I have spent quite a bit of time working on mathematics while sipping coffee at various coffee houses around the country. It is fairly common for people to look over my shoulder and wonder what exactly I'm working on:

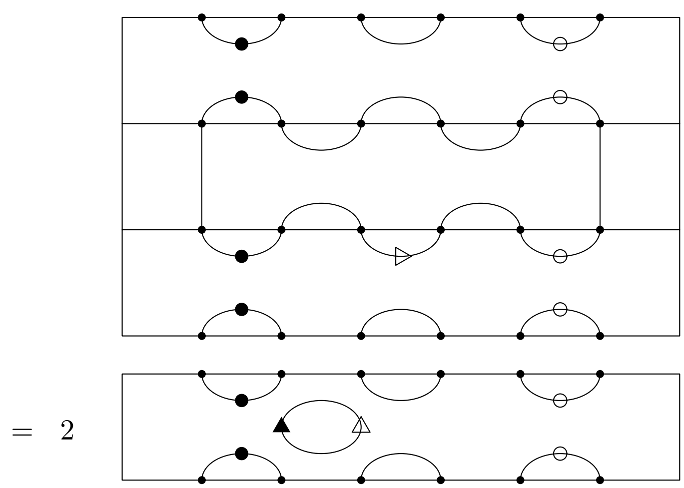
> **Stranger:** "Excuse me, what the heck are you drawing?"
>
> **Me:** "Oh, these? I'm doing mathematics."
>
> **Stranger:** "No, really, what are you doing?"
>
> **Me:** "This really is mathematics. I'm trying to use these pictures to cleverly model an abstract mathematical object that is otherwise difficult to work with."

One facet of my research involves trying to prove that certain associative algebras can be faithfully represented using "diagrams." These simple looking diagrams help us recognize things about the original algebra that we may not otherwise have noticed.

More specifically, I study the combinatorics of Coxeter groups and their associated Hecke algebras, Kazhdan–Lusztig theory, generalized Temperley–Lieb algebras, diagram algebras, and heaps of pieces. By employing combinatorial tools such as diagram algebras and heaps of pieces, one can gain insight into algebraic structures associated to Coxeter groups, and, conversely, the corresponding structure theory can often lead to surprising combinatorial results.

Some of my recent work establishes a faithful representation of a generalized Temperley–Lieb algebra of type $\widetilde{C}$ by a particular diagram algebra. One application of this representation is that it provides a simple non-recursive method for computing leading coefficients of certain Kazhdan–Lusztig polynomials.

One exciting aspect of my research is that its combinatorial nature naturally lends itself to collaborations with undergraduate students. To see a list of the recent projects that I have been working on with undergraduates, see my web page located at `http://oz.plymouth.edu/~dcernst`.



An example of multiplication in $\mathrm{TL}(\widetilde{C})$