CCSU
DEPARTMENT OF MATHEMATICAL SCIENCES

COLLOQUIUM

Friday, September 4
2:00 – 3:00 PM
Maria Sanford, Room 101

RECREATIONS WITH WORDS AND NUMBERS

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Abstract: This talk focuses on interesting strings that are either (1) English words or (2) numbers. The combination of computers and pattern matching methodologies such as regular expressions allows a programmer to discover unusual examples. Most of this talk will be accessible to undergraduates because the emphasis will be on examples and results, not proofs of theorems. To whet your appetite, consider the following questions.

(1) The words *stomachache*, *nonionic*, and *counterterrorism* all contain a substring that is immediately repeated (that is, with no intervening letters). For example, for the first word, this substring is *ach*. Can you find a common English word that contains a substring of four letters that is immediately repeated?

(2) The square of the following integer
624228579548317386188320909320329013264935555613585034560249848356296289668 is
389661319524910006943311531238425925016482192128500480080280569984852381981266389000443336616
2688056960104666815303900832802458098689869591833635502 24. What is unusual about this square number? Hint: it's unlucky.

(3) Note that the squares 169, 196, and 961 (equal to 13^2, 14^2 and 31^2, respectively) are all anagrams of each other. For a randomly selected n digit square number, how likely is it to have at least one anagram that is also square?

(4) For you math experts, show that there exists a smallest real number b in the interval (1, 2) such that there exists a unique b-expansion of 1, given below, where the d_ns are all either 0 or 1. For this smallest b, explicitly give the d_ns.

$$1 = \sum_{n=1}^{\infty} d_n b^{-n}$$

For further information:
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