

High School Math Problems  
2017  
Week 3  
Problem and Solution

Prove that there is no prime three digit number whose digits form an arithmetic progression.

**Solution:**

Suppose that  $A = \overline{abc}$  is a prime number such that its digits  $a$ ,  $b$ , and  $c$  form an arithmetic progression and  $a \neq 0$ . Let  $d$  be the common difference of the arithmetic progression. Since  $d = b - a$ , it follows that  $d \in \mathbb{Z}$ .

Then

$$A = 100a + 10b + c = 100a + 10(a + d) + (a + 2d) = 111a + 12d = 3(37a + 4d),$$

which is divisible by 3.

This is a contradiction with the assumption that  $A$  is a prime number and thus the digits of  $A$  cannot form an arithmetic progression.