Computer Science 182 Data Structures and Program Design
Homework #4 – Hash Trash (10 points)

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Fill in the answers to the following Hash calculation questions:

26^0 is 1, 26^1 is 26, 26^2 is 676, 26^3 is 17576 **, 26^4 is** 456976 **, 26^5 is** 11881376

A text string can be converted to a unique number with a simple formula, assuming a = 0, b = 1, c = 2, ... z = 25, the string 'cat' can be converted like this:

```
'c' *  26^2   +  'a' * 26^1    +   't' * 26^0

 2  *  26^2   +   0  * 26^1    +    19 * 26^0

 2  *  676   +   0  *  26    +   19  *  1

   1352      +      0        +      19        =  1371
```

Convert the string 'plum' to a number using the above formula: 271608
Convert the string 'lime' to a number using the above formula: 199060
Convert the string 'grape' to a number using the above formula: 3041042

The 'hash' in Hash Table refers to mapping a key/number to a particular slot in an array. This requires using the modulus operator '%' and a prime number to calculate the proper slot in the array:

```
26   %    11  =  4    Why?  26 / 11 = 2, remainder 4   or  26 - ( 11 * 2 ) = 4
95   %    17  =  10   Why?  95 / 17 = 5, remainder 10  or  95 - ( 17 * 5 ) = 10
```

Hash (or map) the large number 123812 to an array slot using the prime number 211 : 166

Hash (or map) the large number 457770 to an array slot using the prime number 229 : 228

Now do both. Using the above formula, convert a three letter word to a large number, and then hash (or map) that number to an array slot using the modulus of a prime number:

The three letter word is 'tom' map it to an array slot using the prime number 227 : 54

The three letter word is 'jon' map it to an array slot using the prime number 223 : 217

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Result will appear below

Name: Nicholas Rebhun, nrfactor@gmail.com

Here are the results:

Your answer to 26^3: 17576 is correct

Your answer to 26^4: 456976 is correct

Your answer to 26^5: 11881376 is correct

Your answer, plum converts to: 271608 is correct

Your answer, lime converts to: 199060 is correct

Your answer, grape converts to: 3041042 is correct

Your answer, 123812 modulus (%) 211: 166 is correct

Your answer, 457770 modulus (%) 229: 228 is correct

Your answer, hash/map tom using prime 227: 54 is correct

Your answer, hash/map jon using prime 223: 217 is correct

Your point total is 10 out of 10