Math 201-DAC-AB   Homework 3   Due Wed Oct 26 (before 11:30am)

Fall 2022

Submission Instructions: Questions 1 and 2 are to be done in groups (as with the previous homeworks). Question 3 however is to be done individually. Answers for Q1, Q2 should be submitted in person (at the beginning of class) or electronically via LEA. For Q1 and Q2, only one group member needs to submit the answer, BUT clearly indicate all group members in the submission. Read Q3 carefully for submission procedure.

1. Why does the JAC Student ID trick (see Day 8) work? What's the mathematical principle behind it? Give a detailed explanation in your own words. Feel free to use diagrams, pictures if they help get your point across.

   Somewhere in your explanation, you should address the following questions.

   - Why does the procedure (steps 4-8) always leave the original TOP card as the last face-down card?

   - Can this trick be generalized to use a different number of cards? For example, what would happen if you used a different length ID number (say 8,9,10,11)? Or if you gave a choice of different numbers?

2. Why does the Spelling Trick (see Day 15) work? What's the mathematical principle behind it? Give a detailed explanation in your own words. Feel free to use diagrams, pictures if they help get your point across.

   Somewhere in your explanation, you should address the following questions.

   - What other length words would work for each of the phases of spelling?

   - Suppose you had two packets of five cards instead of four with one packet in Ace through Five order, and the other in reverse order. What words would you spell to make the trick still work?

3. Make the flexagon diagrammed on the next page. Colour it (or at least draw design patterns on it). Here's a video with more detailed instructions on how to make it and what to do with it: `https://youtu.be/7H4lDi79YY8`.

   You must take a short video of you playing with your flexagon to show some of the various faces. You are to submit this video through LEA.

   This flexagon then needs to be submitted in class. It should be contained in an envelope or bag with your name clearly identified. Should you have any questions or issues with this part of the homework, please let me know ASAP.

   Also, if you dive into the deep rabbit hole of flexagons, feel free to make a different kind of flexagon. Bonus points go to the coolest one. The example template included here is just what I think is one of the "easiest" to make, as it doesn't even require tape or glue.

1.

2.

3.

4.

5.