

Student Name: \_\_\_\_\_  
Please write your name on *every* page.

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## 5 Section E

### E1

What is the measure of each angle of a regular hexagon?

Answer to E1: \_\_\_\_\_

### E2

We have that  $\frac{5}{64} = 0.078125$ , and so the 4th digit of the decimal expansion of  $\frac{5}{64}$  is a 1. What is the 2022nd digit of the decimal expansion of  $\frac{1}{7}$ ?

Answer to E2: \_\_\_\_\_

### E3

In a list of the natural numbers 1, 2, 3, 4, 5, ..., which number contains the 111th occurrence of the digit 1?

Answer to E3: \_\_\_\_\_

### E4

What digit does the number  $5^{2022} + 3 \times 6^{2023}$  end in?

Answer to E4: \_\_\_\_\_

### E5

The *serpent value* of an integer is calculated by alternately inserting '-' and '+' signs between the digits, with '-' coming first. For example, the serpent value of 1427 is  $1 - 4 + 2 - 7 = -8$ , and the serpent value of 9 is just 9. What is the sum of all serpent values of numbers from 1 to 999?

Answer to E5: \_\_\_\_\_

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**E6**

A circle is inscribed within a larger quarter circle such that it is tangent to all three sides of it. The line segment tangent to the circle and parallel to the bottom of the quarter circle, with endpoints on the other two sides of the quarter circle, has length 1. What is the radius of the inscribed circle?

Answer to E6: \_\_\_\_\_

**E7**

Ben wakes up on Monday and walks to school, only to find that a flock of geese have moved onto the path he takes, and will not be leaving until the beginning of next week. Fortunately, the geese will let him pass for the day if Ben bribes them with  $n$  treats, but only if  $n$  is a positive integer, and shares no factors other than 1 in common with any number of treats he has bribed them with on previous days. If Ben wants to go to school five days in a row (Monday through Friday), has never bribed the geese before Monday, and never has to bribe the geese again after Friday, what is the minimum number of treats that Ben must give the geese over the course of the week?

Answer to E7: \_\_\_\_\_

**E8**

All permutations of the string GRANDRIVER are listed in alphabetical order (for example, ADEGINRRRV is the first permutation on the list, while ADEGINRRVR is second. In what position does the string GRANDRIVER itself appear on the list?

Answer to E8: \_\_\_\_\_