OCR Maths S1

Topic Questions from Papers

Probability

1 Louise and Marie play a series of tennis matches. It is given that, in any match, the probability that Louise wins the first two sets is $\frac{3}{8}$.

(i) Find the probability that, in 5 randomly chosen matches, Louise wins the first two sets in exactly 2 of the matches. [3]

It is also given that Louise and Marie are equally likely to win the first set.

(ii) Show that P(Louise wins the second set, given that she won the first set) = $\frac{3}{4}$. [2]

(iii) The probability that Marie wins the first two sets is $\frac{1}{3}$. Find

P(Marie wins the second set, given that she won the first set). [2]

(Q6, Jan 2005)

2 A bag contains 5 black discs and 3 red discs. A disc is selected at random from the bag. If it is red it is replaced in the bag. If it is black, it is not replaced. A second disc is now selected at random from the bag.

Find the probability that

(i) the second disc is black, given that the first disc was black, [1]

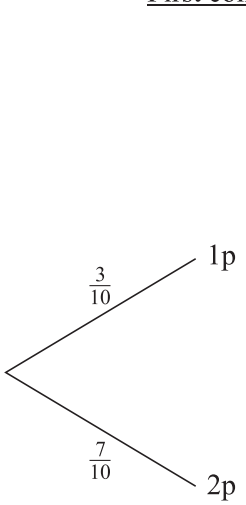
(ii) the second disc is black, [3]

(iii) the two discs are of different colours. [3]

(Q2, June 2006)

3 A bag contains three 1p coins and seven 2p coins. Coins are removed at random one at a time, **without** replacement, until the total value of the coins removed is **at least** 3p. Then no more coins are removed.

(i) Copy and complete the probability tree diagram. [5]



Find the probability that

(ii) exactly two coins are removed, [3]

(iii) the total value of the coins removed is 4p. [3]

(Q7, Jan 2007)

4 A bag contains 6 white discs and 4 blue discs. Discs are removed at random, one at a time, **without** replacement.

(i) Find the probability that

(a) the second disc is blue, given that the first disc was blue, [1]

(b) the second disc is blue, [3]

(c) the third disc is blue, given that the first disc was blue. [3]

(ii) The random variable X is the number of discs which are removed up to and including the first blue disc. State whether the variable X has a geometric distribution. Explain your answer briefly. [1]

(Q4, June 2007)

5 **(i)** A biased coin is thrown twice. The probability that it shows heads both times is 0.04. Find the probability that it shows tails both times. [3]

(ii) Another coin is biased so that the probability that it shows heads on any throw is p. The probability that the coin shows heads exactly once in two throws is 0.42. Find the two possible values of p. [5]

(Q8, June 2007)

6 A supermarket has a large stock of eggs. 40% of the stock are from a firm called Eggzact. 12% of the stock are brown eggs from Eggzact.

An egg is chosen at random from the stock. Calculate the probability that

(i) this egg is brown, given that it is from Eggzact, [2]

(ii) this egg is from Eggzact and is not brown. [2]

(Q4, Jan 2008)

7 A game uses an unbiased die with faces numbered 1 to 6. The die is thrown once. If it shows 4 or 5 or 6 then this number is the final score. If it shows 1 or 2 or 3 then the die is thrown again and the final score is the sum of the numbers shown on the two throws.

(i) Find the probability that the final score is 4. **[3]**

(ii) Given that the die is thrown only once, find the probability that the final score is 4. **[1]**

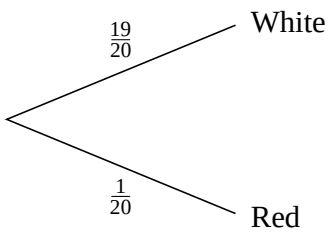
(iii) Given that the die is thrown twice, find the probability that the final score is 4. **[3]**

(Q8, Jan 2009)

8 A game at a charity event uses a bag containing 19 white counters and 1 red counter. To play the game once a player takes counters at random from the bag, one at a time, without replacement. If the red counter is taken, the player wins a prize and the game ends. If not, the game ends when 3 white counters have been taken. Niko plays the game once.

(i) (a) Copy and complete the tree diagram showing the probabilities for Niko. **[4]**

First counter



(b) Find the probability that Niko will win a prize. **[3]**

(ii) The number of counters that Niko takes is denoted by X.

(a) Find $P(X = 3)$. **[2]**

(b) Find $E(X)$. **[4]**

(Q8, June 2009)

9 The table shows the numbers of male and female members of a vintage car club who own either a Jaguar or a Bentley. No member owns both makes of car.

	Male	Female
Jaguar	25	15
Bentley	12	8

One member is chosen at random from these 60 members.

(i) Given that this member is male, find the probability that he owns a Jaguar. **[2]**

Now two members are chosen at random from the 60 members. They are chosen one at a time, without replacement.

(ii) Given that the first one of these members is female, find the probability that both own Jaguars. **[4]**

(Q7, Jan 2010)

10 Jenny and Omar are each allowed two attempts at a high jump.

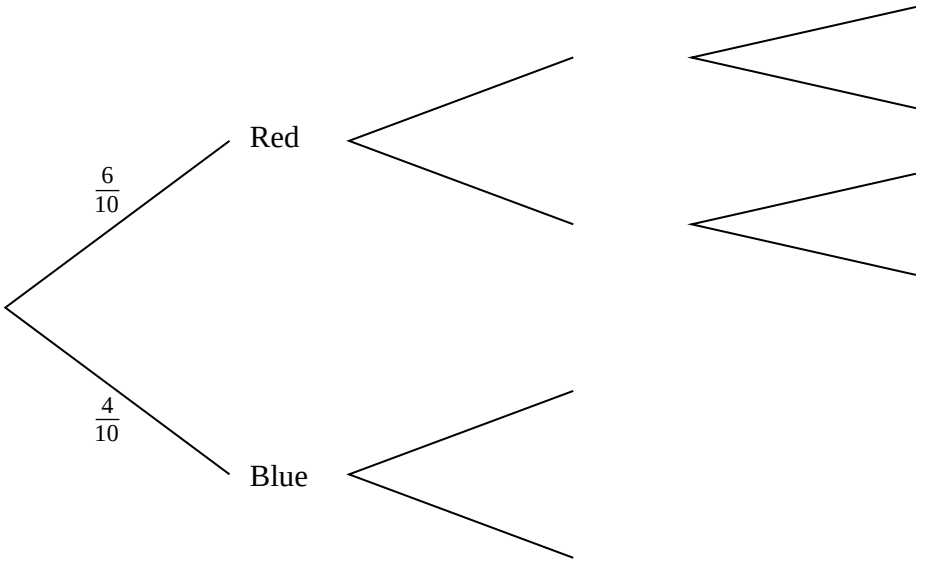
(i) The probability that Jenny will succeed on her first attempt is 0.6. If she fails on her first attempt, the probability that she will succeed on her second attempt is 0.7. Calculate the probability that Jenny will succeed. **[3]**

(ii) The probability that Omar will succeed on his first attempt is p. If he fails on his first attempt, the probability that he will succeed on his second attempt is also p. The probability that he succeeds is 0.51. Find p. **[4]**

(Q4, Jan 2011)

11 A bag contains 4 blue discs and 6 red discs. Chloe takes a disc from the bag. If this disc is red, she takes 2 more discs. If not, she takes 1 more disc. Each disc is taken at random and no discs are replaced.

(i) Complete the probability tree diagram in your Answer Book, showing all the probabilities. **[2]**



(Q5, June 2011)

12 Ann, Bill, Chris and Dipak play a game with a fair cubical die. Starting with Ann they take turns, in alphabetical order, to throw the die. This process is repeated as many times as necessary until a player throws a 6. When this happens, the game stops and this player is the winner.

Find the probability that

(i) Chris wins on his first throw, **[1]**

(ii) Dipak wins on his second throw, **[3]**

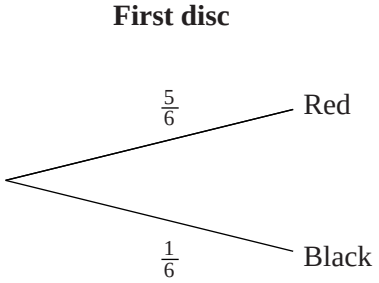
(iii) Ann gets a third throw, **[2]**

(iv) Bill throws the die exactly three times. **[4]**

(Q8, June 2011)

13 A bag contains 5 red discs and 1 black disc. Tina takes two discs from the bag at random without replacement.

(i) The diagram shows part of a tree diagram to illustrate this situation.



Complete the tree diagram in your Answer Book showing all the probabilities. **[2]**

(ii) Find the probability that exactly one of the two discs is red. **[3]**

All the discs are replaced in the bag. Tony now takes three discs from the bag at random without replacement.

(iii) Given that the first disc Tony takes is red, find the probability that the third disc Tony takes is also red. **[2]**

(Q4, June 2012)

14 A six-sided die is biased so that the probability of scoring 6 is 0.1 and the probabilities of scoring 1, 2, 3, 4, and 5 are all equal. In a game at a fête, contestants pay £3 to roll this die. If the score is 6 they receive £10 back. If the score is 5 they receive £5 back. Otherwise they receive no money back. Find the organiser's expected profit for 100 rolls of the die. **[5]**

(Q6, June 2012)

15 **(i)** Kathryn is allowed three attempts at a high jump. If she succeeds on any attempt, she does not jump again. The probability that she succeeds on her first attempt is $\frac{3}{4}$. If she fails on her first attempt, the probability that she succeeds on her second attempt is $\frac{3}{8}$. If she fails on her first two attempts, the probability that she succeeds on her third attempt is $\frac{3}{16}$. Find the probability that she succeeds. **[3]**

(ii) Khaled is allowed two attempts to pass an examination. If he succeeds on his first attempt, he does not make a second attempt. The probability that he passes at the first attempt is 0.4 and the probability that he passes on either the first or second attempt is 0.58. Find the probability that he passes on the second attempt, given that he failed on the first attempt. **[3]**

(Q2, Jan 2013)