

# HW2

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## Task 1

$P(\text{Maine}) = 0.05$ ,  $P(\text{Sahara}) = 0.95$ ,  $P(\text{temp} < 80 \mid \text{Maine}) = 0.8$ ,  
 $P(\text{temp} < 80 \mid \text{Sahara}) = 0.1$

- a.  $P(\text{Maine} \mid \text{temp} < 80) = \frac{P(\text{temp} < 80 \mid \text{Maine})P(\text{Maine})}{P(\text{temp} < 80)}$   
$$= \frac{P(\text{temp} < 80 \mid \text{Maine})P(\text{Maine})}{P(\text{temp} < 80 \mid \text{Maine})P(\text{Maine}) + P(\text{temp} < 80 \mid \text{Sahara})P(\text{Sahara})} = \frac{(0.8)(0.05)}{0.8 * 0.05 + 0.1 * 0.95} =$$

0.29630
- b.  $P(\text{temp} < 80) = P(\text{temp} < 80 \mid \text{Maine} \cap \text{temp} < 80 \mid \text{Sahara}) =$   
 $P(\text{temp} < 80 \mid \text{Maine})P(\text{Maine}) + P(\text{temp} < 80 \mid \text{Sahara})P(\text{Sahara}) =$   
 $0.8 * 0.05 + 0.1 * 0.95 = 0.135$   
Two days in a row =  $(0.135)(0.135) =$ 

0.018225
- c.  $P(\text{temp} < 80) = P(\text{temp} < 80 \mid \text{Maine} \cap \text{temp} < 80 \mid \text{Sahara}) =$   
 $P(\text{temp} < 80 \mid \text{Maine})P(\text{Maine}) + P(\text{temp} < 80 \mid \text{Sahara})P(\text{Sahara}) =$   
 $0.8 * 0.05 + 0.1 * 0.95 = 0.135$   
Three days in a row =  $(0.135)(0.135)(0.135) =$ 

0.002460375

## Task 2

P could be a valid probability function as long as the  $\sum p(x) = 1$ , which would mean that P(C) and P(D) would have to sum to equal 0.1 for this to be a probability function. Thus, P is possibly a probability function.

## Task 3

P could not possibly be a probability density function, as the integral of P(x) from 0 to 10 is 3 which is greater than 1, so it cannot be a probability density function.