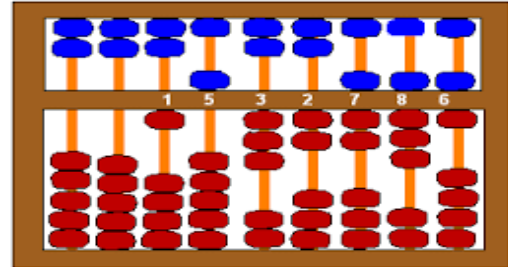


# MTH 180X      Mathematical Tools for Computing

Fall 2017



**Description:** This course introduces basic mathematical tools and formal methods of reasoning used in computing and algorithm design. The goal of the course is to give you a foundation of skills that you can build on as you need in your further study. Topics include propositional logic, functions, relations, graphs, proofs, recursion, elementary number theory, counting, and basic linear algebra. Each topic is motivated and connected to applications in computer science.

Why do we need mathematical techniques in computing? Computation is something that you cannot see and cannot touch. In order to understand computation, we need a language that allows us to reason about things that we cannot see and cannot touch. That language is mathematics. Here is a concrete example. Suppose we are asked to create an algorithm to find the minimum number of 4, 3, and 1 cent coins to make up 6 cents. Let us consider a greedy algorithm always grabbing the largest valued coin possible. Thus, we get a solution containing 4, 1, and 1 cent coins. Is this the minimal number of coins we need to use? If we need to make up  $n$  cents, how many coins do we need? How quickly will the algorithm find a solution? Are there better algorithms? The answers rely on mathematical techniques and proofs. <sup>1</sup>

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**Time:** Tuesdays and Thursdays 9:30 -- 10:45am, Fall 2017

**Room:** Chafee, Room 244

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<sup>1</sup> You can find more in depth reading on connections between mathematics and computer science in <https://www.cs.cornell.edu/home/kleinber/pcm.pdf>