MATH 120: Quiz 6 - 3/21/2019

(I) For a promotion, the manufacturer of Pepsi has placed winning symbols under the caps of 8% of all Pepsi bottles. If you buy a six-pack, what is the probability you win something?

(II) A few years back, a group of Earlham students taking this class collected data on smoking patterns among EC students. The table below shows frequency counts of smokers vs non-smokers in different demographic groups. Suppose we randomly select individuals from this group. Find the probability that:

	Domestic	International
Smoker	25	8
Non-smoker	53	14
Total	78	22

(a) The individual is a smoker.

(b) The individual is a smoker or an international student.

(c) A smoker in this sample is an international student.

[Solution must show calculation step and correct interpretation of each question - e.g., probability of smoker and international, or P(smoker and international), etc.]

Solution

(I) To "win something" in a 6-pack, at least one bottle must be a winner.

The best way to find the probability of at least one winner is via the complement:

$$P(\text{at least one winner}) = 1 - P(\text{no winners})$$

If we assume the 6 bottles are independent, can use simple multiplication:

$$P(\text{no winners}) = P(\text{not win}) \times \cdots \times P(\text{not win}) \quad \{\text{multiply six times}\}$$
$$= 0.92 \times \cdots \times 0.92 = 0.6064 \quad \{\text{since } P(\text{not win}) = 1 - 0.08 = 0.92\}$$

Answer: $P(\text{at least one winner}) = 1 - 0.6064$ $\boxed{= 0.3936}$

(II) According to the given table, there are a total of 100 students.

(a) This is asking for $P(\text{smoker})$.

From the table: $P(\text{smoker}) = \dfrac{25+8}{100}$ $\boxed{= 0.33}$

(b) This is asking for $P(\text{smoker or international}) = \dfrac{25+8+14}{100}$ $\boxed{= 0.47}$

(c) This is asking for $P(\text{international} \mid \text{smoker})$.

From the table, there are 33 smokers, of whom 8 are international students.

Therefore, $P(\text{international} \mid \text{smoker}) = \dfrac{8}{33}$ $\boxed{= 0.2424}$

Grading: Total points possible = 6.

2pt for (I). 4pt for (II)

For (I): 0.5pt = attempt complement; 1pt = compute correct P(no winners); 0.5pt = subtract from 1 and get answer.

For (II): (a) = 1 point; (b) = 1.5 point; (c) = 1.5 point.

For (a): 0.5pt + 0.5pt for answer + calculation step.

For(b): 0.5pt = correctly interpret question; 1pt = step + answer.

For(c): 0.5pt = correctly interpret question; 1pt = step + answer.