2. An urn contains a total of \( n = 125 \) marbles: 93 black and 32 white. In an experiment, two marbles are to be randomly drawn, one at a time, without replacement, and their respective colors recorded.

(a) Draw a tree diagram for this experiment, clearly labeling all relevant outcomes and their corresponding probabilities. Then use it to answer the subsequent questions. Show all work! (13 pts)

(b) Calculate the probability of the event \( E = \) “at least one marble is black.” (2 pts)

(c) Calculate the probability of the event \( F = \) “at least one marble is white.” (2 pts)

(d) Are the events \( E \) and \( F \) statistically independent? Formally justify your answer. (2 pts)

(e) Calculate the probability that both marbles are the same color. (2 pts)

(f) Calculate the probability that both marbles are black, given that both are the same color. (2 pts)

(g) Calculate the probability that both marbles are black, given that at least one of them is black. (2 pts)