Practice Set 5: Maximum Likelihood Estimation

1. **Decision to work part-time**: In this exercise we are going to apply the principle of Maximum Likelihood estimation to propose estimators for alternative parameters of interest. Suppose that we are interested in two decisions made by women of working age. The first decision is whether to work or not. The second decision is, in case that a woman chooses to work, whether she works part time or she works full time.

   (a) Consider the case in which a woman chooses to work with a given probability p_0. What is the probability of a woman who chooses not to work? And the probability that, in an *iid* sample of 10 women, seven women work and three women don't?

   (b) Consider now that the probability of a woman who works full time given that she works is q_0. What is the probability that a woman works full time? What is the probability that, in an *iid* sample of 10 women, five women work part time and two women do not work?

   (c) For an *iid* sample of 100 women, we obtain information on their labor market participation decisions that we summarize in the following Table:

	No.		Part time	Full Time
Works	73	of which	51	22
Does not work	27			

   Write down the likelihood function for this sample and obtain the ML estimates for p_0 and q_0.

   (d) Suppose now that we have a sample of N observations and obtain the following results

	No.		Part time	Full Time
Works	n_1	of which	n_{11}	n_{12}
Does not work	n_2			

   Obtain the Maximum Likelihood estimate for the probability that a woman works part time. Comment.