Po Leung Kuk
18th Primary Mathematics World Contest
Team Contest 2015

Team: _____

1. A number is formed by starting with a single digit, doubling it and writing down the unit digit of the product as the next digit in the number. For example
   - starting with 2 you will get the number 248624….

   When starting with 3 what will the sum of the first 2015 digits be?

2. The six letters of the word "*MOTHER*" are rearranged in all possible orders and the words so formed are listed in alphabetical order (ABCDEFGHIJKLMNOPQRSTUVWXYZ).
   Example
   1. "*EHMORT*",
   2. "*EHMOTR*",
   3. "*EHMROT*",

   …

   n. "*MOTHER*"

   …

   What is the value of *n* (the position of the word "*MOTHER*" on this list)?

3. Let us imagine that all the positive integers are written in an endless table as shown below. What is the position of number 2015?
   For example, 12 is in position C2R4.

	C1	C2	C3	C4	C5	C6	…	
R1	1	2	6	7	15	16	…	
R2	3	5	8	14	17	…		
R3	4	9	13	18	…			
R4	10	12	19	…				
R5	11	20	…					
R6	21	…						
…	…							

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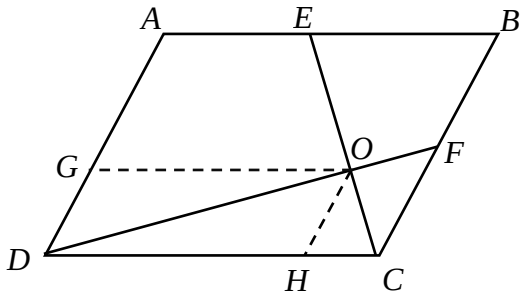
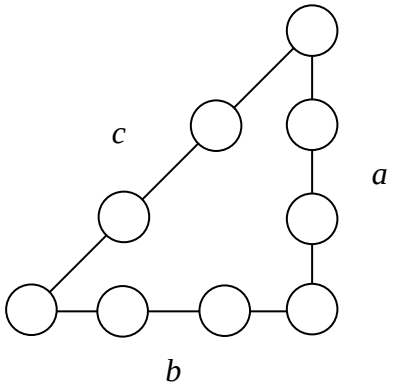
4. Alex, Bobby and Carl dig a garden of 460 m^2. Alex starts digging on his own. After a while Bobby joins him and finally Carl joins them. Each of them digs 40 m^2 per hour, but when two of them work together (due to their talking) each digs 30 m^2 per hour. When the three of them work together, each digs 20 m^2 per hour. Each of them works continuously for 5 hours to dig the whole garden. How many square meters of the garden does Bobby dig?

5. In the figure below, *ABCD* is a parallelogram. Point *E* is the midpoint of *AB*, point *F* is the midpoint of *BC* and point *O* is the intersection of *EC* and *DF*. If *GO* // *AB*, *OH* // *BC*, *GO* = 12 cm and *OH* = 4 cm, find the ratio of the perimeter of *ABCD* to the perimeter of *GOHD*.



6. Each of the numbers from 1 to 9 is placed, one per circle, into the figure shown. The sum of the four numbers written in the circles along the sides of the triangle are respectively *a*, *b* and *c*.

   Place the numbers so that $a^2 + b^2 = c^2$.



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7. In

$$\begin{array}{cccccc} & & P & M & W & C \\ \times & & & & H & K \\ \hline K & H & H & K & K & H \end{array}$$

each distinct letter represents a distinct digit. Find the 4 - digit number $PMWC$.

8. In the 3×3 table below, the number 1 is already placed in a square. Fill in each empty square with a distinct prime number less than 100 so that the sum of each row, column and diagonal is the same.

1		

9. '*PLK*' is a 3 - digit code that follows these rules:-
   (a) '*P*', '*L*' and '*K*' are single digit prime numbers. For example, '352'
   or
   '*P*' is a single digit prime number and '*LK*' is a 2 - digit prime number. For example, '343'.
   (b) '*PLK*' must not have the same adjacent digits. For example, '337' is not allowed.

   How many different '*PLK*' codes can be made?

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10. How many different ways are there to paint the six faces of a cube so that no two adjacent faces have the same colour? Each face must be painted only one colour. Five colours are available but it is not necessary to use all of them.
    (Two ways of painting which give the same colour on corresponding faces after rotations or flips are considered the same way.)