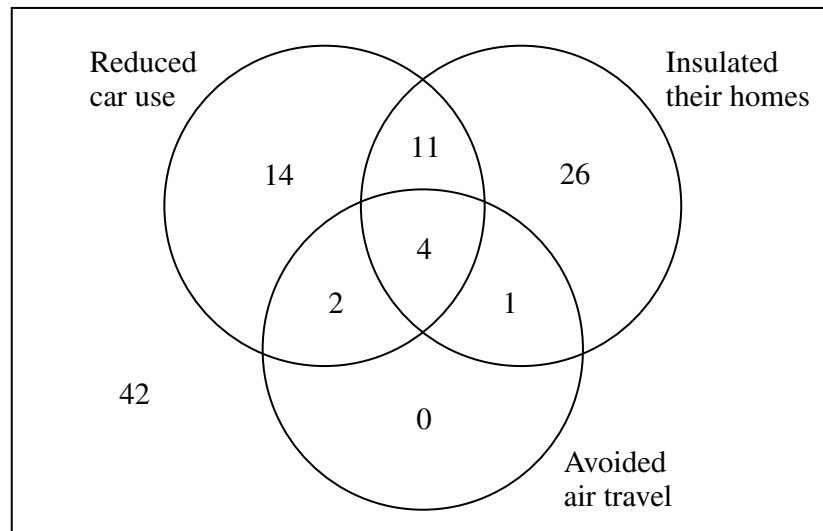


- 1 A survey is being carried out into the carbon footprint of individual citizens. As part of the survey, 100 citizens are asked whether they have attempted to reduce their carbon footprint by any of the following methods.
- Reducing car use
 - Insulating their homes
 - Avoiding air travel

The numbers of citizens who have used each of these methods are shown in the Venn diagram.



One of the citizens is selected at random.

- (i) Find the probability that this citizen

(A) has avoided air travel,

[1]

(B) has used at least two of the three methods.

[2]

- (ii) Given that the citizen has avoided air travel, find the probability that this citizen has reduced car use. [2]

Three of the citizens are selected at random.

- (iii) Find the probability that none of them have avoided air travel.

[3]

- 2 Each packet of *Cruncho* cereal contains one free fridge magnet. There are five different types of fridge magnet to collect. They are distributed, with equal probability, randomly and independently in the packets. Keith is about to start collecting these fridge magnets.
- (i) Find the probability that the first 2 packets that Keith buys contain the same type of fridge magnet. [2]
- (ii) Find the probability that Keith collects all five types of fridge magnet by buying just 5 packets. [3]
- (iii) Hence find the probability that Keith has to buy more than 5 packets to acquire a complete set. [1]
- 3 One train leaves a station each hour. The train is either on time or late. If the train is on time, the probability that the next train is on time is 0.95. If the train is late, the probability that the next train is on time is 0.6. On a particular day, the 09 00 train is on time.
- (i) Illustrate the possible outcomes for the 10 00, 11 00 and 12 00 trains on a probability tree diagram. [4]
- (ii) Find the probability that
- (A) all three of these trains are on time, [2]
- (B) just one of these three trains is on time, [4]
- (C) the 12 00 train is on time. [4]
- (iii) Given that the 12 00 train is on time, find the probability that the 10 00 train is also on time. [4]
- 4 In a survey, a large number of young people are asked about their exercise habits. One of these people is selected at random.
- G is the event that this person goes to the gym.
 - R is the event that this person goes running.
- You are given that $P(G) = 0.24$, $P(R) = 0.13$ and $P(G \cap R) = 0.06$.
- (i) Draw a Venn diagram, showing the events G and R , and fill in the probability corresponding to each of the four regions of your diagram. [3]
- (ii) Determine whether the events G and R are independent. [2]
- (iii) Find $P(R | G)$. [3]

5 My credit card has a 4-digit code called a PIN. You should assume that any 4-digit number from 0000 to 9999 can be a PIN.

(i) If I cannot remember any digits and guess my number, find the probability that I guess it correctly.

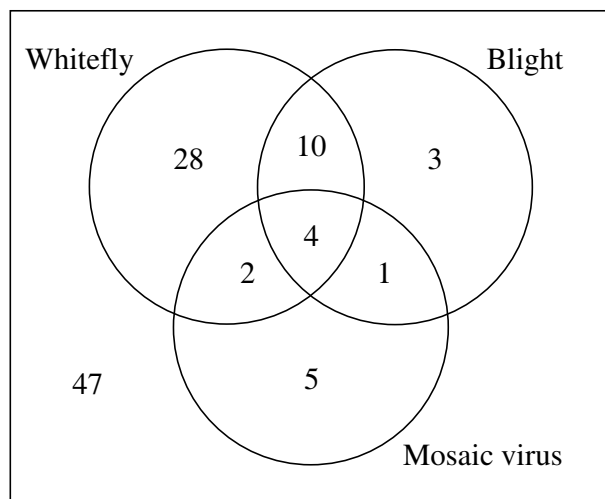
[1]

In fact my PIN consists of four different digits. I can remember all four digits, but cannot remember the correct order.

(ii) If I now guess my number, find the probability that I guess it correctly.

[2]

6 Whitefly, blight and mosaic virus are three problems which can affect tomato plants. 100 tomato plants are examined for these problems. The numbers of plants with each type of problem are shown in the Venn diagram. 47 of the plants have none of the problems.



(i) One of the 100 plants is selected at random. Find the probability that this plant has

(A) at most one of the problems,

[1]

(B) exactly two of the problems.

[2]

(ii) Three of the 100 plants are selected at random. Find the probability that all of them have at least one of the problems.

[3]