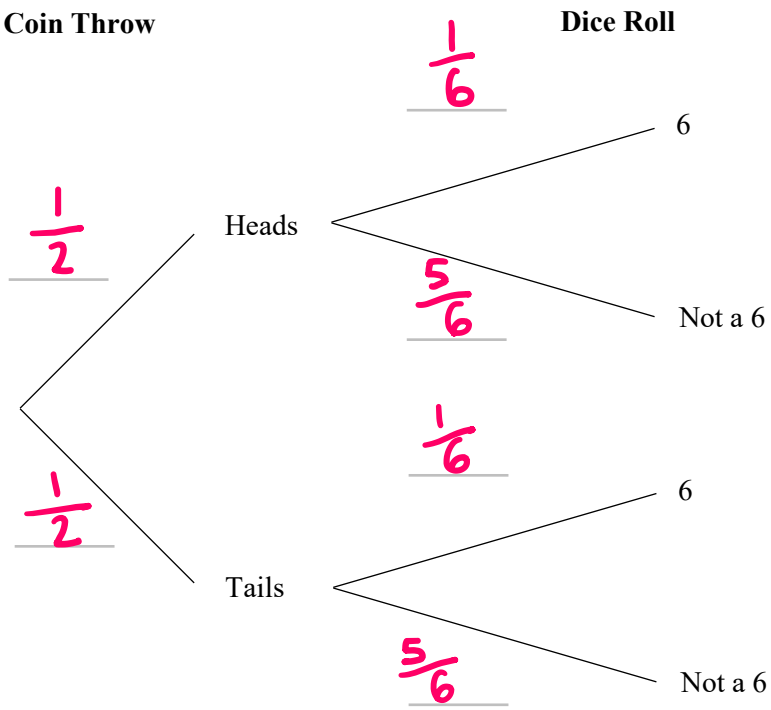
Probability Tree Diagrams

SCAN ME

REVISE THIS TOPIC

1 In a game a fair coin is thrown and a fair six-sided dice is rolled.

(a) Complete the probability tree diagram



(2)

A player wins the game if they throw Heads and then roll a number 6.

(b) Work out the probability that a player wins the game.

$\frac{1}{2} \times \frac{1}{6} = \frac{1}{12}$

$\frac{1}{12}$

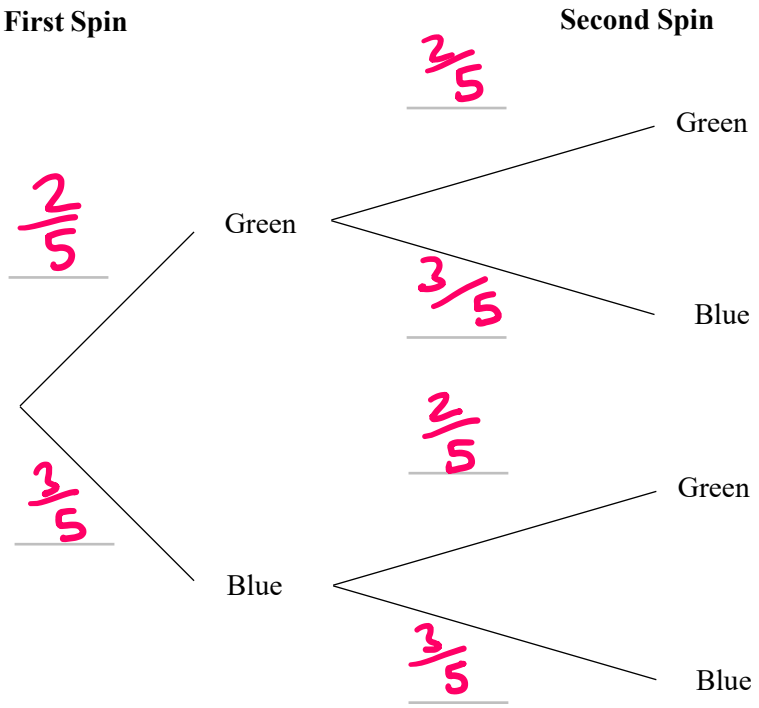
(2)

(Total for Question 1 is 4 marks)

2 A fair spinner has 5 equal sections.
2 of the sections are green and the rest are blue.

The spinner is spun twice.

(a) Complete the probability tree diagram



(2)

(b) Work out the probability that both spins are blue.

$\frac{3}{5} \times \frac{3}{5} = \frac{9}{25}$

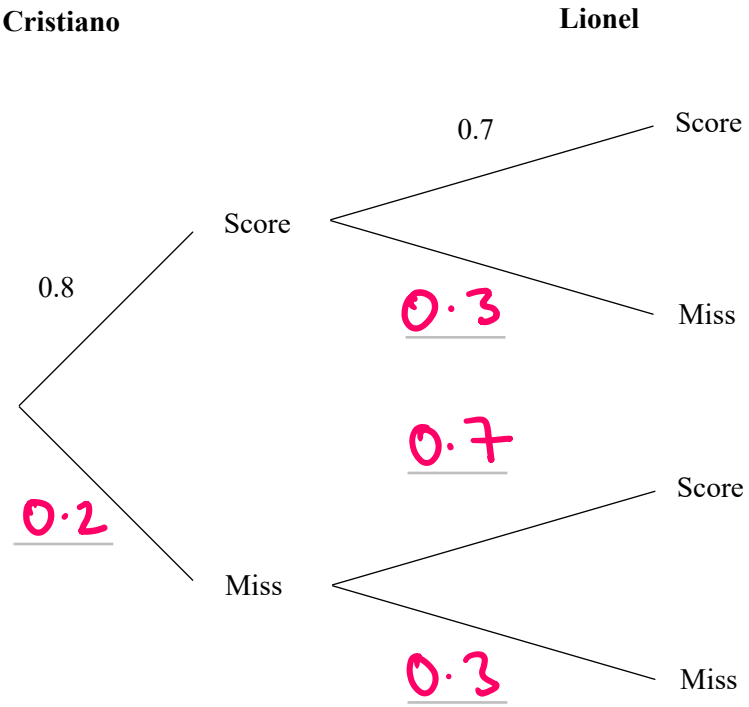
$\frac{9}{25}$

(2)

(Total for Question 2 is 4 marks)

3 Cristiano and Lionel both take penalty kicks.
The probability that Cristiano scores his penalty kick is 0.8
The probability that Lionel scores his penalty kick is 0.7

(a) Complete the probability tree diagram



(2)

(b) Work out the probability that both players score their penalty kicks.

0.8×0.7

0.56

(2)

(c) Work out the probability that both players miss their penalty kicks.

0.2×0.3

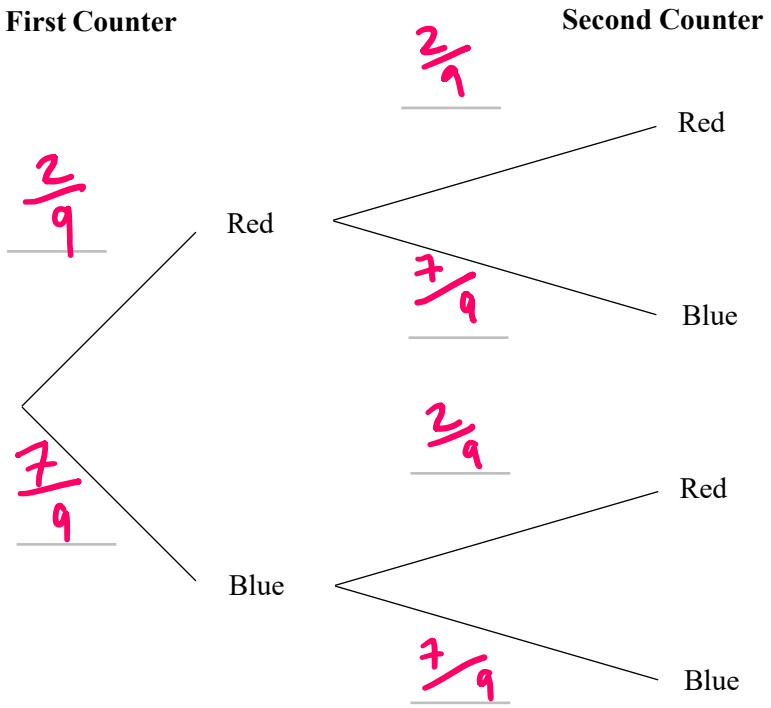
0.06

(2)

(Total for Question 3 is 6 marks)

4 A bag contains 2 red counters and 7 blue counters.
A counter is taken from the bag, the colour is noted and it is put back into the bag.
A second counter is taken and the colour is noted.

(a) Complete the probability tree diagram



(2)

(b) Work out the probability that both counters taken are the same colour.

$P(R,R) = \frac{2}{9} \times \frac{2}{9} = \frac{4}{81}$

$P(BB) = \frac{7}{9} \times \frac{7}{9} = \frac{49}{81}$

$\frac{4}{81} + \frac{49}{81} = \frac{53}{81}$

$\frac{53}{81}$

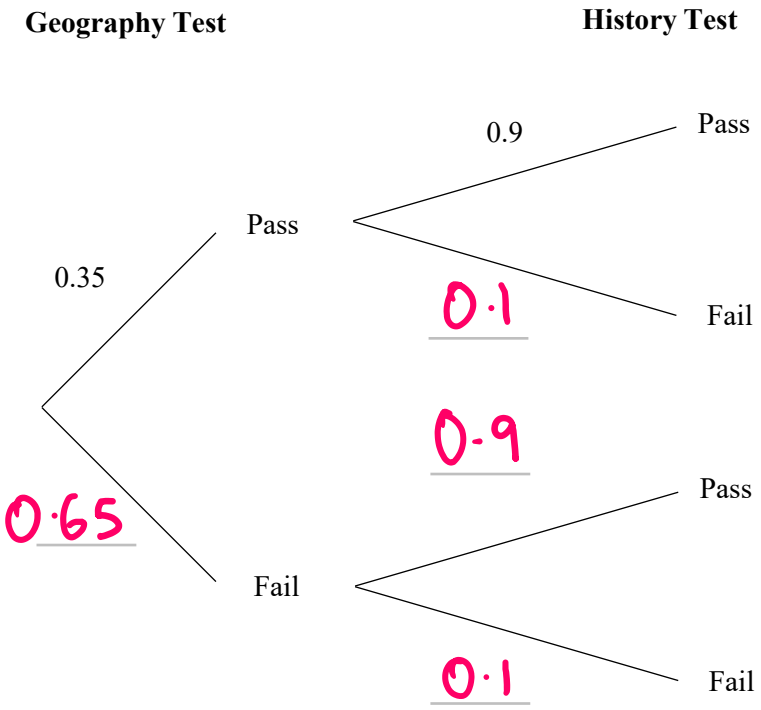
(3)

(Total for Question 4 is 5 marks)

5 Shamil has a geography test and a history test.

The probability that he passes his geography test is 0.35
The probability that he passes his history test is 0.9

(a) Complete the probability tree diagram



(2)

(b) Work out the probability that Shamil passes only one of his tests.

$P(P,F) = 0.35 \times 0.1$

0.035

$P(F,P) = 0.65 \times 0.9$

0.585

$0.035 + 0.585$

$= 0.62$

0.62

(3)

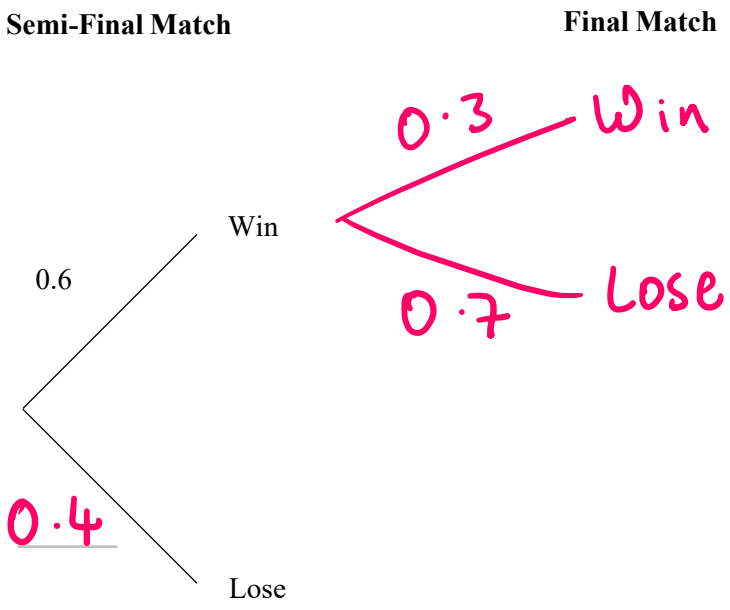
(Total for Question 5 is 5 marks)

6 Ashleigh's hockey team are in the semi final of the hockey cup.
The probability that they win the semi-final match is 0.6

If they win the semi-final match they will play the final match.
If they lose the semi-final match they are knocked out and play no more matches.

The probability that they win the final match (if they play it) is 0.3

(a) Complete the probability tree diagram



(2)

If Ashleigh's team win both the semi-final and the final they win the cup.
(b) Work out the probability that Ashleigh's team do not win the cup.

$P(W,W) = 0.6 \times 0.3$
$= 0.18$

$1 - 0.18 = 0.82$

0·82

(3)

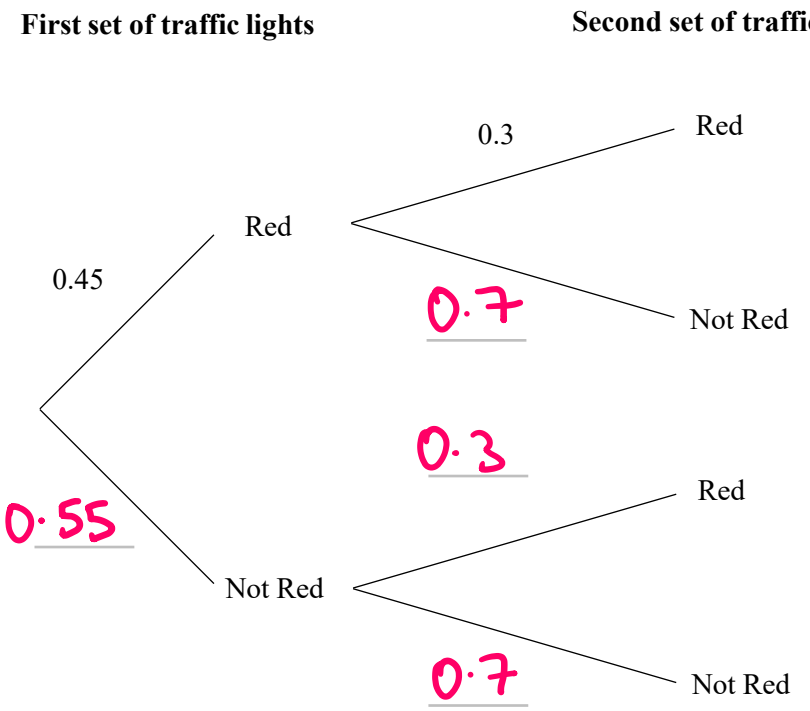
(Total for Question 6 is 5 marks)

7 On Alliyah's journey to work she drives through 2 sets of traffic lights.

When Alliyah arrives at the traffic lights

The probability the first set is red is 0.45
The probability the second set is red is 0.3

(a) Complete the probability tree diagram



(2)

(b) Work out the probability that at least one of the sets of traffic lights is red when Alliyah arrives at them.

$P(R,R) = 0.45 \times 0.3 = 0.135$
$P(R,NR) = 0.45 \times 0.7 = 0.315$
$P(NR,R) = 0.55 \times 0.3 = 0.165$
$0.135 + 0.315 + 0.165$

0.615

(3)

(Total for Question 7 is 5 marks)

8 Sadrile plays a game at the school fair.

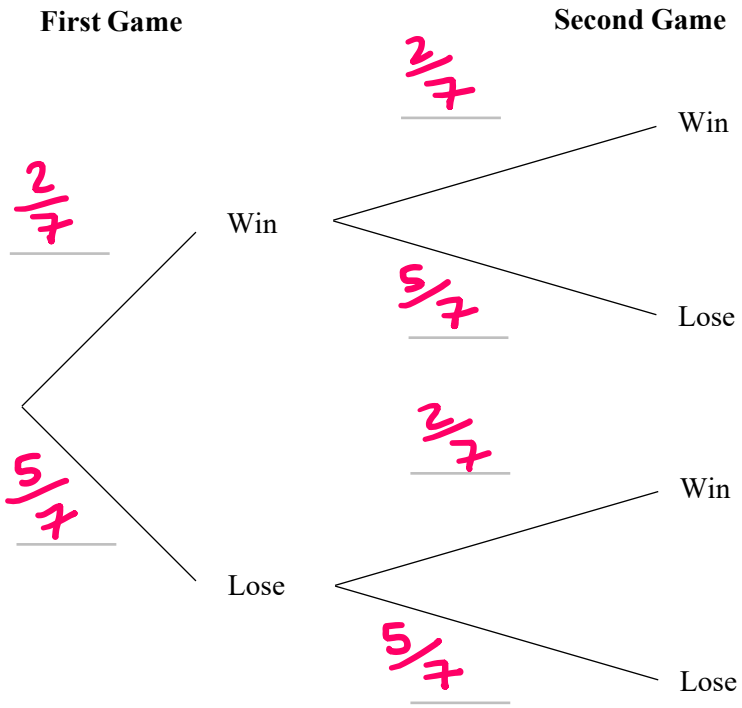
The following cards are shuffled and placed face down.

Win	Lose	Win	Lose	Lose	Lose	Lose

To play the game Sadrile must pick one card at random to see if he wins or not.
After each game the cards are returned and shuffled again.

Sadrile plays the game twice.

(a) Complete the probability tree diagram



(2)

(b) Work out the probability that Sadrile wins exactly one of the games.

$P(W,L) = \frac{2}{7} \times \frac{5}{7} = \frac{10}{49}$

$P(L,W) = \frac{5}{7} \times \frac{2}{7} = \frac{10}{49}$

$\frac{10}{49} + \frac{10}{49}$

$\frac{20}{49}$

(3)

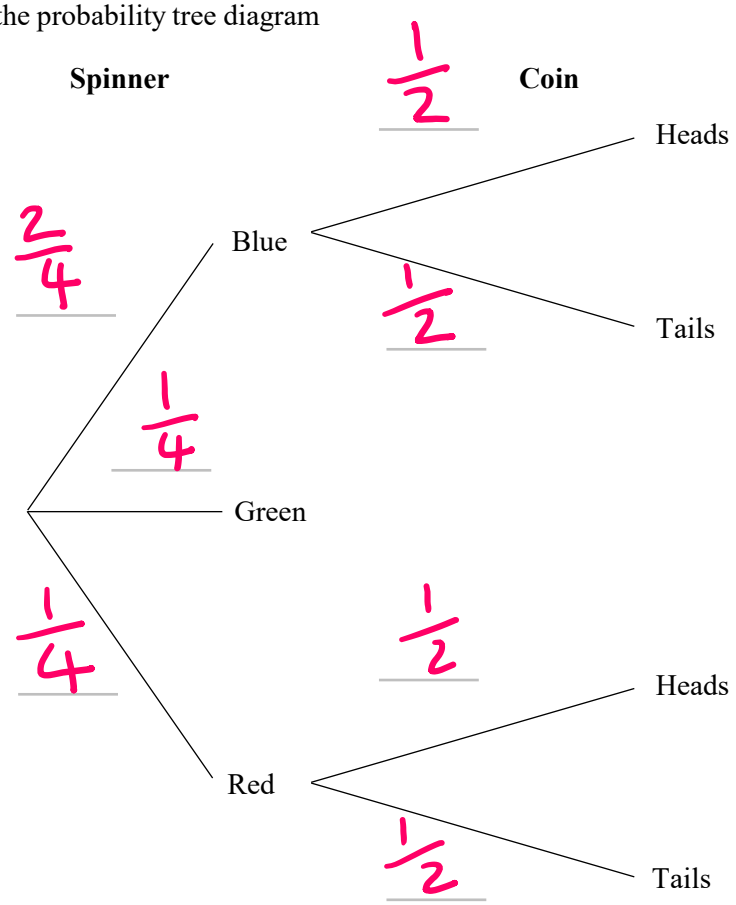
(Total for Question 8 is 5 marks)

9 A fair spinner has 4 equal sections.

Two of the sections are blue.
One of the sections is green.
One of the sections is red.

The spinner is spun. If the spinner lands on blue or red then a fair coin is thrown.

(a) Complete the probability tree diagram



(2)

(b) Work out the probability that a coin is thrown and it lands on heads.

$P(B,H) = \frac{2}{4} \times \frac{1}{2} = \frac{2}{8}$

$P(R,H) = \frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$

$\frac{2}{8} + \frac{1}{8}$

$\frac{3}{8}$

(3)

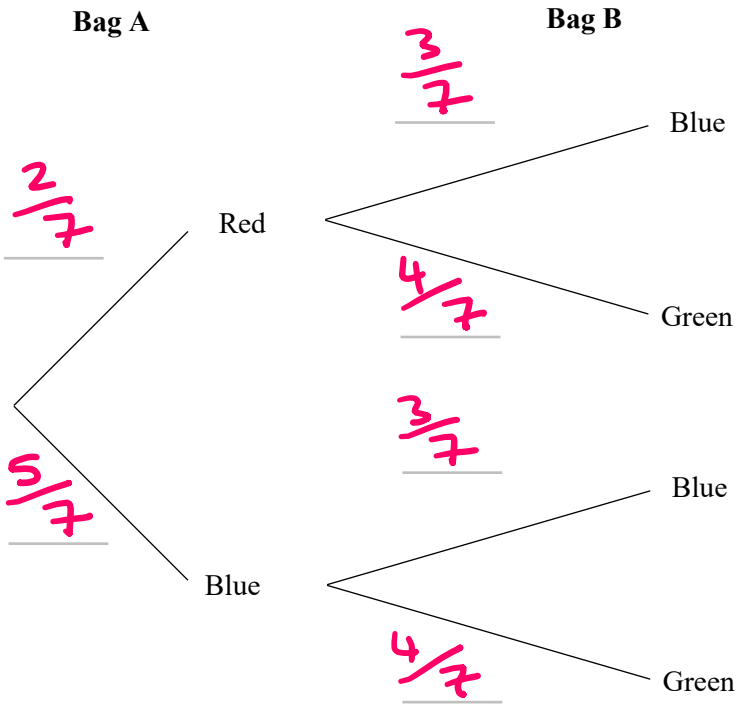
(Total for Question 9 is 5 marks)

10 Fiona has two bags of counters.

Bag A contains only red and blue counters in the ratio 2 : 5
Bag B contains only blue and green counters in the ratio 3 : 4

Fiona takes a counter from bag A and then a counter from bag B.

(a) Complete the probability tree diagram



(2)

(b) Work out the probability that **exactly one** of the counters Fiona selects is blue.

$P(R,B) = \frac{2}{7} \times \frac{3}{7} = \frac{6}{49}$

$P(B,G) = \frac{5}{7} \times \frac{4}{7} = \frac{20}{49}$

$\frac{6}{49} + \frac{20}{49}$

$\frac{26}{49}$

(3)

(Total for Question 10 is 5 marks)

11 A game uses a spinner that has n equal sections.

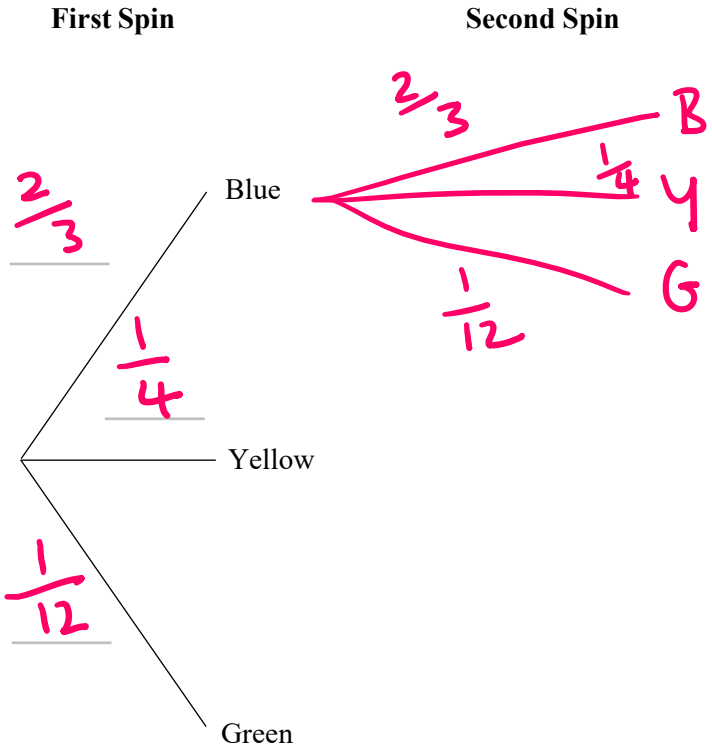
$\frac{2}{3}$ of the sections are blue.

$\frac{1}{4}$ of the sections are yellow

$\frac{2}{3} = \frac{8}{12}$, $\frac{1}{4} = \frac{3}{12}$, $\frac{11}{12}$ so green $= \frac{1}{12}$

The rest of the sections are green.
A player spins the spinner. If it lands on blue they can spin it a second time

(a) Complete the probability tree diagram



(4)

(b) To win the game the player must spin a yellow.
Work out the probability that the player wins the game.

$P(Y) = \frac{1}{4}$

$P(B,Y) = \frac{2}{3} \times \frac{1}{4} = \frac{2}{12}$

$\frac{1}{4} + \frac{2}{12} = \frac{3}{12} + \frac{2}{12}$

$\frac{5}{12}$

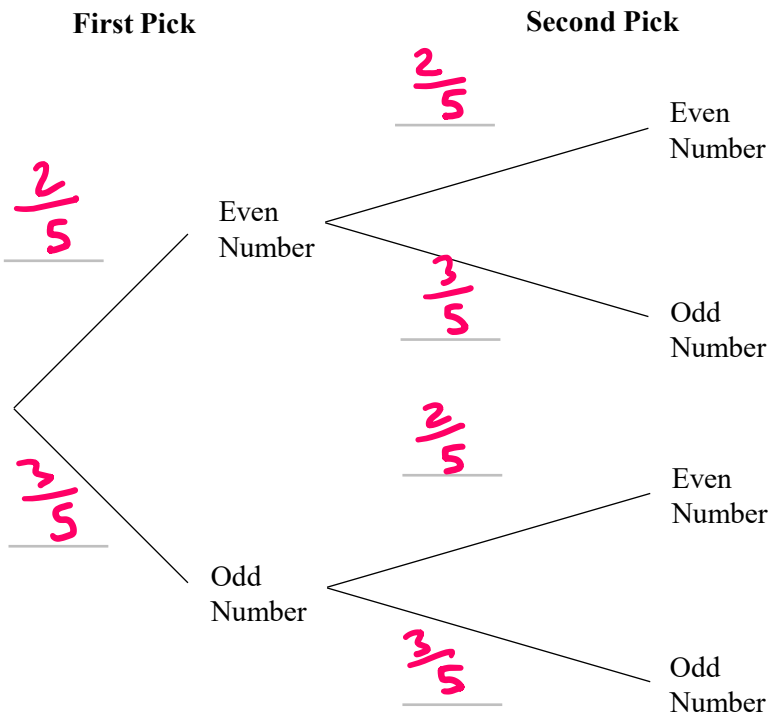
(3)

(Total for Question 11 is 7 marks)

12 A bag contains 5 counters numbered 1 to 5.

In a game a player picks out a counter from the bag, replaces it then picks out a second counter from the bag.

(a) Complete the probability tree diagram



(2)

To win the game the numbers picked must both be even or both be odd.
If one number is even and one number is odd then the player loses.

(b) Is the player more likely to win the game or lose the game?
You must show your working.

$P(E,E) = \frac{2}{5} \times \frac{2}{5}$

$= \frac{4}{25}$

$P(O,O) = \frac{3}{5} \times \frac{3}{5}$

$= \frac{9}{25}$

$\frac{4}{25} + \frac{9}{25} = \frac{13}{25}$ (win)

$1 - \frac{13}{25} = \frac{12}{25}$ (lose)

Win

.....

(4)

350 people play the game.

(c) Work out an estimate for how many people would win the game.

$P(\text{win}) = \frac{13}{25}$

$\frac{13}{25} \times 350 = 182$

182

(2)

The rules of the game are changed. The player now wins if either

Both numbers picked are prime numbers.
Both numbers picked are not prime numbers.

If one number is a prime number and one number is not a prime number, the player loses.

(d) What affect does this have on the probability that a player wins.
Tick one box and give a reason for your answer.

☐ The probability of winning with the new rules is higher.

☐ The probability of winning with the new rules is lower.

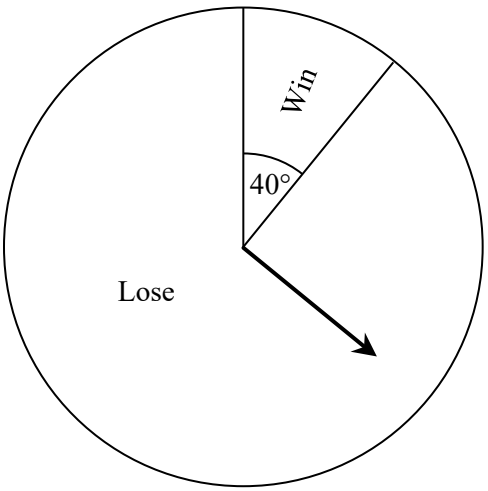
☑ The probability of winning stays the same.

2, 3, 5, 7 (prime)
1, 4, 6 (non prime)
same number of prime as odd
same number of non prime as even

(2)

(Total for Question 12 is 10 marks)

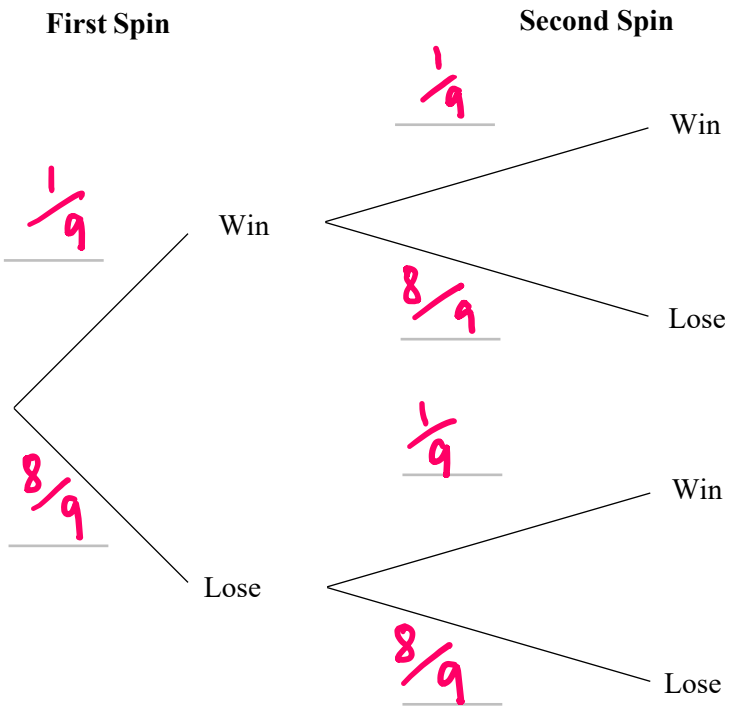
13 The spinner below is used in a game.



$\frac{40}{360} = \frac{1}{9}$

In the game players must spin the spinner two times.

(a) Complete the probability tree diagram



(3)

The table below shows the prizes that the player can win.

Spins	2 × Win	1 × Win	0 × win
Prize	£10	£3	£0

To play the game players must pay £2.50
During one week 405 players play the game.

(b) Work out an estimate for the amount of profit the game organiser made this week.

$P(W,W) = \frac{1}{9} \times \frac{1}{9} = \frac{1}{81}$ ← 2 x win

$P(W,L) = \frac{1}{9} \times \frac{8}{9} = \frac{8}{81}$

$P(L,W) = \frac{8}{9} \times \frac{1}{9} = \frac{8}{81}$ } 1 x win

$P(L,L) = \frac{8}{9} \times \frac{8}{9} = \frac{64}{81}$ ← 0 x win

$\frac{1}{81} \times 405 = 5$ £10 winners

$5 \times £10 = £50$

$\frac{16}{81} \times 405 = 80$ £3 winners

$80 \times £3 = £240$

$405 \times £2.50 = £1012.50$

$£1012.50 - £50 - £240$

£ 722.50

(6)

(Total for Question 13 is 9 marks)