
Math 195: Demystifying Mathematics

HOMEWORK 5 : DUE MARCH 13

These three problems all use the counting skills we've been developing in class. Your final answers will be a number (or something with symbols like $\binom{5}{3}$ or $7!$) **but**, as with prior assignments, you should write your answer in **words and sentences and paragraphs**, not as a bunch of math symbols. Imagine you are explaining to a friend why your answer is correct and use words (and maybe the occasional judicious math symbol). Think of telling a story to explain the answers in your own words. While being correct is generally important (!), I am mainly looking for good, well articulated ideas.

1. Iowa license plates are labeled with 3 letters followed by 3 numbers. The three-letter sequences are assigned in blocks to each county. Assume the letter "O" and "Q" do not show up (they're hard to distinguish from the number 0) although I do not know if this is actually a rule in Iowa. It was true in 1957 that "O" and "Q" were disallowed, but also "I" and "Y" were disallowed back then and those are now allowed.

Disregarding custom license plates, how many different license plates could the state of Iowa produce? Don't just give me an answer. Tell me in words how you got your answer.

For a fascinating read on the progression of license plates in Iowa, check out

<https://tinyurl.com/vfx9slm>

and a story about the demand for new "retro" black plates:

<https://tinyurl.com/vop4nsn>.

2. Palindromes are often associated with word play. They are phrases which read the same backward and forward such as "Do Geese See God?" and "A Man, A Plan, A Canal-Panama!". Numbers can also form palindromes. For example, "23532" or "134,353,431". **How many nine digit numbers (i.e. numbers between 100,000,000 and 999,999,999) are palindromes? Again, don't just give me an answer. Tell me in words how you got your answer.**
3. Students complain regularly about the repetition in DHall food. Let's say there was a "pizza bar" at the DHall which served pizza with three different crusts (white, wheat, and flatbread), and two sauce types (marinara or pesto) and 8 different toppings (cheese, sausage, pepperoni, ham, mushroom, peppers, onion, and olives.)

Assume you are not a vegetarian, and don't have other dietary restrictions. Can you eat a different pizza for dinner every day you are at Grinnell? (Assume also you are here for eight semesters.) Why or why not?