Math 361, Section D13 and D14, Fall 2007
Quiz 4, September 24 **Name:** _____

1. [10 points] This is question 62 on page 119. Barbara and Dianne shoot at a target. They are independent shooters. Suppose that Barbara hits the target with probability p_B and Dianne hits the target with probability p_D. Suppose that we know that the target was hit.
   (a) [5 points] What is the probability that Barbara hit the target?
   (b) [5 points] What is the probability that both Barbara and Dianne hit the target?

Answers

1. Let

$$B = \{\text{Barbara hits the target}\} \qquad D = \{\text{Dianne hits the target}\}.$$

The target being hit is the set $B \cup D$, and

$$\mathbb{P}(B \cup D) = \mathbb{P}(B) + \mathbb{P}(D) - \mathbb{P}(B \cap D) = p_B + p_D - p_B p_D.$$

(a) Note that $B \subset (B \cup D)$, so

$$\mathbb{P}(B|B \cup D) = \frac{\mathbb{P}(B)}{\mathbb{P}(B \cup D)} = \frac{p_B}{p_B + p_D - p_B p_D}.$$

(b) Note that $B \cap D \subset (B \cup D)$, so

$$\mathbb{P}(B \cap D|B \cup D) = \frac{\mathbb{P}(B \cap D)}{\mathbb{P}(B \cup D)} = \frac{p_B p_D}{p_B + p_D - p_B p_D}.$$