## MASSACHUSETTS INSTITUTE OF TECHNOLOGY Department of Electrical Engineering & Computer Science 6.041/6.431: Probabilistic Systems Analysis (Spring 2006)

## Tutorial 1: Answers February 16-17, 2006

1. (a) 
$$\frac{1}{5}$$
  
(b)  $(\frac{4}{5})(\frac{1}{3}) = \frac{4}{15}$   
(c)  $(\frac{2}{5})(\frac{1}{3}) + (\frac{3}{5})(\frac{2}{3}) = \frac{8}{15}$   
(d)  $\frac{2}{5}$   
(e)  $1 - \frac{3}{10} = \frac{7}{10}$ 

2. Our goal is to determine P(M|R), which we may find by means of Bayes' Rule:

$$P(M|R) = \frac{P(M \cap R)}{P(R)}$$

$$= \frac{P(M)P(R|M)}{P(M)P(R|M) + P(M^c)P(R|M^c)}$$

$$= \frac{(0.01)(0.88)}{(0.01)(0.88) + (0.99)(0.07)}$$

$$\approx \boxed{0.1127}$$

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.