

## Topic assessment

1. An amateur weather forecaster describes each day as either sunny, cloudy or wet. He keeps a record each day of his forecast and of the actual weather. His results for one particular year are given in the table.

		Weather Forecast			Total
		Sunny	Cloudy	Wet	
Actual Weather	Sunny	55	12	7	74
	Cloudy	17	128	29	174
	Wet	3	33	81	117
Total		75	173	117	365

A day is selected at random from that year.

- (i) Show that the probability that the forecast is correct is  $\frac{264}{365}$ . [1]

Find the probability that

- (ii) the forecast is correct, given that the forecast is sunny, [2]  
 (iii) the forecast is correct, given that the weather is wet, [2]  
 (iv) the weather is cloudy, given that the forecast is correct. [2]

2. Isobel plays football for a local team. Sometimes her parents attend matches to watch her play.

$A$  is the event that Isobel's parents watch a match

$B$  is the event that Isobel scores in a match

You are given that  $P(B|A) = \frac{3}{7}$  and  $P(A) = \frac{7}{10}$ .

- (i) Calculate  $P(A \cap B)$ . [2]

The probability that Isobel does not score and her parents do not attend is 0.1.

- (ii) Draw a Venn diagram showing the events  $A$  and  $B$ , and mark in the probability corresponding to each of the regions of your diagram. [2]  
 (iii) Are events  $A$  and  $B$  independent? Give a reason for your answer. [2]  
 (iv) By comparing  $P(B|A)$  with  $P(B)$ , explain why Isobel should ask her parents not to attend. [2]

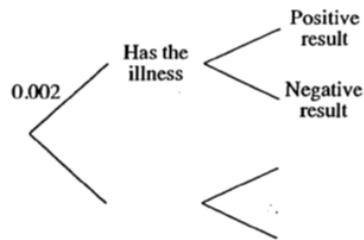
3. In a certain city, there are just two political parties, the Red Party and the Blue Party. Each year one person from each party seeks to be elected as mayor of the city. If the city has a Red Party mayor one year, the probability that it has a Red Party mayor the next year is 0.5. If the city has a Blue Party mayor one year, the probability that it has a Blue Party mayor the next year is 0.7.

In the year 2004 the mayor belongs to the Blue Party.

- (i) Illustrate the possible outcomes for mayor in the years 2005, 2006 and 2007 on a probability tree diagram. [3]  
 (ii) Find the probability that  
 (A) the mayors in 2005 and 2006 belong to the same party [3]  
 (B) the mayor in 2007 belongs to the Red Party, [3]

## Edexcel A level Probability Assessment

- (C) the mayor for just one of the three years after 2004 belongs to the Blue Party. [3]
- (iii) Find the conditional probability that the mayor in 2005 belongs to the Red Party, given that the mayor in 2007 belongs to the Red Party. [3]
4. Newborn babies are tested for a mild illness which affects 1 in 500 babies. The result of a test is either positive or negative. A positive test suggests the baby has the illness. However, the test is not perfect:
- for babies with the illness, the probability of a positive result is 0.99
  - for babies without the illness, the probability of a negative result is 0.95
- (i) Copy and complete this probability tree diagram to illustrate the situation.



- [2]
- (ii) Find the probability that
- (A) the result is positive, [3]
- (B) the test gives the correct diagnosis. [2]
- (iii) Given that the result of a test is positive, show that the conditional probability that the baby has the illness is 0.038 (correct to 3 decimal places). [4]
- Comment on the test in the light of this value being so low.

It is required to raise the probability found in part (iii) by improving the testing process. To achieve this, it is intended to increase the probability of negative results for babies who do not have the illness from its current value of 0.95 to  $p$ .

- (iv) Find the value of  $p$  that would raise the probability in part (iii) to 0.5. [4]

**Total 45 marks**