

1. In a class of 20 students, 12 study Biology, 15 study History and 2 students study neither Biology nor History.
- (a) Illustrate this information on a Venn diagram. (2)
- (b) Find the probability that a randomly selected student from this class is studying both Biology and History. (1)
- (c) Given that a randomly selected student studies Biology, find the probability that this student also studies History. (1)
- (Total 4 marks)**

2. Events  $A$  and  $B$  are such that  $P(A) = 0.3$  and  $P(B) = 0.4$ .
- (a) Find the value of  $P(A \cup B)$  when
- (i)  $A$  and  $B$  are mutually exclusive;
- (ii)  $A$  and  $B$  are independent. (4)
- (b) Given that  $P(A \cup B) = 0.6$ , find  $P(A | B)$ . (3)
- (Total 7 marks)**

3. If  $P(A) = \frac{1}{6}$ ,  $P(B) = \frac{1}{3}$ , and  $P(A \cup B) = \frac{5}{12}$ , what is  $P(A' | B')$ ? (Total 6 marks)

4. Let  $A$  and  $B$  be events such that  $P(A) = 0.6$ ,  $P(A \cup B) = 0.8$  and  $P(A | B) = 0.6$ . Find  $P(B)$ . (Total 6 marks)

5. In a population of rabbits, 1 % are known to have a particular disease. A test is developed for the disease that gives a positive result for a rabbit that **does** have the disease in 99 % of cases. It is also known that the test gives a positive result for a rabbit that **does not** have the disease in 0.1 % of cases. A rabbit is chosen at random from the population.
- (a) Find the probability that the rabbit tests positive for the disease. (2)
- (b) Given that the rabbit tests positive for the disease, show that the probability that the rabbit does not have the disease is less than 10 %. (3)
- (Total 5 marks)**
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6. Jenny goes to school by bus every day. When it is not raining, the probability that the bus is late is  $\frac{3}{20}$ . When it is raining, the probability that the bus is late is  $\frac{7}{20}$ . The probability that it rains on a particular day is  $\frac{9}{20}$ . On one particular day the bus is late. Find the probability that it is not raining on that day. (Total 5 marks)
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7. An influenza virus is spreading through a city. A vaccination is available to protect against the virus. If a person has had the vaccination, the probability of catching the virus is 0.1; without the vaccination, the probability is 0.3. The probability of a randomly selected person catching the virus is 0.22.
- (a) Find the percentage of the population that has been vaccinated. (3)
- (b) A randomly chosen person catches the virus. Find the probability that this person has been vaccinated. (2)
- (Total 5 marks)**
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8. At a nursing college, 80 % of incoming students are female. College records show that 70 % of the incoming females graduate and 90 % of the incoming males graduate. A student who graduates is selected at random. Find the probability that the student is male, giving your answer as a fraction in its lowest terms. (Total 5 marks)

9. Only two international airlines fly daily into an airport. UN Air has 70 flights a day and IS Air has 65 flights a day. Passengers flying with UN Air have an 18% probability of losing their luggage and passengers flying with IS Air have a 23% probability of losing their luggage. You overhear someone in the airport complain about her luggage being lost.

Find the probability that she travelled with IS Air.

(Total 6 marks)

10. Bag A contains 2 red and 3 green balls.

- (a) Two balls are chosen at random from the bag without replacement. Find the probability that 2 red balls are chosen.

(2)

Bag B contains 4 red and  $n$  green balls.

- (b) Two balls are chosen without replacement from this bag. If the probability that two red balls are chosen is  $\frac{2}{15}$ , show that  $n = 6$ .

(4)

A standard die with six faces is rolled. If a 1 or 6 is obtained, two balls are chosen from bag A, otherwise two balls are chosen from bag B.

- (c) Calculate the probability that two red balls are chosen.

(3)

- (d) Given that two red balls are chosen, find the probability that a 1 or a 6 was obtained on the die.

(4)

(Total 13 marks)

11. There are 30 students in a class, of which 18 are girls and 12 are boys. Four students are selected at random to form a committee. Calculate the probability that the committee contains

- (a) two girls and two boys;

(3)

- (b) students all of the same gender.

(3)

(Total 6 marks)