

## SEPTEMBER/OCTOBER SOLUTIONS

### **PALINDROMIC NUMBERS**

Palindromic Numbers are numbers that remain the same when their digits are reversed. For example, 77, 575, 14641, and 392293 are palindromic numbers. In base 16, how many numbers from  $1_{16}$  to  $1,000,000_{16}$  are palindromes?

### **SOLUTION**

First note that in order to form a palindromic number we need the first digit and the last digit to be the same, the second digit and the second to the last digit to be the same and so on. Since we are working in base 16, there are exactly 15 palindromic numbers with 1 digit. Similarly, since the first digit cannot be 0, there are 15 palindromic numbers with 2 digits. For 3 digits numbers, since again the first digit cannot be 0 but the second digit can be any number from 0 to F, there are  $15 \times 16 = 240$  palindromic numbers. Likewise, for 4, 5 and 6 digits there are 240, 3840 and 3840 palindromic numbers respectively. Therefore there are

$$15 + 15 + 240 + 240 + 3840 + 3840 = \underline{\underline{8190}}$$

palindromic numbers from  $1_{16}$  to  $1,000,000_{16}$ .

### CORRECT SOLUTIONS

- (1) Cole Franks
- (2) Daniel Grier
- (3) David Wheaton
- (4) George Helman (Answer only)
- (5) Stefan Singer
- (6) Nathan Sairam
- (7) Nolan Miller