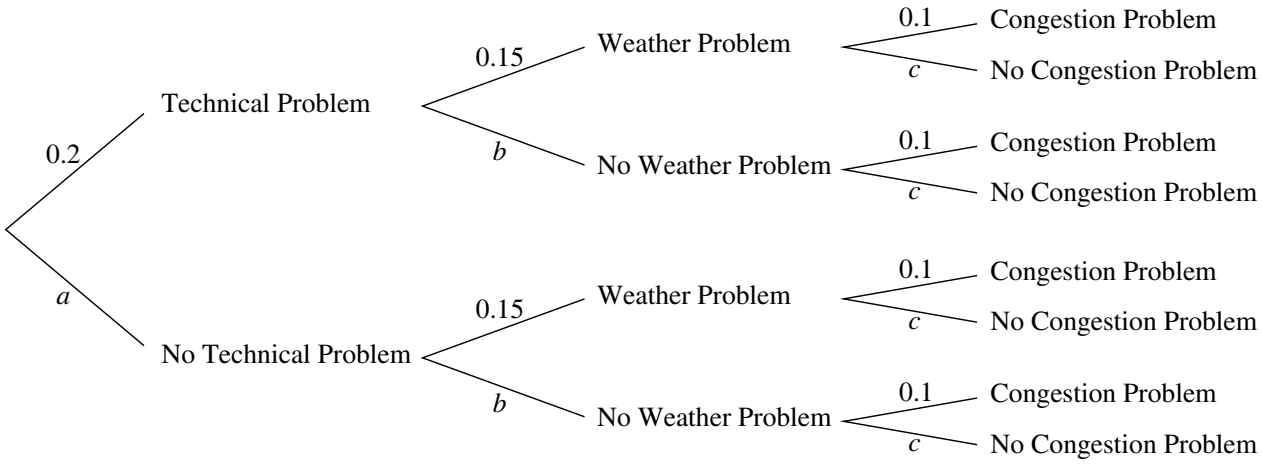
1 Laura frequently flies to business meetings and often finds that her flights are delayed. A flight may be delayed due to technical problems, weather problems or congestion problems, with probabilities 0.2, 0.15 and 0.1 respectively. The tree diagram shows this information.



(i) Write down the values of the probabilities a, b and c shown in the tree diagram. **[2]**

One of Laura's flights is selected at random.

(ii) Find the probability that Laura's flight is not delayed and hence write down the probability that it is delayed. **[4]**

(iii) Find the probability that Laura's flight is delayed due to just one of the three problems. **[4]**

(iv) Given that Laura's flight is delayed, find the probability that the delay is due to just one of the three problems. **[3]**

(v) Given that Laura's flight has no technical problems, find the probability that it is delayed. **[3]**

(vi) In a particular year, Laura has 110 flights. Find the expected number of flights that are delayed. **[2]**

2 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 $P(R) = 0.36$, $P(L) = 0.25$ and $P(R \cap L) = 0.2$.

(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]**

(iii) Find $P(L \mid R)$. State what this probability represents. **[3]**

3 In the 2001 census, people living in Wales were asked whether or not they could speak Welsh. A resident of Wales is selected at random.

- W is the event that this person speaks Welsh.
- C is the event that this person is a child.

You are given that $P(W) = 0.20$, $P(C) = 0.17$ and $P(W \cap C) = 0.06$.

(i) Determine whether the events W and C are independent. [2]

(ii) Draw a Venn diagram, showing the events W and C, and fill in the probability corresponding to each region of your diagram. [3]

(iii) Find $P(W|C)$. [2]

(iv) Given that $P(W|C') = 0.169$, use this information and your answer to part **(iii)** to comment very briefly on how the ability to speak Welsh differs between children and adults. [1]

4 A small business has 8 workers. On a given day, the probability that any particular worker is off sick is 0.05, independently of the other workers.

(i) A day is selected at random. Find the probability that

(*A*) no workers are off sick, [2]

(*B*) more than one worker is off sick. [3]

(ii) There are 250 working days in a year. Find the expected number of days in the year on which more than one worker is off sick. [2]