1086-11-1974 **Duff G. Campbell*** (campbell@hendrix.edu), Dept. of Mathematics and Computer Science, 1600 Washington Ave., Little Rock, AR 72212. *Patterns in continued fractions for $\sqrt{n}$.* Preliminary report.

In an undergraduate number theory course, I asked my students to find patterns in the continued fraction expansions of $\sqrt{n}$, working from a list of expansions for $n = 1$ to $n = 100$. Every time I assign this problem, students find the five "classic" patterns, for $n = m^2 \pm 1$, $n = m^2 \pm 2$, and $n = m^2 + m$. These patterns occur for every m. But one year, my students found some other patterns, which only occured for even m, or odd m. They also found two patterns for m divisible by 3. Inspired by their efforts, I looked at the data myself, and found sixteen other patterns, each restricted to its own congruence class (mod M) with M's up to 27. In addition, I found other patterns where n had to satisfy a quadratic condition (such as n of the form $4k^2 + 3k + 1$). Together, these twenty-odd patterns cover $\sqrt{n}$ for n up to 68, and 87 of the first hundred, etc. I have also found patterns in the continued fraction expansions of algebraic integers which are roots of $x^2 + x - n$. Here I have five patterns which apply to every n, fifteen that obey linear congruences, eight that satisfy quadratic congruences and two cubic congruences. Together, these patterns cover all n up to $n = 23$, sixty-eight of the first hundred, etc. (Received September 24, 2012)