Shrewsbury School.

MATHEMATICS PRIZE, 1951

1. Evaluate by logarithms :—

$$(0\cdot4283)^{-0\cdot4} \times (3\cdot262)^{2\cdot7} \times (42\cdot6)^{-0\cdot6}$$

2. A common error, when using an automatic machine for adding sums of money, is to record sums such as £7 5s. as 7s. 5d. or £13 9s. as 13s. 9d. If only one amount is recorded incorrectly, and if the error in the result is £x ys. zd., prove that $x+y+z$ is either 11 or 30, and that the wrong entry is either xs. $(12-z)$d. or $(x+1)$s. $(12-z)$d.

3. ABC is any triangle. AX, AY are the perpendiculars from A to the bisectors of the angles B and C. Prove that XY is parallel to BC.

4. Find a number divisible by 41 whose digits are all nines, and, without doing the division, find the remainder when 900008000070000600005000040000300002000001 is divided by 41.

5. If the hands of a clock are indistinguishable, what is the time about 7.20 which might also be about 3.35 ?

6. ABCD is a parallelogram, and P is a point inside such that the angles APB and CPD are supplementary. Prove that the angles PBC and CDP are equal.

7. A boy thinks of an odd number ; he multiplies the number by 3 and divides the result by 2, finding that the quotient is even. He then multiplies the quotient by 3 and divides by 2, and states that the result is 175. Prove that he is wrong ; and, assuming that his only error is in taking the final figure to be 5, find what was the original number.

8. A man arrives at his station 34 minutes earlier than he had ordered his car to meet him there. He started to walk home at 4 miles per hour, and met the car after it had come 10 miles. He thus got home 8 minutes sooner than he had originally expected. Find the speed of the car and the distance of his house from the station.

9. AB is a chord of a circle, and EF is the perpendicular diameter ; another circle is drawn to touch the arc AFB at C, and the chord AB at D. Prove that CDE is a straight line, and hence show that the tangent from E to the smaller circle is equal to EA.