MAT 312/AMS 351: HOMEWORK 4

ASSIGNED FEB 15, 2024

All textbook problems refer to *"Numbers, Groups, and Codes"*, by Humphreys and Prest, 2nd edition.

Unless stated otherwise, all numbers in this problem set are positive integers.

1. Textbook, p. 58, problem 2

2. Textbook, p. 58, problem 3

3. Textbook, p. 58, problem 5

4. Textbook, p. 75, problem 5

5. Complete the problem started in class: compute $5^{2023} \mod 77$, using the following steps:
   (a) Compute $5^{2023} \mod 7$ (hint: write several first powers of 5 mod 7 and observe the pattern.)
   (b) Compute $5^{2023} \mod 11$
   (c) Use Chinese remiander theorem to find $5^{2023} \mod 77$

6. Use same technique to find $5^{2023} \mod 143$ (hint: $143 = 11 \cdot 13$).

7. Mayan civilization used several different calendars. One of them was so-called tzolk'in calendar, in which each day was identified by a name (there were 20 different day names: Imix, Ik, Akbal...) and number (ranging from 1 to 13), e.g 1 Imix or 9 Akbal. Unlike our familiar calendars, moving to next day changed both day number and day name: next day after 1 Imix would be 2 Ik. As usual, once we reach day number 13, next day would be day 1 again, and similar for day names. You can find details, including glyphs used for each day name, in Wikipedia.
   (a) How many days did the calendar cover? if we start with 1 Imix, how many days would pass before we get to next 1 Imix?
   (b) How many days would pass between 1 Imix and 8 Eb (Eb is the 12th day name in sequence)?