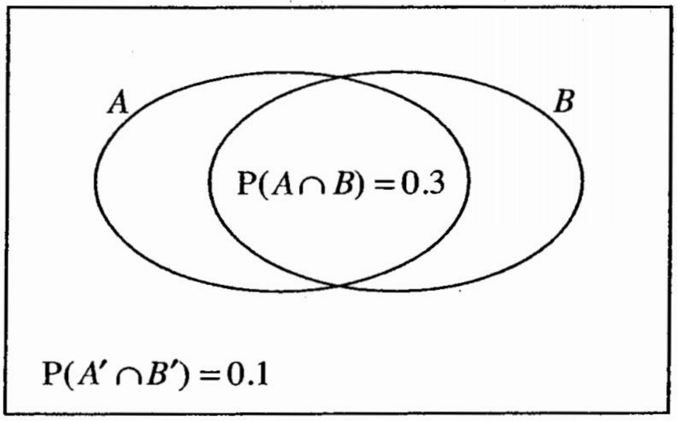
Intro to Probability (From OCR 4766)

Q1, (Jan 2005, Q3)

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]

Q2, (Jan 2006, Q8i-iii)

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]

Q3, (Jan 2007, Q5)

Each day the probability that Ashwin wears a tie is 0.2. The probability that he wears a jacket is 0.4. If he wears a jacket, the probability that he wears a tie is 0.3.

(i) Find the probability that, on a randomly selected day, Ashwin wears a jacket and a tie. [2]

(ii) Draw a Venn diagram, using one circle for the event 'wears a jacket' and one circle for the event 'wears a tie'. Your diagram should include the probability for each region. [3]

(iii) Using your Venn diagram, or otherwise, find the probability that, on a randomly selected day, Ashwin

(A) wears either a jacket or a tie (or both),

(B) wears no tie or no jacket (or wears neither). [3]

Q4, (Jan 2006, Q5)

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]

Q5, (Jan 2009, Q5i,ii)

Each day Anna drives to work.

- R is the event that it is raining.
- L is the event that Anna arrives at work late.

You are given that $\mathrm{P}(R) = 0.36$, $\mathrm{P}(L) = 0.25$ and $\mathrm{P}(R \cap L) = 0.2$.

(i) Determine whether the events R and L are independent. **[2]**

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

Q6, (Jun 2010, Q7)

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

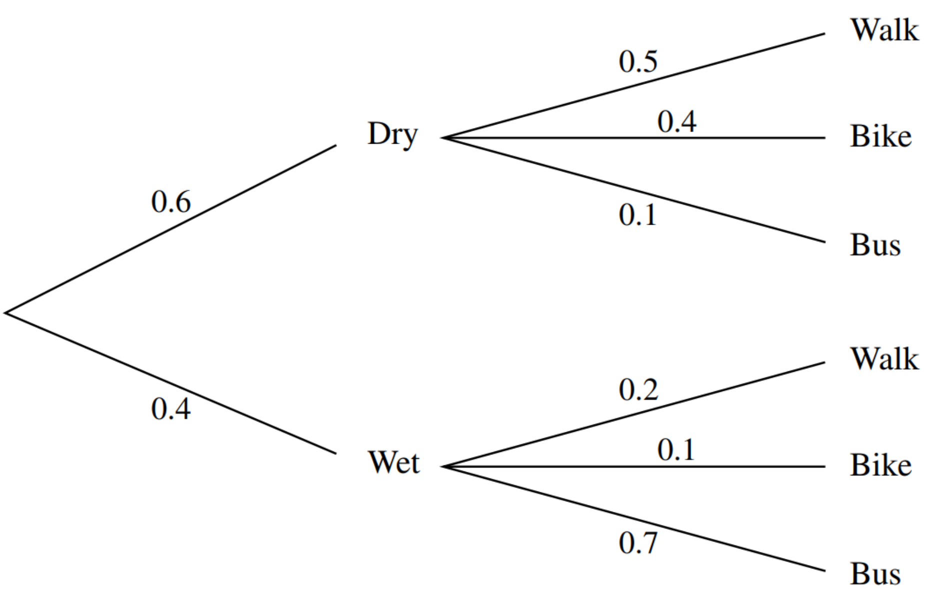
(A) all three of these trains are on time, **[2]**

(B) just one of these three trains is on time, **[4]**

(C) the 12 00 train is on time. **[4]**

Q7, (Jan 2011, Q5i,ii)

Andy can walk to work, travel by bike or travel by bus. The tree diagram shows the probabilities of any day being dry or wet and the corresponding probabilities for each of Andy's methods of travel.



A day is selected at random. Find the probability that

(i) the weather is wet and Andy travels by bus, **[2]**

(ii) Andy walks or travels by bike, **[3]**

Q8, (Jun 2014, Q2i,ii)

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]**

Q9, (Jun 2011, Q5i,ii)

In a recent survey, a large number of working people were asked whether they worked full-time or part-time, with part-time being defined as less than 25 hours per week. One of the respondents is selected at random.

- W is the event that this person works part-time.
- F is the event that this person is female.

You are given that $P(W) = 0.14$, $P(F) = 0.41$ and $P(W \cap F) = 0.11$.

(i) Draw a Venn diagram showing the events W and F, and fill in the probability corresponding to each of the four regions of your diagram. **[3]**

(ii) Determine whether the events W and F are independent. **[2]**

Q10, (Jun 2013, Q7i,ii)

Jenny has six darts. She throws darts, one at a time, aiming each at the bull's-eye. The probability that she hits the bull's-eye with her first dart is 0.1. For any subsequent throw, the probability of hitting the bull's-eye is 0.2 if the previous dart hit the bull's-eye and 0.05 otherwise.

(i) Illustrate the possible outcomes for her first, second and third darts on a probability tree diagram. **[4]**

(ii) Find the probability that

(A) she hits the bull's-eye with at least one of her first three darts, **[3]**

(B) she hits the bull's-eye with exactly one of her first three darts. **[4]**

Q11, (Jun 2016, Q2)

In a hockey league, each team plays every other team 3 times. The probabilities that Team A wins, draws and loses to Team B are given below.

- P(Wins) = 0.5
- P(Draws) = 0.3
- P(Loses) = 0.2

The outcomes of the 3 matches are independent.

(i) Find the probability that Team A does not lose in any of the 3 matches. **[1]**

(ii) Find the probability that Team A either wins all 3 matches or draws all 3 matches or loses all 3 matches. **[2]**

(iii) Find the probability that, in the 3 matches, exactly two of the outcomes, 'Wins', 'Draws' and 'Loses' occur for Team A. **[4]**
