# INTERNATIONAL MATHEMATICS AND SCIENCE OLYMPIAD FOR PRIMARY SCHOOLS (IMSO) 2008
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. In the diagram the top two sets of scales are in perfect balance. For the third set, the right hand side is heavier than the left hand side, and has to be supported as shown. What can be added to the left hand side to achieve a perfect balance in this case as well?
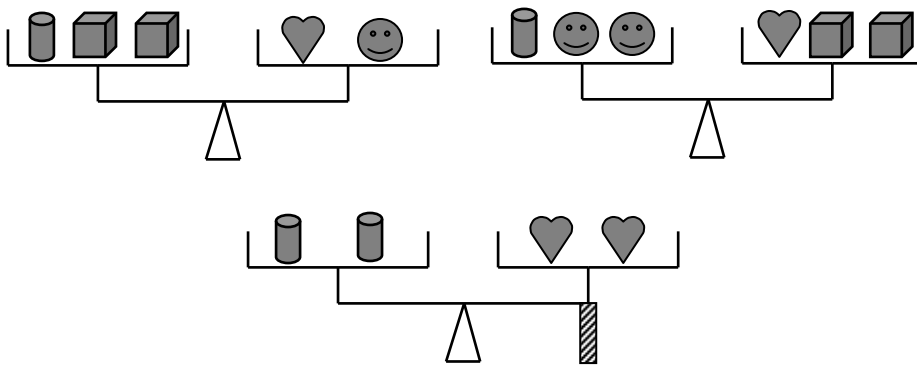
2. A rectangle is divided into 9 small rectangles, as shown in the diagram, which is not drawn to scale. The areas of 5 of the small rectangles (in suitable units) are given. What is X?

6	9	
	15	18
X		27

3. The diagram depicts seven soft drink cans, seen from above, which are held tightly together by means of a ribbon. The circles represent the tops of the cans, and the other curve, which is clearly not a circle, represents the edge of the ribbon. The ends of the ribbon meet exactly; there is no overlap. Given that the cans all have diameter 6 cm, find the exact length of the ribbon. (Take $\pi = 3.14$)

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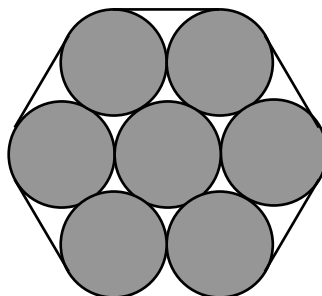
4. *A*, *B*, *C* and *D* are four members of the football team. No two have the same weight. *A* is 8 kg heavier than *C*. *D* is 4 kg heavier than *B*. The sum of the weights of the heaviest and the lightest is 2 kg less than the sum of the weights of the other two people. If the sum of all their weights is 402 kg, what does *B* weigh?

5. At a youth club one evening, one quarter of the members were playing pool, one sixth were playing table tennis, and five times the difference between these numbers were watching television. A further twelfth of the members were reading, leaving 7 members wandering around undecided what to do. How many members were present that evening? (Please note: nobody was trying to do more than one thing at a time. For example, no one was playing pool and watching television.)

6. In the sum shown, each digit 1, 2, 3, 4, 5, 6, 7, 8, 9 occurs just once.

$$\begin{array}{r} 3 \ 9 \\ 4 \ 5 \\ \underline{7 \ 8} \\ \text{Total} \quad 1 \ 6 \ 2 \end{array}$$

There are many similar sums, in which three 2-digit numbers are added together to give a 3-digit number and each digit 1, 2, 3, 4, 5, 6, 7, 8, 9 occurs just once. Find the largest total (the 3-digit number).

7. There is a duck-pond in the local park, with a one mile path right round it. One morning, grandma decided that she would have an hour's gentle exercise and walked round the pond at an average speed of 3 miles per hour. Her grandson Jerry started off at the same place and the same time, ran for an hour at an average speed of 8 miles per hour and went in the opposite direction to his grandmother. How many times did they meet after they had started and before they came to the end of their respective ordeals? (No including the final encounter.)

8. Catriona would like to become an Olympic sprinter. Her younger sister Morag would rather play football, but helps Catriona by racing against her. When they tried the 100 metre dash, Catriona cross the winning line when Morag was still 20 metres short of it. Catriona wanted something more challenging, so it was agreed that she would start 20 metres behind the normal starting line. They both ran at exactly the same speeds as in the first race. Where was Morag when Catriona crossed the winning line?

9. My bank card has a four-digit number code that I need to punch in when I get money out of the ATM. To help me remember it I noted the following facts
   (a) No two digits are the same.
   (b) The fourth digit is the sum of the other three.
   (c) The first digit is the sum of the middle two digits.
   (d) If I reverse the number, the result as an exact multiple of 7
   What is my number?

10.

	1	2	3	4	5	6

Six of seven positions are occupied by six frogs, which are numbered 1, 2, 3, 4, 5, 6 as shown. A frog can jump to an adjacent position if it is vacant, or leap over another frog to the next position but one if it is vacant, and can move backwards or forwards. What is the least possible number of moves required if the frogs are to occupy the six positions which were occupied at the start, but in the order 6 5 4 3 2 1 reading from left to right?

11. As I am sure you know, a date can be represented by writing down three positive integers. For example, the seventeenth of June 1995 can be represented by 17.6.95; it is the 17th day of the 6th month in the 95th year of the 20th century. Define the "date sum" of any date to be the sum of the corresponding integers. Thus the date sum of 17 June 1995 is $17+6+95=118$. Now let n be the sum of the date sums of all the days from 1st January 2001 to 31st December 2007 inclusive. Find the value of n.

12. *AB* is a diameter of a circle with centre *M*. *CD* is a chord of this circle which is parallel to *AB* and *C* is its extremity nearer to *A*. *MC* meets *AD* at a point *E* such that *AC=EC*. Find the size of the angle *CAM*.