# INTERNATIONAL MATHEMATICS AND SCIENCE OLYMPIAD FOR PRIMARY SCHOOLS (IMSO) 2009
Mathematics Contest in Taiwan

Name: _____ **School:** _____ **Grade:** _____ **Number:** _____

Short Answer: there are 12 questions, fill in the correct answers in the answer sheet. Each correct answer is worth 10 points. Time limit: 90 minutes.

1. Find the largest possible divisor of the three numbers, 480608, 508811 and 723217, so that the reminder is the same in each case.

2. In a small group of people it was found that all of the following relationships were present: father, mother, son, daughter, brother, sister, cousin, nephew, niece, uncle and aunt. What is the smallest group of people for which this is possible?

3. Seven cubes are glued together face to face as shown in the diagram. The volume of the solid formed in this way is 189 cm^3. Find the surface area of the solid.
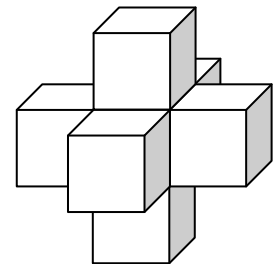
4. Jack said to Jim: "If I give you 6 pigs for one horse, then you will own twice as many animals as I own." Dan said to Jack: "If I give you 14 sheep for one horse, then you will own three times as many animals as I own." Jim said to Dan: "If I give you 4 cows for one horse, then you'll own six times as many animals as I own." How many animals in total do Jack, Jim and Dan own?

5. By adding brackets in various ways to the expression 1÷3÷5÷7÷11÷13, what is the maximum number of different values which the expression can have?

6. Replace the asterisks with digits so that the multiplication below is correct:

    $$\begin{array}{r} * \ * \ * \ * \ * \\ \times \quad * \ * \ * \ * \\ \hline 3 \ 3 \ 3 \ 3 \ 7 \\ * \ * \ * \ * \ * \ * \\ * \ * \ * \ * \ * \ * \\ * \ * \ * \ * \ * \ * \\ \hline * \ * \ * \ * \ 2 \ 0 \ 0 \ 9 \ * \end{array}$$

    What is the product?

7. Tom has a contract to dig out some foundations and it must be done in 30 days. His own machine, which he wishes to use as much as possible, would take 48 days to do all the work. He can hire a bigger machine which would do the complete job in 21 days, but it costs $300 a day. There is only enough room for one machine at a time. What is the least number of days for which he will have to hire the larger machine?

8. Four different right-angled triangles all have sides which are of integral length and their perimeters are the same length. Find the smallest perimeter for which this is possible.

9. The diagram is of an irregular pentagon with all 5 of its diagonals drawn in. How many distinct triangles (not necessarily different) can be found, using only the lines (or parts of lines) shown in the diagram?
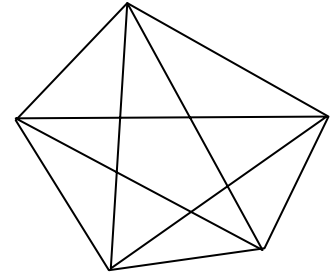
10. I have a rectangular picture whose edges are each an exact number of centimeters in length. At a quick glance it could be mistaken for a square, but it is not a square. It is placed inside a black border which is 3 cm wide all the way around the picture. The area of the border is exactly equal to the area of the picture. What is the area, in cm^2, of the picture alone?

11. A combination lock on a safe needs a 6-letter sequence to open the safe. This is made from the letters A, B, C, D, E, F with none of them being used twice. Here are three guesses at the combination

$$C\ B\ A\ D\ F\ E$$
$$A\ E\ D\ C\ B\ F$$
$$E\ D\ F\ A\ C\ B$$

In the FIRST guess only ONE letter is in its correct place. In the SECOND guess only TWO letters are in their correct places and those two correct places are not next to each other. In the THIRD guess only THREE letters are in their correct places. Each of the 6 letters is in its correct place once. What is the correct combination?

12. Given that *ABCD* is a square and the lengths *EA*, *EB*, *EC* are in the ratio *EA*:*EB*:*EC*=1:2:3, determine the size of the angle *AEB,* in degree.