MAT271E Probability & Statistics

HOMEWORK 2 **March 15, 2023**

due date: March 22, 2023

Q1- The table shows the results of a survey in which 146 families were asked if they own a computer and if they will be taking a summer vacation during the current year.

		Summer vacation this year		
		Yes	No	Total
Owns a computer	Yes	87	28	115
	No	14	17	31
	Total	101	45	146

(a) Find the probability that a randomly selected family is not taking a summer vacation this year.
(b) Find the probability that a randomly selected family owns a computer.
(c) Find the probability that a randomly selected family is taking a summer vacation this year, given that they own a computer.
(d) Find the probability that a randomly selected family is taking a summer vacation this year and owns a computer.
(e) Are the events "owning a computer" and "taking a summer vacation this year" independent or dependent events? Explain using mathematics.

Q2- (problem 3.8 of "İstatistik ve Olasılık, D. A. Şaşmaz") A game is played by rolling a dice then picking a ball from boxes A, B, and C. Box A contains 3 green and 1 yellow balls, box B contains 2 green and 2 yellow balls and box C contains 1 green and 3 yellow balls. First the dice is rolled, then one ball is picked. If the score of dice is 1 or 2, one ball is picked from box A. If the score of dice is 3 or 4 or 5, one ball is picked from box B, and if the score of dice is 6, one ball is picked from box C. Calculate the probability of picking a yellow ball and a green ball in this game.

Q3- A bacteria infects 2% of people. It is possible to detect the bacteria in a person using a test. The test is positive (tells that there is infection) 1% of the time even though the person is not infected; this situation is called false positive. The test is negative (indicates no infection) 10% of the time even though the person is infected; this is called false negative. Using Bayes' theorem calculate the probability that a person who tests positive actually has the disease.