1145-65-234 **Tyler Kloefkorn*** (tkloefkorn@math.arizona.edu), **Andrew Gillette** (agillette@math.arizona.edu) and **Victoria Sanders** (victoriasanders@email.arizona.edu). *Computational Serendipity and Tensor Product Finite Element Differential Forms.*

Many conforming finite elements on squares and cubes are elegantly classified into families by the language of finite element exterior calculus and presented in the Periodic Table of the Finite Elements. Use of these elements varies, based principally on the ease or difficulty in finding a "computational basis" of shape functions for element families. The tensor product family, $\mathcal{Q}_r^-\Lambda^k$, is most commonly used because computational basis functions are easy to state and implement. The trimmed and non-trimmed serendipity families, $\mathcal{S}_r^-\Lambda^k$ and $\mathcal{S}_r\Lambda^k$ respectively, are used less frequently because they are newer and, until now, lacked a straightforward technique for computational basis construction. This represents a missed opportunity for computational efficiency as the serendipity elements in general have fewer degrees of freedom than elements of equivalent accuracy from the tensor product family. Accordingly, we present complete lists of computational bases for both serendipity families, for any order $r \geq 1$ and for any differential form order $0 \leq k \leq n$, for problems in dimension $n = 2$ or 3. The bases are defined via shared subspace structures, allowing easy comparison of elements across families. (Received August 23, 2018)