

3.3 Conditional Probability and Independent Events

- 1 Each of the numbers 1, 2, 3, 4, 5, 6, 7, 8, 9 is written on a card and the nine cards are shuffled. A card is then dealt.

Given that the card is a multiple of 3, find the probability that the card is

- (i) even,
- (ii) a multiple of 4.

- 2 A bag contains 20 identical sweets apart from the colour: 10 are pink, 7 are green and 3 are yellow. Jovian randomly selects two sweets from the bag, one after the other, and eats them. Find the probability that

- (i) she eats two pink sweets,
- (ii) the first sweet is green and the second sweet is yellow,
- (iii) she eats exactly one pink sweet,
- (iv) neither sweet is green.

- 3 A fair cubical die is thrown twice. Find the probability of obtaining

- (i) a score of 2 on both throws,
- (ii) a score of 2 on just one throw,
- (iii) a score of 4 on at least one throw,
- (iv) a score lower than 3 on both throws.

- 4 In a large group of people it is known that 10% have a hot breakfast, 20% have a hot lunch and 25% have a hot breakfast or a hot lunch. Find the probability that a person chosen at random from this group

- (i) has a hot breakfast and a hot lunch,
- (ii) has a hot lunch, given that the person chosen had a hot breakfast.

- 5 A card is picked from an ordinary pack containing 52 playing cards. It is then replaced in the pack, the pack is shuffled and a second card is picked. Find the probability that

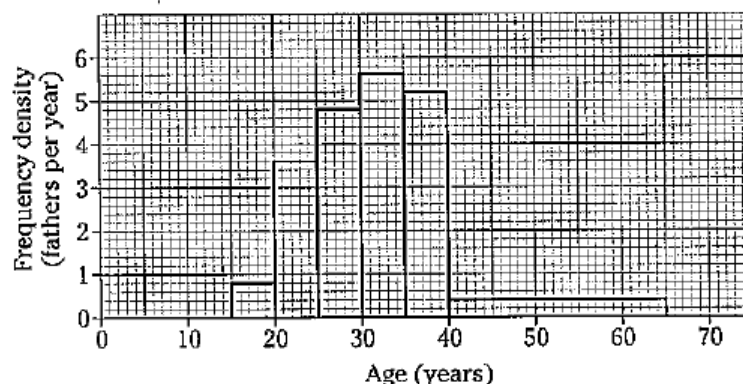
- (i) both cards are the seven of diamonds,
- (ii) the first card is a heart and the second card is a spade,
- (iii) at least one card is a Queen.

- 6 Two fair tetrahedral dice, each with faces labelled 1, 2, 3, 4, are thrown and the number on which each lands is noted.
- Find the probability that the sum of the two numbers is even, given that at least one die lands on a 3.
 - Find the probability that at least one die lands on a 3, given that the score is even.
- 7 In a group of 100 college students, 80 own a laptop computer, 65 own a desktop computer and 50 own both a laptop computer and a desktop computer. Find the probability that a student chosen at random from the group
- owns a desktop computer, given that the student owns a laptop computer,
 - does not own a laptop computer, given the student owns a desktop computer,
 - does not own a laptop computer or a desktop computer.
- 8 The events A and B are such that $P(A \mid B) = 0.4$, $P(B \mid A) = 0.25$ and $P(A \text{ and } B) = 0.12$.
- Are A and B independent? Give a reason for your answer.
 - Find $P(A \text{ or } B)$.
- 9 Events A and B are such that $P(A) = 0.45$, $P(B) = 0.35$ and $P(A \text{ or } B) = 0.7$.
- Find $P(A \text{ and } B)$.
 - Show that events A and B are not independent.
 - Find $P(A \mid B)$.
- 10 Two ordinary fair dice, one red and one blue, are thrown.
Events A , B and C are defined as follows:
Event A : the number showing on the red die is 5 or 6
Event B : the total of the numbers showing on the two dice is 7
Event C : the total of the numbers showing on the two dice is 8.
- State, with a reason, which two of the events A , B and C are mutually exclusive.
 - Show that the events A and B are independent.
- 11 A school has 100 teachers. In a survey on the use of the school car park, the teachers were asked whether they had driven a car to school on a particular day. Of the 70 full-time teachers, 45 had driven a car to school and of the 30 part-time teachers, 12 had driven a car to school.
- Copy and complete the two-way table, where C denotes the event 'the teacher had driven a car to school that day'.

	C	C'	Total
Full-time teacher			
Part-time teacher			
Total			100

- (ii) Find the probability that a teacher chosen at random
 - (a) is a part-time teacher who had driven a car to school,
 - (b) is a full-time teacher who had not driven a car to school,
 - (c) is a full-time teacher or had driven a car to school,
 - (d) is a part-time teacher, given that the teacher had driven a car to school.
- (iii) Are the events 'the teacher had driven a car to school' and 'the teacher is full-time' independent? Give a reason for your answer.
- (iv) Describe two events that are mutually exclusive.

- 12 Each father in a random sample of fathers was asked how old he was when his first child was born. The following histogram represents the information.



- (i) What was the modal group?
- (ii) How many fathers were between 25 and 30 years old when their first child was born?
- (iii) How many fathers were in the sample?
- (iv) Find the probability that a father, chosen at random from the group, was between 25 and 30 years old when his first child was born, given that he was older than 25 years.

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