2uma AI SL: Assignment 2

Conditional probability and expectations

Due on Thursday the 23/01

- PLEASE START YOUR ASSIGNMENT EARLY – so you have plenty of time to attend study café / ask teachers / ask friends
- You can get all the help you need in the Study Café Tuesdays and Thursdays. Khadija (Tuesdays) and Nathan (Thursdays) will be there!

Problem 1.

Let *A* and *B* be events such that $P(A) = 0.5$, $P(B) = 0.4$ and $P(A \cup B) = 0.6$

a) Find $P(A \cap B)$

b) Find $P(A|B)$.

c) Explain whether A and B are independent events.

Problem 2.

At Penna Airport the probability, P(*A*), that all passengers arrive on time for a flight is 0.70. The probability, P(*D*), that a flight departs on time is 0.85. The probability that all passengers arrive on time for a flight and it departs on time is 0.65.

a) Show that event *A* and event *D* are **not** independent.

b) Find $P(A \cap D')$.

c) Given that all passengers for a flight arrive on time, find the probability that the flight does **not** depart on time.

Problem 3.

Josie has three ways of getting to school. 30% of the time she travels by car, 20% of the time she rides her bicycle and 50% of the time she walks.

When travelling by car, Josie is late 5% of the time. When riding her bicycle she is late 10% of the time. When walking she is late 25% of the time. Given that she was on time, find the probability that she rides her bicycle.

Problem 4.

A new blood test has been shown to be effective in the early detection of a disease. The probability that the blood test correctly identifies someone with this disease is 0.99, and the probability that the blood test correctly identifies someone without that disease is 0.95. The incidence of this disease in the general population is 0.0001.

A doctor administered the blood test to a patient and the test result indicated that this patient had the disease. What is the probability that the patient has the disease?

Problem 5.

The probability that a tomato seed will germinate is 0.87 . If a market gardener plants 5000 seeds, how many are expected to germinate?

Problem 6.

A survey was carried out at an international airport. A number of travellers were interviewed and asked for their flight destinations. The results are shown in the table below.

Destination	America	Africa	Asia
Number of males	45	62	37
Number of females	35	46	25

One traveller is to be chosen at random from all those interviewed.

(a) Find the probability that this traveller was going to Africa.

One female traveller is to be chosen at random from all those interviewed.

(b) Find the probability that this female traveller was going to Asia.

One traveller is to be chosen at random from those **not** going to America.

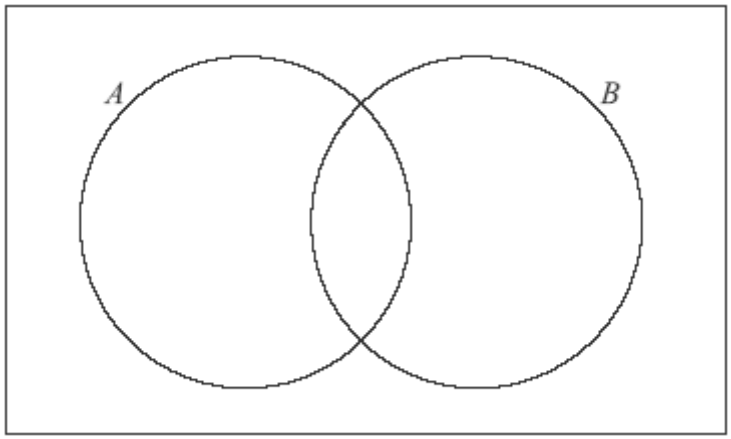
(c) Find the probability that the chosen traveller is female.

Problem 7.

A group of 30 students were asked about their favourite topping for toast.

18 liked peanut butter (*A*)
10 liked jam (*B*)
6 liked neither

(a) Show this information on the Venn diagram below.



(b) Find the number of students who like both peanut butter and jam.

(c) Find the probability that a randomly chosen student from the group likes peanut butter, given that they like jam.