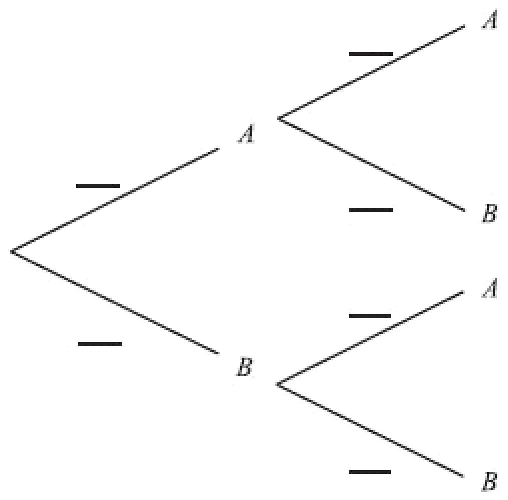
1. A bag contains four apples (A) and six bananas (B). A fruit is taken from the bag and eaten. Then a second fruit is taken and eaten.

(a) Complete the tree diagram below by writing probabilities in the spaces provided.

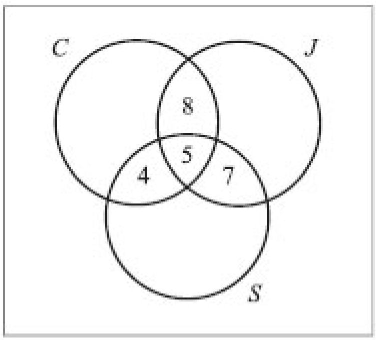


(3)

(b) Find the probability that one of each type of fruit was eaten.

(3)
(Total 6 marks)

2. The Venn diagram below shows information about 120 students in a school. Of these, 40 study Chinese (C), 35 study Japanese (J), and 30 study Spanish (S).



A student is chosen at random from the group. Find the probability that the student

(a) studies exactly two of these languages;

(1)

(b) studies only Japanese;

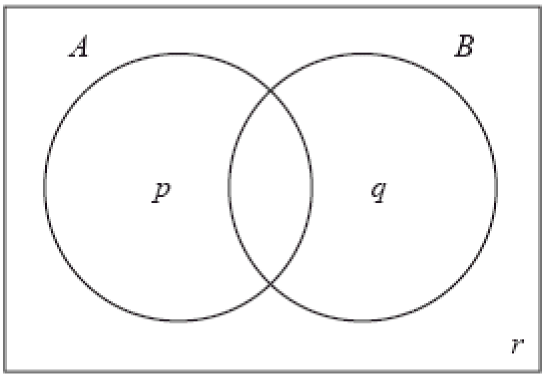
(2)

(c) does not study any of these languages.

(3)
(Total 6 marks)

3. Consider the events A and B, where $\mathrm{P}(A) = 0.5$, $\mathrm{P}(B) = 0.7$ and $\mathrm{P}(A \cap B) = 0.3$.

The Venn diagram below shows the events A and B, and the probabilities p, q and r.



(a) Write down the value of

(i) p;

(ii) q;

(iii) r.

(3)

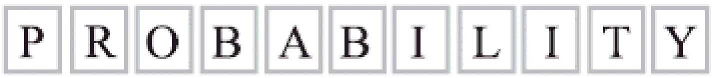
(b) Find the value of $\mathrm{P}(A \mid B')$.

(2)

(c) Hence, or otherwise, show that the events A and B are **not** independent.

(1)
(Total 6 marks)

4. The letters of the word PROBABILITY are written on 11 cards as shown below.



Two cards are drawn at random without replacement.
Let A be the event the first card drawn is the letter A.
Let B be the event the second card drawn is the letter B.

(a) Find $\mathrm{P}(A)$.

(1)

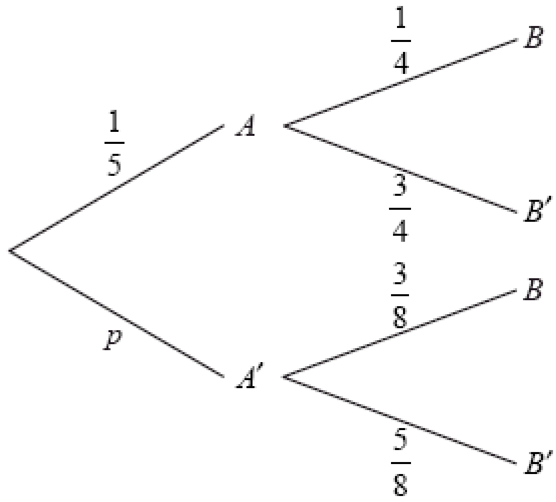
(b) Find $\mathrm{P}(B \mid A)$.

(2)

(c) Find $\mathrm{P}(A \cap B)$.

(3)
(Total 6 marks)

5. The diagram below shows the probabilities for events A and B, with $P(A') = p$.



(a) Write down the value of p.

(1)

(b) Find $P(B)$.

(3)

(c) Find $P(A' \mid B)$.

(3)
(Total 7 marks)

6. In any given season, a soccer team plays 65 % of their games at home.
When the team plays at home, they win 83 % of their games.
When they play away from home, they win 26 % of their games.

The team plays one game.

(a) Find the probability that the team wins the game.

(4)

(b) If the team does not win the game, find the probability that the game was played at home.

(4)
(Total 8 marks)

7. In a class, 40 students take chemistry only, 30 take physics only, 20 take both chemistry and physics, and 60 take neither.

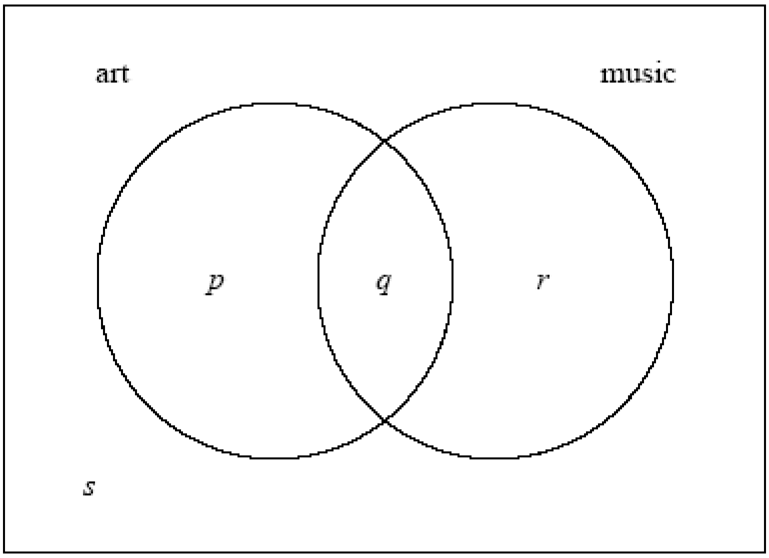
(a) Find the probability that a student takes physics given that the student takes chemistry.

(b) Find the probability that a student takes physics given that the student does **not** take chemistry.

(c) State whether the events “taking chemistry” and “taking physics” are mutually exclusive, independent, or neither. Justify your answer.

(Total 6 marks)

8. In a group of 16 students, 12 take art and 8 take music. One student takes neither art nor music. The Venn diagram below shows the events art and music. The values p, q, r and s represent numbers of students.



(a) (i) Write down the value of s.

(ii) Find the value of q.

(iii) Write down the value of p and of r.

(5)

(b) (i) A student is selected at random. Given that the student takes music, write down the probability the student takes art.

(ii) **Hence**, show that taking music and taking art are **not** independent events.

(4)

(c) Two students are selected at random, one after the other. Find the probability that the first student takes **only** music and the second student takes **only** art.

(4)
(Total 13 marks)

9. Consider the events A and B, where $P(A) = \frac{2}{5}$, $P(B') = \frac{1}{4}$ and $P(A \cup B) = \frac{7}{8}$.

(a) Write down $P(B)$.

(b) Find $P(A \cap B)$.

(c) Find $P(A \mid B)$.

(Total 6 marks)

10. In a class of 100 boys, 55 boys play football and 75 boys play rugby. Each boy must play at least one sport from football and rugby.

(a) (i) Find the number of boys who play both sports.

(ii) Write down the number of boys who play only rugby.

(3)

(b) One boy is selected at random.

(i) Find the probability that he plays only one sport.

(ii) Given that the boy selected plays only one sport, find the probability that he plays rugby.

(4)

Let A be the event that a boy plays football and B be the event that a boy plays rugby.

(c) Explain why A and B are **not** mutually exclusive.

(2)

(d) Show that A and B are **not** independent.

(3)
(Total 12 marks)

11. Let A and B be independent events such that $P(A) = 0.3$ and $P(B) = 0.8$.

(a) Find $P(A \cap B)$.

(b) Find $P(A \cup B)$.

(c) Are A and B mutually exclusive? Justify your answer.

(Total 6 marks)

12. There are 20 students in a classroom. Each student plays only one sport. The table below gives their sport and gender.

	Football	**Tennis**	**Hockey**
Female	5	3	3
Male	4	2	3

(a) One student is selected at random.

(i) Calculate the probability that the student is a male or is a tennis player.

(ii) Given that the student selected is female, calculate the probability that the student does not play football.

(4)

(b) Two students are selected at random. Calculate the probability that neither student plays football.

(3)
(Total 7 marks)

13. Let A and B be independent events, where $\mathrm{P}(A) = 0.6$ and $\mathrm{P}(B) = x$.

(a) Write down an expression for $\mathrm{P}(A \cap B)$.

(1)

(b) Given that $\mathrm{P}(A \cup B) = 0.8$,

(i) find x;

(ii) find $\mathrm{P}(A \cap B)$.

(4)

(c) **Hence**, explain why A and B are **not** mutually exclusive.

(1)
(Total 6 marks)

14. The eye colour of 97 students is recorded in the chart below.

	Brown	Blue	Green
Male	21	16	9
Female	19	19	13

One student is selected at random.

(a) Write down the probability that the student is a male.

(b) Write down the probability that the student has green eyes, given that the student is a female.

(c) Find the probability that the student has green eyes or is male.

(Total 6 marks)

15. Two restaurants, *Center* and *New*, sell fish rolls and salads.

Let F be the event a customer chooses a fish roll.
Let S be the event a customer chooses a salad.
Let N be the event a customer chooses neither a fish roll nor a salad.

In the *Center* restaurant $P(F) = 0.31$, $P(S) = 0.62$, $P(N) = 0.14$.

(a) Show that $P(F \cap S) = 0.07$.

(3)

(b) Given that a customer chooses a salad, find the probability the customer also chooses a fish roll.

(3)

(c) Are F and S independent events? Justify your answer.

(3)

At *New* restaurant, $P(N) = 0.14$. Twice as many customers choose a salad as choose a fish roll. Choosing a fish roll is **independent** of choosing a salad.

(d) Find the probability that a fish roll is chosen.

(7)
(Total 16 marks)