Student Name: _____

Please write your name on *every* page.

6 Section F

F1
The volume of a cube is 64. What is the total length of all edges of the cube?

Answer to F1: _____

F2
What is the maximum possible area of a rectangle with perimeter 12?

Answer to F2: _____

F3
A fair 6-sided die is thrown 2018 times. Which of the following is the appoximate probability that it will land on 6 at least 328 times: 0.1, 0.4, 0.7, or 1?

Answer to F3: _____

F4
What is the area of the smallest square that completely covers a triangle with side lengths 3, 4, 5?

Answer to F4: _____

F5
Mr. Liang's grade 10 class has 12 boys and 16 girls. For a class project, he randomly partners the students into groups of two. On average, how many groups will have one boy and one girl?

Answer to F5: _____

Student Name: _____

Please write your name on *every* page.

F6

A **palindrome** is a number that reads the same forwards and backwards. For example, 12321 is a palindrome, as is 70207 or 8888888. Find any two different whole numbers whose cubes ($n^3 = n \times n \times n$ are 7-digit palindromes. Write both numbers, seperated by a comma, in the blank.

Answer to F6: _____

F7

Let n coins weighing $1, 2, \ldots, n$ grams be given. Suppose Baron Munchhausen knows which coin weighs how much, but his audience does not. Then $a(n)$ is the minimum number of weighings the Baron must conduct on a balance scale, so as to unequivocally demonstrate the weight of at least one of the coins.

Values of $a(n)$ for small n are as follows:

- $a(1) = 0$ as the audience already knows the only coin has weight 1
- $a(2) = 1$; the Baron may weigh $1 < 2$, identifying both
- $a(3) = 1$; the Baron may weigh $1 + 2 = 3$, which identifies the 3-gram coin
- $a(4) = 1$; the Baron may weigh $1 + 2 < 4$, which identifies the 3-gram coin
- $a(5) = 2$

What is $a(8)$?

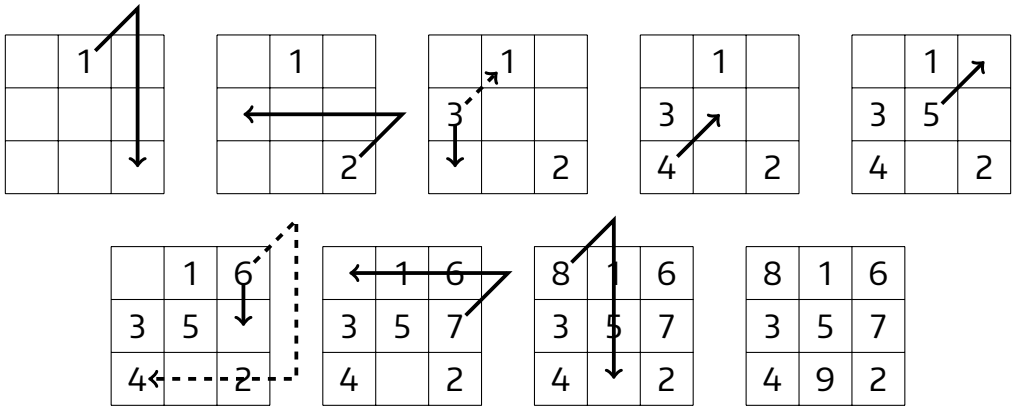
Answer to F7: _____

Student Name: _____

Please write your name on *every* page.

F8

A **magic square** is a grid of whole numbers such that the sum of each row or column is equal to the same number. One way to build a magic squares is to write the numbers in order with the "north-east" technique. Start by writing a 1 in the middle square on the top row. Until the entire square is full, write the next number in the square up and to the right (north-east) of the last number we wrote. If this goes outside the square, wrap around to the other side of the square. Sometimes, that square might already be full; if so, we write the number in the square below the last square (south) instead. See the picture below for an example on a 3×3 magic square:



If you do this process on a 63×63 magic square, what number will be in the top-left corner?

Answer to F8: _____