

## CSCI 246 Problem 1-1

Collaborators: *none*

## Section 9.2, Problem 17

- a. Let  $n_i$  be the number integers from 1000 to 9999. The first digit has nine options (integers 1 through 9), and the remaining three have ten options (integers 0 through 9).  $n_i = 9 * 10 * 10 * 10 = 9000$
- b. Let  $n_o$  be the number of integers from 1000 to 9999 that are odd. The first digit has nine options (integers 1 through 9) and the middle two have ten options (integers 0 through 9). The final digit must be in the set  $A = \{1, 3, 5, 7, 9\}$  to make the integer even, the size of  $A$  is 5, therefore, the last digit has 5 options.  $n_o = 9 * 10 * 10 * 5 = 4500$
- c. Let  $n_d$  be the number of integers from 1000 to 9999 that are distinct. The first digit has nine options (integers 1 through 9) and the second digit also has nine options (integers 0 through 9 excluding the first choice). Each subsequent digit has one less option than the digit before it.  $n_d = 9 * 9 * (9 - 1) * (9 - 2) = 9 * 9 * 8 * 7 = 4536$
- d. Let  $n_b$  be the number of integers from 1000 to 9999 that are both odd and distinct. To be odd, the final digit of a number must be odd. Let  $A = \{1, 3, 5, 7, 9\}$  be the set of odd digits. We will now find the amount of distinct 4-digit numbers that can be created given we have selected a final digit. Given an arbitrary final digit in the set  $A$ , there are 8 options for the first digit (integers 1-9 excluding final digit), the second digit also has 8 options (integers 0-9 excluding the first digit and the final digit), and the third digit has 7 options (integers 0-9 excluding the first and second digits as well as the final digit). Because an arbitrary final digit was chosen, this product can be multiplied by the magnitude of  $A$  to find  $n_b$ .  $n_b = 8 * 8 * 7 * |A| = 8 * 8 * 7 * 5 = 2240$ .
- e.  $P(\text{A random 4-digit integer has distinct digits}) = \frac{\text{number of 4-digit integers with distinct digits}}{\text{number of 4 digit integers}} = \frac{4536}{9000} = 0.504$   
 $P(\text{A random 4-digit integer has distinct digits and is odd}) = \frac{\text{number of odd 4-digit integers with distinct digits}}{\text{number of 4 digit integers}} = \frac{2240}{9000} = 0.2488$

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December 4, 2018

**CSCI 246 Problem 1-2**

Collaborators: *none*