

Probability Questions

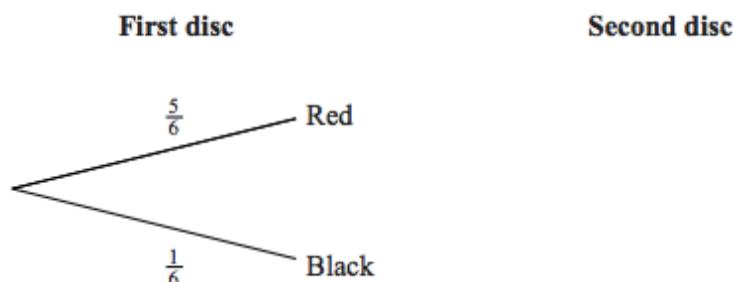
1.

- (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]

2.

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]

3.

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

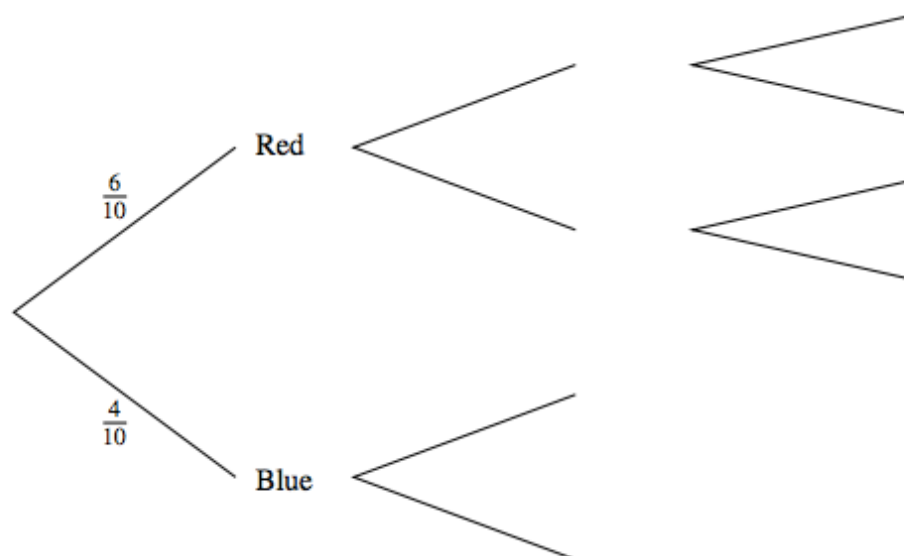
- (i) The probability that Jenny will succeed on her first attempt is 0.6. If she fails on her first attempt, the probability that she will succeed on her second attempt is 0.7. Calculate the probability that Jenny will succeed. [3]
- (ii) The probability that Omar will succeed on his first attempt is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

Probability Questions

4.

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]



The total number of blue discs that Chloe takes is denoted by X .

- (ii) Show that $P(X = 1) = \frac{3}{5}$. [2]

5.

A washing-up bowl contains 6 spoons, 5 forks and 3 knives. Three of these 14 items are removed at random, without replacement. Find the probability that

- (i) all three items are of different kinds, [3]
(ii) all three items are of the same kind. [3]

6.

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]

Probability Questions

7.

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]

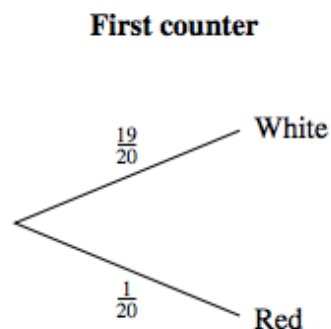
Now two members are chosen at random from the 60 members. They are chosen one at a time, without replacement.

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

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]



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

Probability Questions

9.

- (i) A bag contains 12 red discs and 10 black discs. Two discs are removed at random, without replacement. Find the probability that both discs are red. [2]
- (ii) Another bag contains 7 green discs and 8 blue discs. Three discs are removed at random, without replacement. Find the probability that exactly two of these discs are green. [3]
- (iii) A third bag contains 45 discs, each of which is either yellow or brown. Two discs are removed at random, without replacement. The probability that both discs are yellow is $\frac{1}{15}$. Find the number of yellow discs which were in the bag at first. [4]

10.

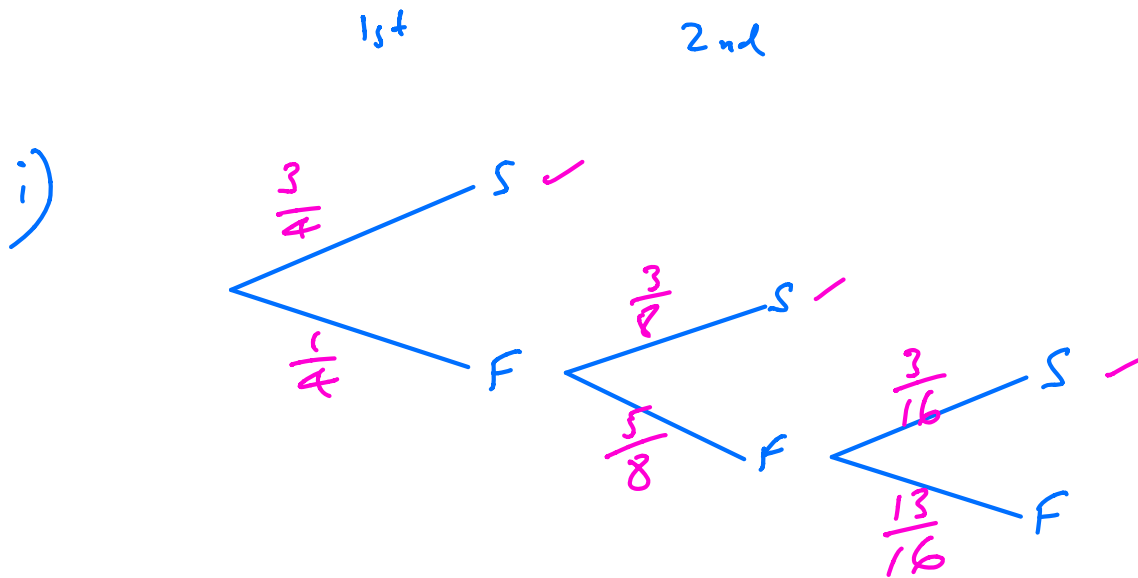
A supermarket has a large stock of eggs. 40% of the stock are from a firm called Eggzact. 12% of the stock are brown eggs from Eggzact.

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]

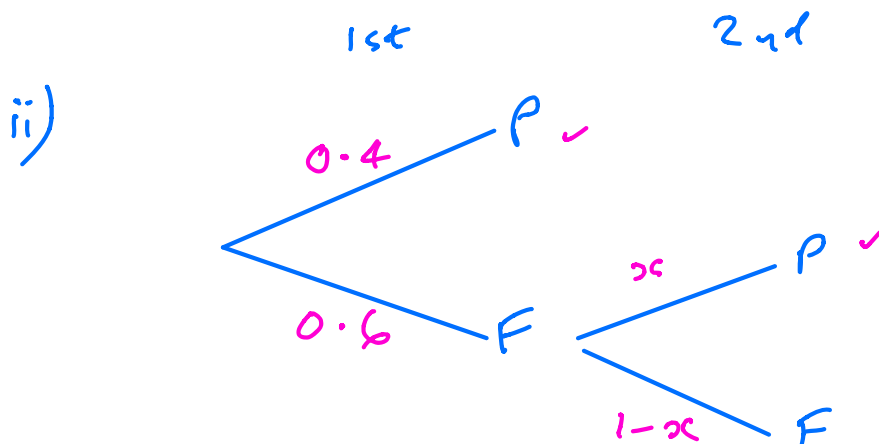
1.

- (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]
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$$P(\text{Success}) = \frac{3}{4} + \frac{1}{4} \times \frac{3}{8} + \frac{1}{4} \times \frac{5}{8} \times \frac{3}{16}$$

$$= \frac{447}{512} \quad \text{or} \quad 0.873$$



$$P(\text{Passes 1st or 2nd Attempt}) = 0.4 + 0.6x = 0.58$$

$$0.6x = 0.58 - 0.4$$

$$x = \frac{0.18}{0.6}$$

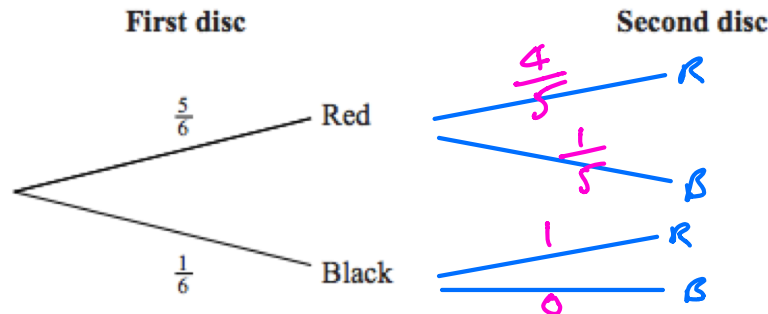
$$x = 0.3$$

$$P(\text{Passes 2nd Attempt} \setminus \text{Failed 1st}) = x = 0.3$$

2.

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]

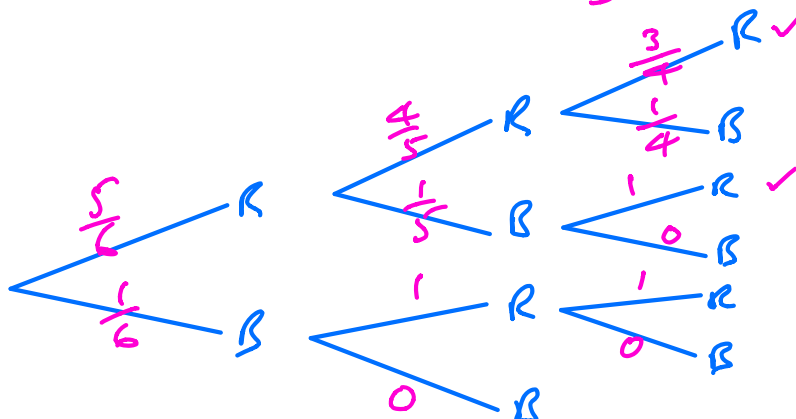
All the discs are replaced in the bag. Tony now takes three discs from the bag at random without replacement.

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

[2]

$$\begin{aligned} \text{ii) } P(\text{exactly 1 Red}) &= \frac{5}{6} \times \frac{1}{5} + \frac{1}{6} \times 1 \\ &= \frac{1}{3} \end{aligned}$$

iii)



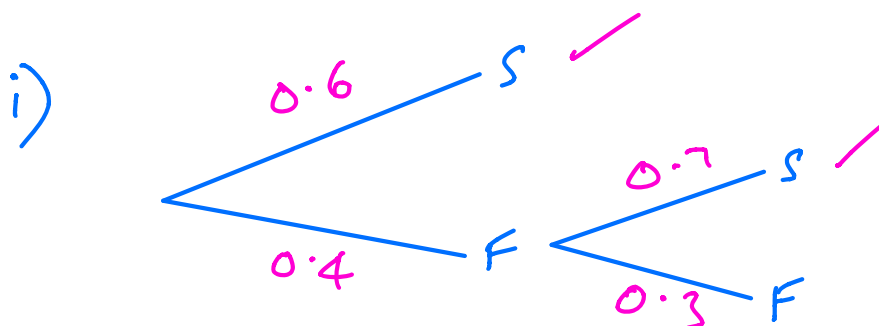
1st Red has happened so

$$\begin{aligned}\text{Prob (3rd is red)} &= \frac{4}{5} \times \frac{3}{4} + \frac{1}{5} \times 1 \\ &= \frac{3}{5} + \frac{1}{5} = \frac{4}{5}\end{aligned}$$

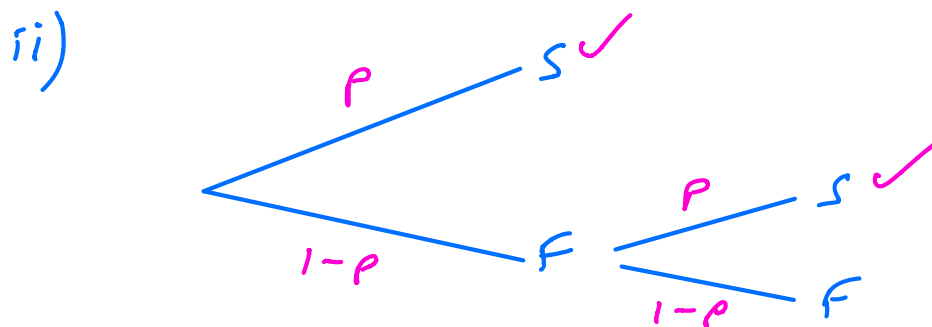
3.

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]



$$P(\text{Succeeds}) = 0.6 + 0.4 \times 0.7 = 0.88$$



$$\begin{aligned}P(\text{Succeeds}) &= p + (1-p)p = 0.51 \\ p + p - p^2 &= 0.51 \\ p^2 - 2p + 0.51 &= 0\end{aligned}$$

$$\cancel{p = \frac{17}{10}} \quad p = \frac{3}{10}$$

$$p = 0.3$$
