

Name (print): _____ Major/Year _____

Show all your work. **Do not use book, notes, or scrap paper.** Write your answers in the space provided. You may continue on the reverse. This quiz contributes 6% to your course grade.

1. (2 points) We roll n dice. What is the expected value of the product of the numbers shown? Do not prove.
2. (18 points) Let $r \geq 2$. Let \mathcal{H} be an r -uniform hypergraph with m edges, $|A_1| = \dots = |A_m| = r$. Prove: if $m \leq 2^{r-1}$ then \mathcal{H} is 2-colorable.
3. (40 points) Outline the proof that for every k and g there exists a graph of girth $\geq g$ and chromatic number $\geq k$. (The more accurate the details, the more points.)