

**INTERNATIONAL MATHEMATICS AND SCIENCE OLYMPIAD
FOR PRIMARY SCHOOLS (IMSO) 2007**

Mathematics Contest (Second Round) in Taiwan, Essay Problems

Name: _____ **School:** _____ **Grade:** _____ **ID number:** _____

Answer the following 10 questions, and show your detailed solution in the space provided after each question. Each question is worth 4 points.

Time limit: 60 minutes.

1. The 400-digit number 12345678901234567890...890 is given.

Step 1: Cross out all the digits in odd-numbered places.

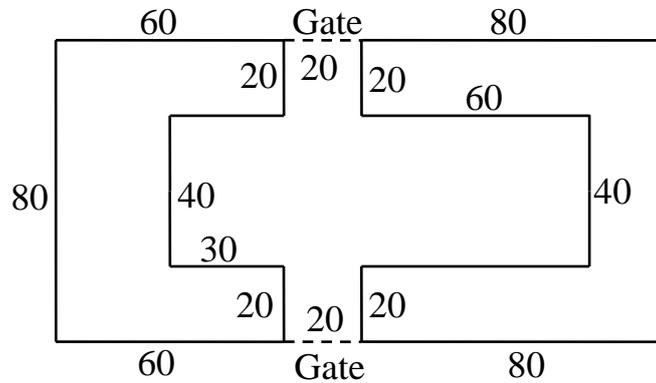
Step 2: Cross out all the digits in odd-numbered places of the remaining digits.

...

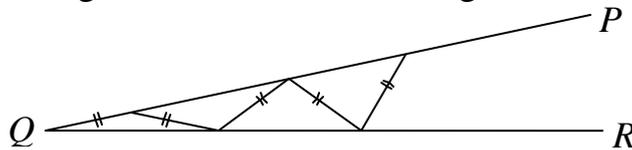
Continue until no digits remain. What is the last digit to be crossed out?

2. A street of houses numbered from 1 to 302 inclusive is to be numbered with new brass numerals. How many of the digits "2" would be needed to complete the job?

6. Here is the plan of a building which has a courtyard with two entrance gates. Passers-by can look through the gates but may not enter. Dimensions of the building are given in metres, and all corners are right angles. What is the area, in square metres, of that part of the courtyard which cannot be seen by passers-by?



7. In the diagram $\angle PQR = 6^\circ$, and a sequence of isosceles triangles is drawn as shown. What is the largest number of such triangles that can be drawn?



8. Let $n = 9 + 99 + 999 + \dots + 99\dots 9$, where the last number to be added consists of 99 digits of 9. How many times will the digit 1 appear in n ?

9. The following multiplication example, including the answer, uses each number from 0 to 9 once and once only. Four of the numbers are filled in for you. Can you fill in the rest?

$$\begin{array}{r}
 \square 0 2 \\
 \times \quad \quad 3 \square \\
 \hline
 \square 5 \square \square \square
 \end{array}$$

10. The four circles represent cinder paths. The four cyclists started at noon. Each person rode round a different circle, one at the rate of six miles an hour, another at the rate of nine miles an hour, another at the rate of twelve miles an hour, and the fourth at the rate of fifteen miles an hour. They agreed to ride until all met at the center, from which they started, for the fourth time. The distance round each circle was exactly one-third of a mile. When did they finish their ride?

