SHREWSBURY SCHOOL

MATHEMATICS PRIZE, 1961

1. Find the smallest whole number which leaves remainders 2, 4, 6, 10 when it is divided by 3, 5, 7, 11 respectively.

2. Solve:
$$b+c+d=19, \qquad a+c+d=16,$$
$$a+b+d=14, \qquad a+b+c=11.$$

3. A circular piece of paper is folded about a chord AB, and a circle, centre A, cuts the arcs in P and Q. Prove that B, P, Q are in a straight line.

4. Find the law governing the following two series of numbers, and write down the next term in each series :—

    (i)   0, 1, 2, 9, 44, 265, ...

    (ii) $\dfrac{1}{1}, \dfrac{3}{2}, \dfrac{7}{5}, \dfrac{17}{12}, \dfrac{41}{29},$ ....

5. ABCD is a parallelogram and P is a point inside such that the angles APB and CPD are supplementary. Prove that the angles PAD, PCD are equal.

6. A vessel contains 10 gallons of milk. When a gallon of its contents is drawn out, a gallon of water is poured in. After how many such operations will the contents of the vessel contain less than 10 per cent of milk ?

7. Prove that the sum of the diagonals of a quadrilateral is less than its perimeter but greater than half its perimeter.

8. One side of a triangle is one-third of the perimeter, and the area of the triangle is three-fifths that of the equilateral triangle described on that side. Prove that the sides of the triangle are in the ratios 3 : 5 : 7.