Basic Probability

92 min

97 marks

1. A class consists of students studying Spanish or French or both. Fifteen students study Spanish and twelve study French.

The probability that a student studies French given that she studies Spanish is $\dfrac{7}{15}$.

    (a)   Draw a Venn diagram to illustrate this information.

(3)

    (b)   Find the probability that a student studies Spanish given that she studies one language only.

(3)
(Total 6 marks)

2. Today Philip intends to go walking. The probability of good weather (G) is $\frac{3}{4}$. If the weather is

good, the probability he will go walking (W) is $\frac{17}{20}$. If the weather forecast is not good (NG) the

probability he will go walking is $\frac{1}{5}$.

(a) Complete the probability tree diagram to illustrate this information.
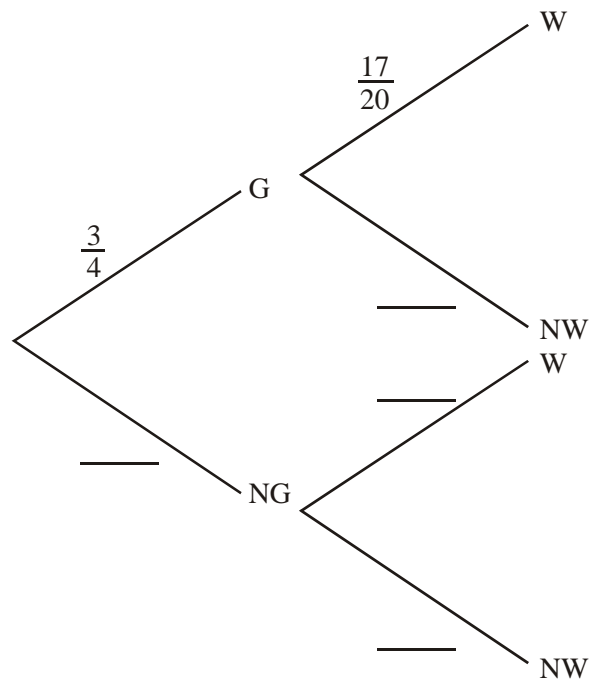
(b) What is the probability that Philip will go walking?

(Total 8 marks)

3. There are two biscuit tins on a shelf. The **red** tin contains three chocolate biscuits and seven plain biscuits. The **blue** tin contains one chocolate biscuit and nine plain biscuits.

(a) A child reaches into the **red** tin and randomly selects a biscuit. The child returns that biscuit to the tin, shakes the tin, and then selects another biscuit.
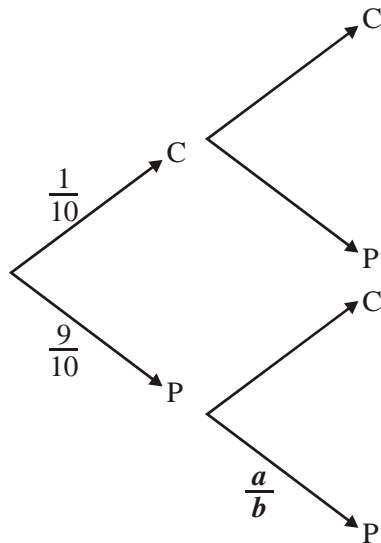
Find the probability that

(i) both biscuits chosen are chocolate.

(2)

(ii) one of the biscuits is plain and the other biscuit is chocolate.

(3)

(b) A second child chooses a biscuit from the **blue** tin. The child eats the biscuit and chooses another one from the **blue** tin. The tree diagram below represents the possible outcomes for this event.

(i) Write down the values of *a* and *b*.

(2)

(ii) Find the probability that both biscuits are chocolate.

(1)

(iii) What is the probability that *at least* one of the biscuits is chocolate?

(3)

(c)   Suppose that before the two children arrived, their brother randomly selected one of the
        biscuit tins and took out one biscuit.

        Calculate the probability that this biscuit was chocolate.

(4)

**(Total 15 marks)**

4.   The probability, p, that James gets up before 07.00 is 0.95.
        If James gets up before 07.00, the probability, t, that he arrives at school on time is 0.98.
        If James gets up later than 07.00, the probability that he arrives at school on time is 0.55.
        The above information is represented by the following tree diagram.
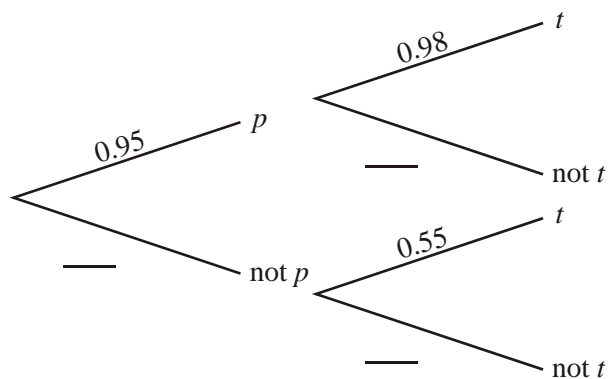
(a)   Complete the tree diagram.

(b)   Calculate the probability that James gets up before 07.00 and is on time for school.

(c)   Calculate the probability that James does **not** arrive at school on time.

(Total 8 marks)

5. (a) Phoebe chooses a biscuit from a blue tin on a shelf. The tin contains one chocolate biscuit and four plain biscuits. She eats the biscuit and chooses another one from the tin. The tree diagram below represents the situation with the four possible outcomes where A stands for chocolate biscuit and B for plain biscuit.
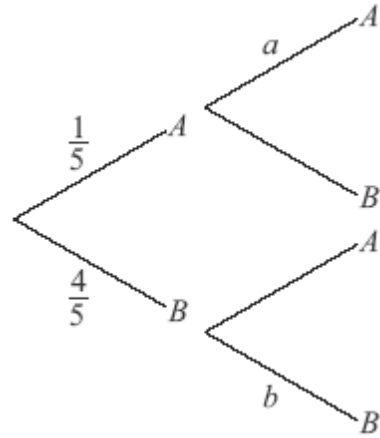

(i) Write down the value of a.

(ii) Write down the value of b.

(iii) Find the probability that both biscuits are plain.

(6)

On another shelf there are two tins, one red and one green. The red tin contains three chocolate biscuits and seven plain biscuits and the green tin contains one chocolate biscuit and four plain biscuits. Andrew randomly chooses either the red or the green tin and randomly selects a biscuit.
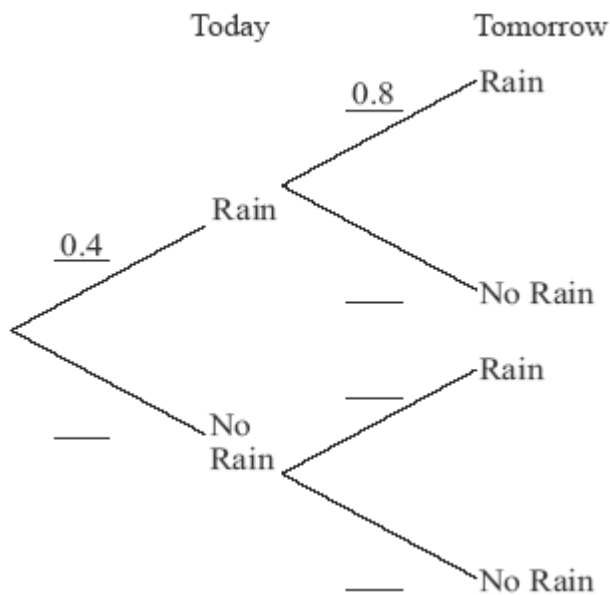
(b) **Copy and complete** the tree diagram below.
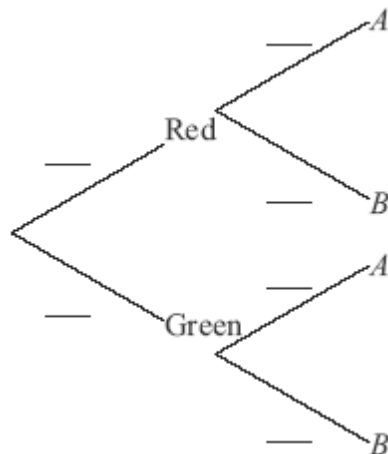
(3)

(c)   Find the probability that

    (i)   he chooses a chocolate biscuit;

    (ii)   he chooses a biscuit from the red tin given that it is a chocolate biscuit.

(6)

(Total 15 marks)

6.   The probability that it rains today is 0.4. If it rains today, the probability that it will rain tomorrow is 0.8. If it does not rain today, the probability that it will rain tomorrow is 0.7.

(a)   Complete the tree diagram below.

```
            Today              Tomorrow
                          0.8    Rain
                      Rain
              0.4
                           ___   No Rain

                                 Rain
                           ___
                      No
                      Rain

                           ___   No Rain
              ___
```

(3)

(b)   Calculate the probability of rain tomorrow.

(3)

(Total 6 marks)

7.   Heinrik rolls two 6-sided dice at the same time. One die has three red sides and three black sides. The other die has the sides numbered from 1 to 6. By means of a tree diagram, table of outcomes or otherwise, answer each of the following questions.

(a)   How many different possible combinations can he roll?

(b)   What is the probability that he will roll a red and an even number?

(c)   What is the probability that he will roll a red or black and a 5?

(d)   What is the probability that he will roll a number less than 3?

(Total 8 marks)

8.   A bag contains 2 red, 3 yellow and 5 green sweets.

Without looking, Mary takes one sweet out of the bag and eats it. She then takes out a second sweet.

(a)   If the first sweet is green, what is the probability that the second sweet is also green?

(b)   If the first sweet is not red, what is the probability that the second sweet is red?

(Total 4 marks)

9.   The data in the table below refers to a sample of 60 randomly chosen plants.

Growth rate ↓	dark	light	shady	total
high	3	8	14	25
low	8	9	18	35
total	11	17	32	60

Classification by environment

(a)   (i)   Find the probability of a plant being in a shady environment.

(ii)   Find the probability of a plant having a low growth rate and being in a dark environment.

(iii) Find the probability of a plant not being in a dark environment.

(5)

(b) A plant is chosen at random from the above group.

Find the probability that the chosen plant has

(i) a high growth rate or is in a dark environment, but not both

(ii) a light environment, given that it has a high growth rate.

(4)

(c) The 60 plants in the above group were then classified according to leaf type. It was found that 15 of the plants had type A leaves, 37 had type B leaves and 8 had type C leaves.
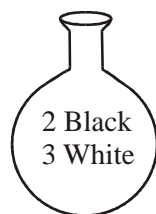
Two plants were randomly selected from this group. Find the probability that

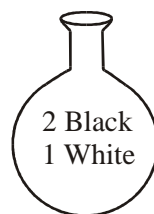(i) both plants had type C leaves

(ii) neither of the plants had type B leaves.

(5)
(Total 14 marks)

10. Two jars contain a number of coloured balls as indicated in the diagrams below.

2 Black
3 White

2 Black
1 White

Jar One   **Jar Two**

Two experiments are carried out.

First Experiment: A jar is first chosen at random and then a ball is drawn from that jar.

(a) Draw, **and label fully**, a tree diagram to show **all** possible outcomes of this experiment.

(2)

(b) What is the probability that a white ball is drawn?

(3)

Second Experiment: The ball drawn in the first experiment is not replaced. A second ball is then drawn from the same jar.

(c)   What is the probability that both balls are white?

(2)

(Total 7 marks)

11.   Events A and B have probabilities $P(A) = 0.4$, $P(B) = 0.65$, and $P(A \cup B) = 0.85$.

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

(b)   State with a reason whether events A and B are independent.

(c)   State with a reason whether events A and B are mutually exclusive.

(Total 6 marks)