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SA402 · Dynamic and Stochastic Models — Fall 2023 · Uhan

Quiz 1 – 8/23/2023

Problem	Weight	Score
1a	1	
1b	1	
2a	1	
2b	1	
Total		/ 40

Instructions. You have 15 minutes to complete this quiz. You may use your plebe-issue TI-36X Pro calculator. You may not use any other materials.

Show all your work. To receive full credit, your solutions must be completely correct, sufficiently justified, and easy to follow.

Problem 1. Simplex Pizza sells New York style and Sicilian style pizza by the slice. Let N represent the number of New York style slices in one order, and let T represent the total number of slices in one order. The joint probabilities of N and T are as follows:

		T = 1	T = 2	T = 3
N	0	0.10	0.05	0.01
	1	0.25	0.10	0.02
	2	0	0.35	0.04
	3	0	0	0.08

a. What is the probability that an order contains a total of 2 slices?

See Example 1 in Lesson 2 for a similar example.

b. What is the probability that an order contains 2 New York style slices, given that the order contains a total of 2 slices?

See Example 3 in Lesson 2 for a similar example.

Problem 2. The Orange Company was having problems with its automated manufacturing cells yesterday: sometimes a tablet came out of a cell defective. 65% of the tablets were produced in cell 1, 25% in cell 2, and 10% in cell 3. 1% of the tablets produced in cell 1 came out defective, 1% in cell 2, and 5% in cell 3.

Suppose you select 1 tablet made yesterday at random. Let C be a random variable that represents the cell it was produced in (i.e., $C = 1$, 2 or 3). In addition, let D represent a random variable indicating whether the tablet came out defective (i.e., $D = 1$ if defective, 0 otherwise).

a. What is the probability that the randomly selected tablet came out defective, i.e. $\Pr\{D = 1\}$?

See Problem 2 in the Lesson 2 Exercises for a similar example.

b. Are C and D independent? Give a <u>numerical</u> argument for why or why not.

Recall that X and Y are <u>not</u> independent if

$$\Pr\{X \in \mathcal{A} \text{ and } Y \in \mathcal{B}\} \neq \Pr\{X \in \mathcal{A}\} \Pr\{Y \in \mathcal{B}\} \quad \text{for some } \mathcal{A} \text{ and } \mathcal{B}$$

Another way to show that X and Y are <u>not</u> independent is to show that

$$\Pr\{Y \in \mathcal{B} \mid X \in \mathcal{A}\} \neq \Pr\{Y \in \mathcal{B}\} \quad \text{for some } \mathcal{A} \text{ and } \mathcal{B}$$

Most of you had the right approach here. Many of you, however, incorrectly identified the probabilities you used to show one of above.