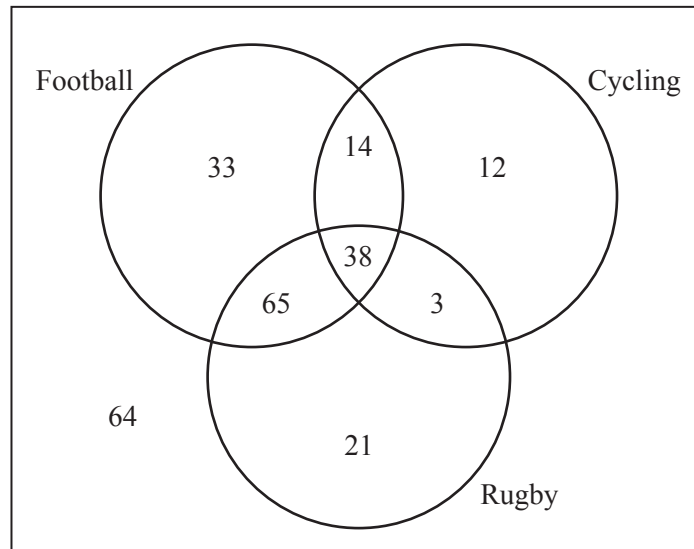


- 1 A survey is being carried out into the sports viewing habits of people in a particular area. As part of the survey, 250 people are asked which of the following sports they have watched on television in the past month.
- Football
 - Cycling
 - Rugby

The numbers of people who have watched these sports are shown in the Venn diagram.



One of the people is selected at random.

- (i) Find the probability that this person has in the past month
- (A) watched cycling but not football, [1]
- (B) watched either one or two of the three sports. [2]
- (ii) Given that this person has watched cycling, find the probability that this person has not watched football. [2]
- 2 A normal pack of 52 playing cards contains 4 aces. A card is drawn at random from the pack. It is then replaced and the pack is shuffled, after which another card is drawn at random.
- (i) Find the probability that neither card is an ace. [2]
- (ii) This process is repeated 10 times. Find the expected number of times for which neither card is an ace. [1]

3 Candidates applying for jobs in a large company take an aptitude test, as a result of which they are either accepted, rejected or retested, with probabilities 0.2, 0.5 and 0.3 respectively. When a candidate is retested for the first time, the three possible outcomes and their probabilities remain the same as for the original test. When a candidate is retested for the second time there are just two possible outcomes, accepted or rejected, with probabilities 0.4 and 0.6 respectively.

(i) Draw a probability tree diagram to illustrate the outcomes. [3]

(ii) Find the probability that a randomly selected candidate is accepted. [2]

(iii) Find the probability that a randomly selected candidate is retested at least once, given that this candidate is accepted. [3]

4 Each weekday, Marta travels to school by bus. Sometimes she arrives late.

- L is the event that Marta arrives late.
- R is the event that it is raining.

You are given that $P(L) = 0.15$, $P(R) = 0.22$ and $P(L | R) = 0.45$.

(i) Use this information to show that the events L and R are not independent. [1]

(ii) Find $P(L \cap R)$. [2]

(iii) Draw a Venn diagram showing the events L and R , and fill in the probability corresponding to each of the four regions of your diagram. [3]

5 Each weekday Alan drives to work. On his journey, he goes over a level crossing. Sometimes he has to wait at the level crossing for a train to pass.

- W is the event that Alan has to wait at the level crossing.
- L is the event that Alan is late for work.

You are given that $P(L | W) = 0.4$, $P(W) = 0.07$ and $P(L \cup W) = 0.08$.

(i) Calculate $P(L \cap W)$. [2]

(ii) Draw a Venn diagram, showing the events L and W . Fill in the probability corresponding to each of the four regions of your diagram. [3]

(iii) Determine whether the events L and W are independent, explaining your method clearly. [3]

- 6 Malik is playing a game in which he has to throw a 6 on a fair six-sided die to start the game. Find the probability that
- (i) Malik throws a 6 for the first time on his third attempt, [3]
 - (ii) Malik needs at most ten attempts to throw a 6. [2]
- 7 At a garden centre there is a box containing 50 hyacinth bulbs. Of these, 30 will produce a blue flower and the remaining 20 will produce a red flower. Unfortunately they have become mixed together so that it is not known which of the bulbs will produce a blue flower and which will produce a red flower.
- Karen buys 3 of these bulbs.
- (i) Find the probability that all 3 of these bulbs will produce blue flowers. [3]
 - (ii) Find the probability that Karen will have at least one flower of each colour from her 3 bulbs. [3]
- 8 At a call centre, 85% of callers are put on hold before being connected to an operator. A random sample of 30 callers is selected.
- (i) Find the probability that exactly 29 of these callers are put on hold. [3]
 - (ii) Find the probability that at least 29 of these callers are put on hold. [3]
 - (iii) If 10 random samples, each of 30 callers, are selected, find the expected number of samples in which at least 29 callers are put on hold. [2]