Student Name: _____

Please write your name on ***every*** page.

5 Section E

E1

Isa is a fan of agriculture, and wants to build a fence to contain her cows. She is also a fan of shapes, and wants to either build the fence in an equilateral triangle or a square. She has 12 metres of fence to work with, and wants to use it all. How much larger is the area enclosed by her square fence idea than that which is enclosed by her equilateral triangle fence idea?

Answer to E1: _____

E2

What is the value of the product $(1-\frac{1}{2})\times(1-\frac{1}{3})\times\cdots\times(1-\frac{1}{2019})$?

Answer to E2: _____

E3

Let $f_n(x)$ denote the function f applied n times to value x. For example, $f_4(x) = f(f(f(f(x))))$. Let $g(x) = x+2$. Find the value of $g_{673}(673)$.

Answer to E3: _____

E4

A bag contains 3 red, 2 blue, and 5 green marbles. Bob draws marbles from the bag until either all the red marbles or all the blue marbles have been drawn. What is the probability that the last marble drawn is blue?

Answer to E4: _____

E5

A cube has side length 4. A cylindrical hole of radius 1 is drilled through the centre of a face of the cube straight through to the opposite face. What is the surface area of the resulting solid?

Answer to E5: _____

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E6

Five friends, Alice, Bob, Carl, David, and Earl, want to go see a movie at their local theater. Some of the friends have preferences to their seating plan:

- Carl wants to sit at the very left or right end of all the other friends.
- Alice and David prefer to sit beside each other.

How many different seating arrangements can there be if all of the preferences are met?

Answer to E6: _____

E7

A number is called twoodd if it has exactly 2 different odd factors. For example, 6 is twoodd as it has only 1 and 3 as its odd factors, but 18 is not twoodd as it has 1, 3, and 9 as odd factors. How many numbers between 1 and 100 are twoodd?

Answer to E7: _____

E8

Noah and Ben are playing a dice game. First Noah rolls a twenty sided die with numbers from 1 to 20. If the result is 13 or higher, then he is allowed to roll two six sided dice with numbers from 1 to 6, and sum them to determine how many points he gets. Ben opts to make the rules slightly more interesting. He will give Noah 10 extra points automatically whenever Noah rolls the six sided dice but Noah will only get to roll them if the result on the twenty sided die is 18 or higher instead of 13 or higher. How many fewer points can Noah expect to earn under the new system than under the old one?

Answer to E8: _____