1 A school athletics team has 10 members. The table shows which competitions each of the members can take part in.

		Competiton				
		100 m	200 m	110 m hurdles	400 m	Long jump
Athlete	Abel	✓	✓			✓
	Bernoulli		✓		✓	
	Cauchy	✓		✓		✓
	Descartes	✓	✓			
	Einstein		✓		✓	
	Fermat	✓		✓		
	Galois				✓	✓
	Hardy	✓	✓			✓
	Iwasawa		✓		✓	
	Jacobi			✓		

An athlete is selected at random. Events A, B, C, D are defined as follows.

A: the athlete can take part in exactly 2 competitions.
B: the athlete can take part in the 200 m.
C: the athlete can take part in the 110 m hurdles.
D: the athlete can take part in the long jump.

(i) Write down the value of $\mathrm{P}(A \cap B)$. [1]

(ii) Write down the value of $\mathrm{P}(C \cup D)$. [1]

(iii) Which two of the four events A, B, C, D are mutually exclusive? [1]

(iv) Show that events B and D are not independent. [2]

2 Jane buys 5 jam doughnuts, 4 cream doughnuts and 3 plain doughnuts.

On arrival home, each of her three children eats one of the twelve doughnuts. The different kinds of doughnut are indistinguishable by sight and so selection of doughnuts is random.

Calculate the probabilities of the following events.

(i) All 3 doughnuts eaten contain jam. [3]

(ii) All 3 doughnuts are of the same kind. [3]

(iii) The 3 doughnuts are all of a different kind. [3]

(iv) The 3 doughnuts contain jam, given that they are all of the same kind. [3]

On 5 successive Saturdays, Jane buys the same combination of 12 doughnuts and her three children eat one each. Find the probability that all 3 doughnuts eaten contain jam on

(v) exactly 2 Saturdays out of the 5, [3]

(vi) at least 1 Saturday out of the 5. [3]

3 Answer part (i) of this question on the insert provided.

The lowest common multiple of two integers, x and y, is the smallest positive integer which is a multiple of both x and y. So, for example, the lowest common multiple of 4 and 6 is 12.

(i) On the insert, complete the table giving the lowest common multiples of all pairs of integers between 1 and 6. [1]

		Second integer					
		1	2	3	4	5	6
First integer	1	1	2	3	4	5	6
	2	2	2	6	4	10	6
	3	3	6	3	12	15	6
	4	4	4	12			12
	5	5	10	15			
	6	6	6	6	12		

Two fair dice are thrown and the lowest common multiple of the two scores is found.

(ii) Use the table to find the probabilities of the following events.

(A) The lowest common multiple is greater than 6. [1]

(B) The lowest common multiple is a multiple of 5. [1]

(C) The lowest common multiple is both greater than 6 and a multiple of 5. [2]

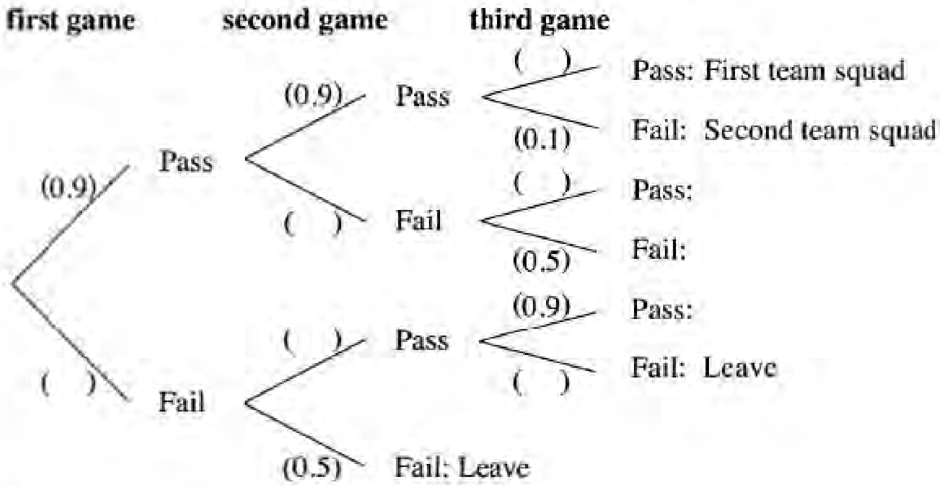
(iii) Use your answers to part (ii) to show that the events "the lowest common multiple is greater than 6" and "the lowest common multiple is a multiple of 5" are not independent. [2]

4 Answer part (i) of this question on the insert provided.

Mancaster Hockey Club invite prospective new players to take part in a series of three trial games. At the end of each game the performance of each player is assessed as pass or fail. Players who achieve a pass in all three games are invited to join the first team squad. Players who achieve a pass in two games are invited to join the second team squad. Players who fail in two games are asked to leave. This may happen after two games.

- The probability of passing the first game is 0.9
- Players who pass any game have probability 0.9 of passing the next game
- Players who fail any game have probability 0.5 of failing the next game

(i) On the insert, complete the tree diagram which illustrates the information above. [2]



(ii) Find the probability that a randomly selected player

(A) is invited to join the first team squad, [2]

(B) is invited to join the second team squad. [3]

(iii) Hence write down the probability that a randomly selected player is asked to leave. [1]

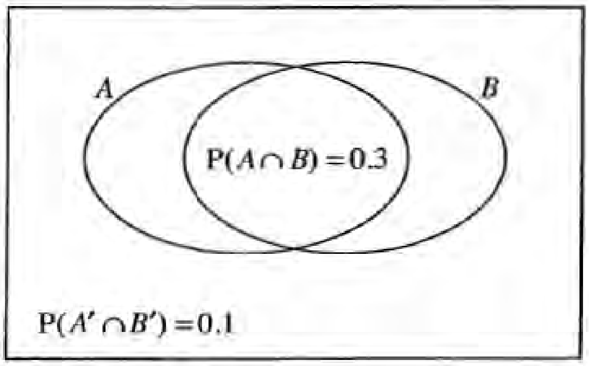
(iv) Find the probability that a randomly selected player is asked to leave after two games, given that the player is asked to leave. [2]

Angela, Bryony and Shareen attend the trials at the same time. Assuming their performances are independent, find the probability that

(v) at least one of the three is asked to leave, [3]

(vi) they pass a total of 7 games between them. [5]

5 The Venn diagram illustrates the occurrence of two events A and B.



You are given that $P(A \cap B) = 0.3$ and that the probability that neither A nor B occurs is 0.1. You are also given that $P(A) = 2P(B)$.

Find $P(B)$. [3]