Probability

Nov 04

2 A jar contains 12 discs of which 4 are red, 5 are white and 3 are blue. Three discs are selected at random from the jar, one after the other. When a disc has been removed it is not replaced in the jar.

(i) Find the probability that the first two discs are both red. [2]

(ii) Find the probability that the third disc is blue, given that the first two discs are red. [1]

(iii) Calculate the probability that the three discs are of different colours. [3]

Jan 05

1 Siân shoots two arrows at a target. The probability that her first shot hits the target is 0.7. If her first shot hits the target then the probability that her second shot hits the target is 0.77. If her first shot misses the target then the probability that her second shot hits the target is 0.63. Find the probability that

(i) Siân misses the target with both shots, [2]

(ii) Siân hits the target exactly once in her two shots. [2]

Jan 04

4 Mike is taking an examination module. He wants to achieve a top grade in this module and he can have a maximum of three attempts. If he gains the top grade at any particular attempt at the module, he will not take it again. At his first attempt he estimates that his probability of gaining a top grade is $\frac{7}{10}$. If he does not gain a top grade at the first attempt, he estimates that he has a probability of $\frac{16}{25}$ of gaining a top grade at the second attempt. If he does not gain a top grade in either of the first two attempts, he estimates that he has a probability of $\frac{29}{50}$ of gaining a top grade in the third (and last) attempt.

(i) Using Mike's estimates, show that the probability that he will gain a top grade is 0.955, correct to 3 significant figures. [4]

(ii) Sasha and Katie also take this examination. You may assume that their probabilities of gaining a top grade are the same as Mike's at each stage and the performances of the three students are independent of each other. Calculate the probability that exactly two of the three students gain a top grade. [4]

May 02

4 A jar contains 4 red discs, 6 white discs and 5 green discs. Three discs are removed at random from the jar, one after the other. Once a disc has been removed it is not replaced in the jar.

(a) Find the probability that

(i) the first disc is red, [1]

(ii) the second disc is white if the first disc is green. [1]

(b) Calculate the probability that

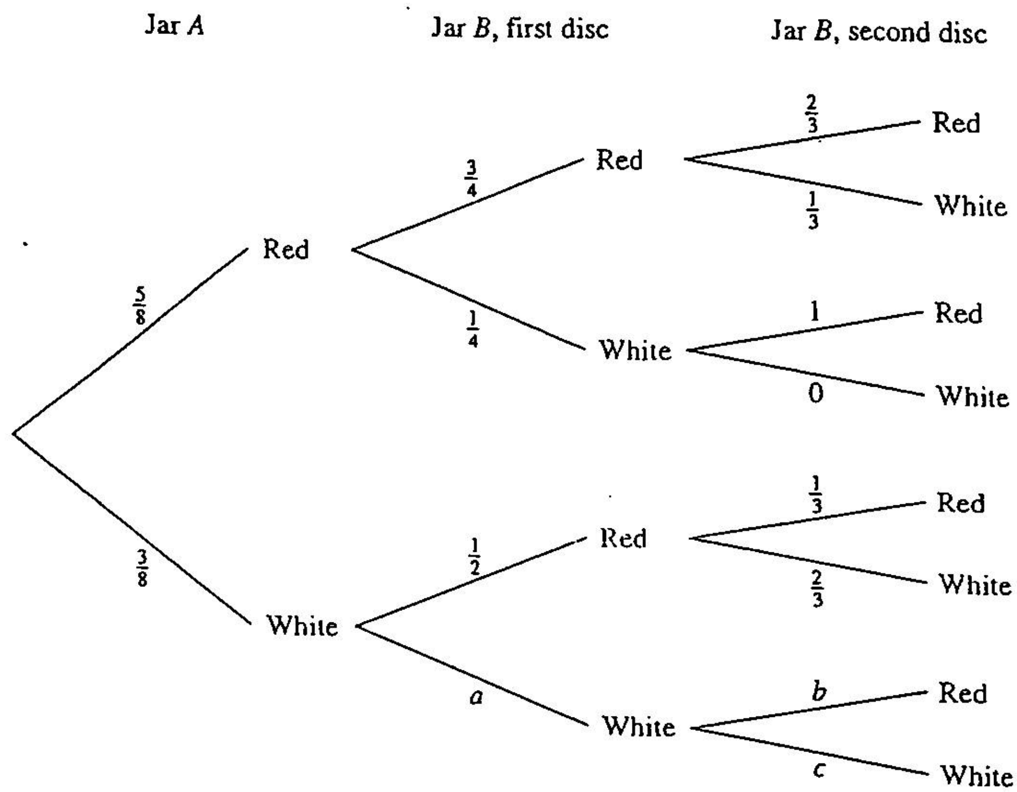
(i) exactly two of the three discs are red, [3]

(ii) the three discs are the same colour. [3]

Probability (cont 1)

Jun 01

4 Two jars containing some discs are placed on a table. Jar A contains 5 red discs and 3 white discs, and Jar B contains 2 red discs and 1 white disc. A disc is selected from Jar A at random and placed in Jar B. Two discs are then selected at random from Jar B. The first of these two discs is not replaced in Jar B before the second disc is selected. The possible outcomes are represented by the tree diagram given below.



(i) State the values of the probabilities a, b and c. [3]

(ii) Let D be the total number of red discs selected from Jar B. Show that $P(D = 2) = \frac{3}{8}$. [2]

Jan 03

3 Two tennis players X and Y play three sets of tennis against each other. The probability that X wins the first set is $\frac{2}{3}$. For each subsequent set the probability of a player winning the set is $\frac{3}{4}$ if that player won the previous set. There are no drawn sets, so every set results in either X or Y winning.

(i) Show this information on a tree diagram. [3]

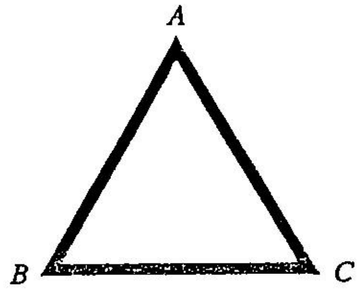
(ii) Use the tree diagram to find the probability that

(a) X wins all three sets, [1]

(b) X wins two sets and Y wins one set. [3]

Probability (cont 2)

7 Siân is involved in a game in which she runs along three paths in the form of a triangle, as in the diagram below.



When she arrives at a corner, she chooses her subsequent direction according to the following rules.

Sum 04

- When she is at A, she chooses path AB with probability $\frac{2}{3}$ and she chooses path AC with probability $\frac{1}{3}$.
- When she is at B, she chooses path BA with probability $\frac{3}{4}$ and she chooses path BC with probability $\frac{1}{4}$.
- When she is at C, she chooses path CA with probability $\frac{4}{5}$ and she chooses path CB with probability $\frac{1}{5}$.
- Once she has chosen a particular path she runs to the other end of the path.
- She starts at A.

(i) Show that the probability that she returns to A after choosing two paths is $\frac{23}{30}$. [3]

(ii) Find the probability that she returns to A after choosing three paths. [4]

(iii) Find the probability that she is at B after four choices. [5]

2 Aamir, Brad and Chris each take a penalty shot in a sports competition. The probability that Aamir succeeds is $\frac{3}{4}$, the probability that Brad succeeds is $\frac{2}{5}$ and the probability that Chris succeeds is $\frac{5}{9}$. The result of any competitor's shot is independent of all other results. Calculate the probability that

Nov 02

(i) Aamir, Brad and Chris all succeed, [2]

(ii) Aamir and Brad succeed but Chris does not, [1]

(iii) exactly two out of the three competitors succeed. [3]