This assignment is due at the beginning of class on FRIday, February 28. Please bring a neat, legible hard copy of your work with you to class. If your homework is multiple pages long, please staple the pages in the correct order.

Problem set guidelines: While you are welcome to discuss the problems with your classmates and you are strongly encouraged to seek help from me, after discussing the problems with others, your must write your own solutions. On work you turn in, you should acknowledge your collaborators by writing their names next to any problems you discussed with them. Write clearly and neatly (or type), giving thorough solutions that could be understood well by your classmates. Note that carefully communicating a solution is one of the most important parts of mathematics: if we can't convince others that our solution is correct, then our solution will not be accepted by the mathematical community.

After each solution, write a few sentences about your solution process: what was clear to you from the beginning, what did you have to think about more, what approaches did you take, what virtues of the ones we've discussed in *Math for Human Flourishing* did you feel were cultivated as you thought the problem and wrote your solution, etc. You do not need to answer all of these questions, but you should give a thoughtful explanation. **Solutions without a sufficient reflection will earn an R.**

1. Which, if either, player has a winning strategy on a 2×6 bar in Chomp? Describe the winning strategy. If neither player has a winning strategy, explain why not.
2. Exploratory Exercise: do as much as you can with this problem. Describe your process, include dead ends, and explain what you think you need to know/figure out in order to get unstuck anywhere you get stuck. Your reflection for this kind of exercise should focus on virtues and desires discussed in *Math for Human Flourishing* as the other questions listed in the reflection description are already included in the exercise solution itself. To earn an M on an Exploratory Exercise, you do not need to get everything correct, but you need to engage deeply with the question and reflect carefully on what you're doing.

   For this Exploratory Exercise, explore the More Ways to be Rude variation of Chomp on a 4×4 or larger square board. In this variation, before play begins, you place multiple bad squares anywhere on the board. The winner is the player who chomps the smaller number of bad squares.

   Questions you should address (even if you can't answer them fully):

   (a) How many bad squares can you place and still have an interesting game?
   (b) How does the location of the bad squares affect game play?
   (c) Create at least 5 examples and play them out, including your thoughts as you play (feel free to enlist a friend to play against you so that you don't have to play yourself, but if it's a friend who's never played Chomp at all, warm them up first with some regular Chomp). Make sure that the play on each turn is clear (as in, don't just turn in a picture of the board at the end of play).
   (d) Is there a player with a winning strategy based on the number of bad squares?
   (e) Bonus: try the same variation on a non-square board.
3. Consider the original game of Prime Cubes, which we will learn on Monday in class, in which players take turns placing the natural numbers 1–8 on a cube such that any two numbers that share an edge add to a prime number.

   (a) What's the longest game that can be played? Explain how we know this.
   (b) Which, if either, player has a winning strategy? Describe the winning strategy. If neither player has a winning strategy, explain why not. Remember that for a player to have a winning strategy, that player has to have a way to play that will result in that player winning no matter what the other player does. To describe a winning strategy, you need to explain how the player will play at each step of the game (in many cases, this can be generalized) in response to their opponent's move.