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 2

M1. An unlimited supply of petrol is available from a camp at one edge of a desert which is 800 miles wide but no petrol is available anywhere else. A truck can only carry enough petrol to travel 500 miles and is able to leave petrol to be collected later. (There is no limit on the size of such stocks and it should be assumed that no petrol is lost by evaporation or spillage.) Establish whether or not it is possible for the truck to get across the desert and, if it is, explain how.

M2. Two ships, one 200 metres in length and the other 100 metres in length, travel at constant but different speeds. When travelling in opposite directions, it takes 20 seconds for them to completely pass each other. When travelling in the same direction, it takes 50 seconds for them to completely pass each other.

Find the speed of the faster ship.

M3. Four identical isosceles triangles border a square of side 6 cm, as shown. When the four triangles are folded up they meet at a point to form a pyramid with a square base. If the height of this pyramid is 4 cm, find the total area of the four triangles and the square.
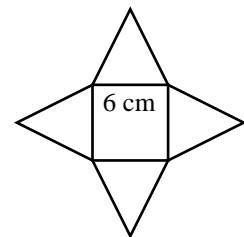
M4. Show that the product of four consecutive odd integers is always 16 less than a square number.

Deduce that the product of four consecutive odd integers can never be a square number except in one particular case.

M5. A cardboard box manufacturer makes open-topped boxes which are cubes. Because of changes in the market, there are plans to double the volume of the boxes which are made. The regular supplier of raw cardboard offers a 37.5% discount on the price that was originally being charged. A new supplier offers a deal in which the manufacturer would be paying exactly the same for the raw material for his bigger boxes as was paid for the smaller boxes.

Which is the best deal for the manufacturer?

END OF PROBLEM SET 2