FLORENCE NIGHTINGALE DAY 17th DECEMBER 2015

QUIZ

Q1.

A dish needs 15' cooking. You only have two hour glasses (filled with sand), one of 7' and another of 11'. How can you cook the dish for 15' exactly?

Q2.

Draw six line segments of equal length to form eight equilateral triangles.

Q3.

A man travels $5,000$ miles in a car with one spare tyre. He rotated the tyres on his car so that at the end of the trip, each tyre had traveled the same number of miles. For how many miles was each tyre used?

Q4.

A magic square is an array of numbers such that the sum of each row and each column add up to the same total. Complete the square below so that it is a 7×7 magic square containing the integers $1, 2, \ldots, 49$.

	1					
	49					
		32	23	21	12	

Q5.

You have ten stacks of coins of 20p. Exactly one entire stack is counterfeit, but you do not know which one. You know the exact weight of a single coin of 20p, and you also know that a single counterfeit coin weighs 1g more than a genuine 20p coin. You may weigh the coins on a pointer scale. What is the minimum number of weighings necessary to determine which stack is counterfeit?

Q6.

Two or more spots are placed anywhere on the circumference of a circle. Every pair is joined by a straight line, dividing the disk into a certain number of regions. For instance, with three points, we can get at most 4 regions, as shown in Figure 1. Given six spots, what is the maximum number of regions into which the circle can be divided?

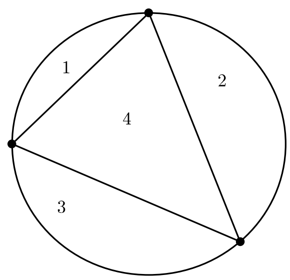

FIGURE 1. Spots on a circle

Q7.

A knight's tour is a path taken by a knight on a chessboard: two cells in one direction and one cell perpendicular (see example Figure 2). The rules for such "tour" is that the knight can visit a cell at most once, and cannot cross his path. On a 6×6 chessboard, what is the maximum length of a knight's tour?

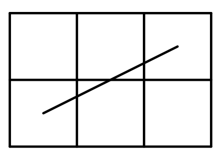

FIGURE 2. Knight's move: 2 by 1 cell

Q8.

A cyclic number is a number X formed by n digits, such that for each integer $k = 1, \dots, n$, the multiple kX of X contains the same digits listed in the same cyclic order (that is $abc \sim bca \sim cab$). Trivially, 1 is a cyclic number, since $1 \cdot 1 = 1$. Complete the following six digits number into a cyclic number

$$1\,4\,2\,-\;-\,-$$

Q9.

Planar maps are coloured according to the rule that no two regions sharing (part of) a common edge can have same colour. For instance, the map in Figure 3 requires (at least) 3 colours.

The edges in the map of Figure 3 have same length. Rearrange these six equal length edges so that the minimum number of colours required is 4. (Note, the regions need not have same area!)

Q10.

Ali, Ben and Cathy lunch together every day. If Ali orders a coffee, then so does Ben. Either Ben or Cathy always orders a coffee, but never both during the same lunch. Either Ali or Cathy or both always order a coffee, and if Cathy orders a coffee, then so does Ali.

You decide to join them for a lunch on Tuesday. Who amongst Ali, Ben and Cathy will order a coffee then?

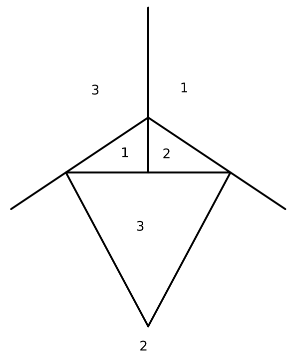

FIGURE 3. A map requiring 3 colours at least.

Q11.

There is a unique number of 10 digits which has the property that the first digit gives the number of 0 in it, the second digit that of 1, and so forth, up to the tenth digit which is the number of 9 forming it. Find this number.