.** Three expert logicians played a game with a set of 21 cards each with a different two-digit prime number. Each drew a card and held it up so that they could not see the number on their own card but could see the number on the cards of each of the others. 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 "Don't know" to the first question. What did Ali answer to the second question and what numbers did Bobby and Charlie have?

- M5.** Consider a square with side 15 cm and an equilateral triangle with the same perimeter. Which has the greater area? And by how much?

END OF PROBLEM SET 1