

Programming Problems for Secondary Students

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The following problems are taken from Snover, S. L., and Spikell, M. A., "Problem Solving and Programming: The License Plate Curiosity," *Mathematics Teacher* (November 1981), pp. 616-617.

Snover and Spikell observed a license plate with the digits 183184. The left-most three digits and the right-most three digits form numbers that differ by 1. The number itself is a perfect square.

The following program was written by Snover and Spikell to find all the six-digit squares that have left and right halves differing by 1.

```
10 for C=317 to 999
15 N=C*C
20 L=INT(N/1000)
30 R=N-1000*L
40 D=ABS(L-R)
45 IF D<>1 THEN 55
50 PRINT N,C
55 NEXT C
60 END
```

Activities for Your Students

1. Explain the logic of the above program.
2. Run the program to generate all the six-digit squares that have left and right halves differing by one and their square root.
3. Modify the above program to solve these problems given by Snover and Spikell:
 - a. What are all the six-digit squares whose difference between the left and right halves is 4? Is 9? Is 2?
 - b. What are all the four-digit squares with a difference of one between the left-most and right-most pairs of digits?
 - c. What are all the distinct differences that can occur between the left and right halves of four-digit square numbers?
 - d. What are all the six-digit cubes whose difference between the left and right halves is a cube?
 - e. Two six-digit squares whose groups of two digits are each powers of 2 are 160801 and 161604. Find all six-digit squares with this property. Note that 0 is not considered a power of 2, and 160000 is not, therefore, a desired result.