# Massachusetts Institute of Technology 

Department of Electrical Engineering \& Computer Science
6.041/6.431: Probabilistic Systems Analysis
(Spring 2006)

## Tutorial 1: Answers <br> February 16-17, 2006

1. (a) $\frac{1}{5}$
(b) $\left(\frac{4}{5}\right)\left(\frac{1}{3}\right)=\frac{4}{15}$
(c) $\left(\frac{2}{5}\right)\left(\frac{1}{3}\right)+\left(\frac{3}{5}\right)\left(\frac{2}{3}\right)=\frac{8}{15}$
(d) $\frac{2}{5}$
(e) $1-\frac{3}{10}=\frac{7}{10}$
2. Our goal is to determine $P(M \mid R)$, which we may find by means of Bayes' Rule:

$$
\begin{aligned}
P(M \mid R) & =\frac{P(M \cap R)}{P(R)} \\
& =\frac{P(M) P(R \mid M)}{P(M) P(R \mid M)+P\left(M^{c}\right) P\left(R \mid M^{c}\right)} \\
& =\frac{(0.01)(0.88)}{(0.01)(0.88)+(0.99)(0.07)} \\
& \approx 0.1127
\end{aligned}
$$

3. $A_{12}$ and $A_{13}$ are independent, and the same is true of any other pair from the events $A_{12}$, $A_{13}$, and $A_{23}$. However, $A_{12}, A_{13}$, and $A_{23}$ are not independent. In particular, if $A_{12}$ and $A_{13}$ occur, then $A_{23}$ also occurs.
