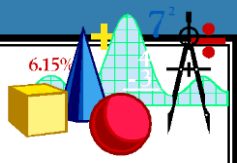

Calculator / Computer: **Happy Numbers**

Happy numbers have been described as numbers that give a final result of 1 when put through a process. The process is: separate the digits, square the digits, and then add the squares. If this process is continued the result will either be a "happy number" or it will be a repeating cycle of numbers—an "unhappy number".

Examples:

$$32 = 3 - 2 = 3^2 + 2^2 = 9 + 4 = 13 = 1 - 3 = 1^2 + 3^2 = 1 + 9 = 10 = 1 - 0 = 1^2 + 0 = 1$$

32 is a happy number!

$$51 = 5^2 + l^2 = 25 + 1 = 26 = 2^2 + 6^2 = 4 + 36 = 40 = 4^2 + 0 = 16 = 1^2 + 6^2 = 1 + 36 = 37 = 3^2 + 7^2 = 9 + 49 = 58 = 5^2 + 8^2 = 25 + 64 = 89 = 8^2 + 9^2 = 64 + 81 = 145 = l^2 + 4^2 + 5^2 = 42 = 4^2 + 2^2 = 20 = 2^2 + 0 = 4 = 4^2 = 16$$

…and as you can see we are starting to go in circles. 51 is not a very happy number!

Using the set of whole numbers {1, 2, 3, 4...}; make a table of the happy numbers up to 100 or larger if you wish. Look for patterns in your table. Based on your table, try to find if it is possible to predict if a number will be "happy".

Share your table with your class in an oral report. Show how "happy" numbers are found.

Extension: *Write a computer program that will compute whether a number is a "happy" number or not. Use this program to do the above activity.*