MATH 120: Quiz 5 - 3/18/2022

Suppose the probability that a U.S. resident has traveled to Canada is 0.2, to Mexico is 0.1, and to both countries is 0.02.

- (a) What is the probability that a randomly chosen U.S. resident has not traveled to either country?
- (b) What is the probability that a person who has been to Mexico, has also visited Canada.
- (c) Are traveling to Mexico and to Canada statistically independent, disjoint, neither, or both?

[Show steps/reasons. Answers alone will receive little, if any, credit]

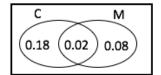
Solution

One way to organize the information is using a Venn diagram that shows disjoint/ non-overlapping probabilities. Let C=Canada, M=Mexico.

The intersection region is 0.02, since that is the probability of travel to both countries.

$$P(C)=0.2, P(M)=0.1.$$

That leaves 0.2 - 0.02 = 0.18, and 0.1 - 0.02 = 0.08 for the other regions shown in the Venn diagram.



- (a) Probability that the person has not traveled to either country = 1-P(C or M)From the Venn diagram: P(C or M) = 0.18 + 0.02 + 0.08 = 0.28Therefore, the answer is: = 1 - 0.28 = 0.72
- (b) Probability that a person who has been to Mexico, has also visited Canada: This is asking for the conditional probability P(C|M)From the Venn diagram, $P(C|M) = \frac{0.02}{0.1}$ $\boxed{= 0.2}$
- (c) Are traveling to Mexico and to Canada independent, disjoint, neither, or both? They are clearly NOT disjoint, since $P(C \text{ and } M) \neq 0$. For independence, we must check whether P(C|M) = P(C), or whether P(M|C) = P(M). From part (b) we know P(C|M) = 0.2. Also, the question gives us P(C) = 0.2. It follows that traveling to Mexico and to Canada are statistically independent.

Grading: Total points possible = 6.

2 points for each of the three parts (a), (b), and (c).

For (a): 1pt=Venn diagram with disjoint probabilities; OR, demonstrate use of correct general addition rule. 1pt=plugin correct numbers and show how to get answer.

For (b): 1pt=state correct conditional probability interpretation of question.
1pt=plugin correct numbers and show how to compute answer.

For (c): 0.5pt = say they are not disjoint (it is okay if reason is missing here). 1pt=state correct condition to check for independence. 0.5pt=get correct answer for independence.