Math 8062 Homework 2

Due Thursday, 1/27/21

1. Use the Ham Sandwich Theorem to solve the following problem in combinatorics.

Suppose there are 100 boxes, with each box containing some number of apples, oranges, and kiwis. Prove that there exists a way to choose 51 boxes out of 100, which will simultaneously contain at least half of the apples, at least half of the oranges, and at least half of the kiwis.

Remark: I am not aware of any solution that doesn't use topology. However, I will certainly accept it if you find one! If the problem is simplified to 2 kinds of fruit instead of 3, then there is a combinatorial solution by induction (although it still requires a bit of cleverness).

2, 3, 4. Do problems 6, 8, 10 on pages 38–39 of Hatcher.