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. 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)

3. Tim goes to a popular restaurant that does not take any reservations for tables. It has been determined that the waiting times for a table are normally distributed with a mean of 18 minutes and standard deviation of 4 minutes.

(a) Tim says he will leave if he is not seated at a table within 25 minutes of arriving at the restaurant. Find the probability that Tim will leave without being seated.

(2)

(b) Tim has been waiting for 15 minutes. Find the probability that he will be seated within the next five minutes.

(4)

(Total 6 marks)

4. Two players, A and B, alternately throw a fair six–sided dice, with A starting, until one of them obtains a six. Find the probability that A obtains the first six.

(Total 7 marks)

5. Let A and B be events such that $P(A) = 0.6$, $P(A \cup B) = 0.8$ and $P(A \mid B) = 0.6$.

Find $P(B)$.

(Total 6 marks)

6. 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)

7. 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)