Student Name: **School:** **Grade:**

Math-M-Addicts May 2018 Group L Entrance Exam

Instructions: Please write legibly and fully justify your answers. Points will be deducted for incomplete solutions. At the same time, it is OK to provide partial answers, as you may earn points for good ideas even if you do not have full solutions. Good luck!

Problem 1. Place numbers 1, 2, 3, 4, 5, 6, 7, 8 and 9 around a circle so that sum of any two numbers next to each other is not divisible by 3, 5 or 7.

Problem 2. How many two-digit numbers give a perfect square when added to the two-digit number written by the same digits but in reverse order?

Problem 3. A carpenter went to a lumber yard and bought 10 planks of wood. Each plank had a length that was a whole number of centimeters. The longest plank had a length of exactly 54 centimeters. Prove that there exist three planks that can be arranged to form a triangle.

Problem 4. The number 12 can be written as a sum of an integer and its smallest divisor greater than 1 in two different ways: 12 = 10+2 = 9+3. Find the smallest possible integer than can be represented as a sum of an integer and its smallest divisor greater than 1 in **FOUR** different ways.

Problem 5. Prove that for any integer *n*

$$1*2*3+\ 2*3*4\ +\ 3*4*5\ +\ldots.+\ n*(n+1)*(n+2)\ =\ \frac{n(n+1)(n+2)(n+3)}{4}$$

Problem 6. The fraction $\frac{3}{4}$ is written on the board. Every minute Fanny chooses two integers.

The first number, which is always between 80 and 100 (inclusive), is added to the numerator. The second number, which is between 100 and 120 (also inclusive), is added to the denominator. If at any point the numerator and denominator have a common factor, the fraction is reduced to its lowest terms. Can Fanny eventually get to the fraction $\frac{2}{3}$?