Problems for Week 2

January 26, 2022

Problem 1. *The table below shows some information about* 200 *students and their most frequent method of travel to school.*

	Walk	Not walk	Total
Male	56	40	96
Female	72	32	104
Total	128	72	200

1. *Find the probability that a randomly chosen student is female*

2. *Find the probability that a randomly chosen student is female and walks to school*

3. *Given the student is female what is the probability that they walk to school?*

Problem 2. *There are* 8 *counters in a bag. Five of the counters are red and* 3 *of the counters are blue. Two counters are taken at random from the bag. Compute the probability that one counter of each colour are taken.*

Problem 3. *For three events* A, B *and* C*, we know that*

- *A and C are independent*

- *B and C are independent*

- *A and B are disjoint*

- *$\mathbb{P}(A \cup C) = \frac{2}{3}, \mathbb{P}(B \cup C) = \frac{3}{4}, \mathbb{P}(A \cup B \cup C) = \frac{11}{12}$.*

Compute $\mathbb{P}(A), \mathbb{P}(B)$ *and* $\mathbb{P}(C)$*.*

Problem 4. *Consider two independent fair coin tosses, and the following events:*

$$H_1 = \{1st\ toss\ is\ a\ head\}$$
$$H_2 = \{2nd\ toss\ is\ a\ head\}$$
$$D = \{the\ two\ tosses\ have\ different\ results\}$$

Show that these events are pairwise independent but not independent.

Problem 5. *A computer manufacturer uses chips from three sources. Chips from source* A, B *and* C *are defective with probabilities* $0.005, 0.001$ *and* 0.01*, respectively. The proportions of chips from* A, B, C *are* $0.5, 0.1, 0.4$*, respectively. A randomly selected chip is found to be defective. Compute the probability that the chips are from* A*.*

Problem 6. *Let* A_1 *and* A_2 *be a partition of the sample space* Ω*. Assume* $\mathbb{P}(B) > 0$ *and* $\mathbb{P}(A_1|B) < \mathbb{P}(A_1)$*. Prove that* $\mathbb{P}(A_2|B) > \mathbb{P}(A_2)$*.*