Chhetri Academy

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GCSE MATHS

Probability

Edexcel 1MA1 | Subtopic collection Topic 53

Tree diagrams and combined events

Higher tier

Past paper question booklet

44	2003-2025	Higher
question groups	available papers	tier

Before you begin

1. Show working and use units where appropriate.
2. Use extra paper if you need more space.
3. Print at actual size (100%) for measurement questions.

Name _____ **Date** _____

Whole questions are retained for context; some parts cover other points. Legacy sources are labelled.

Leave blank

11. Julie does a statistical experiment. She throws a dice 600 times. She scores six 200 times.

(a) Is the dice fair? Explain your answer.

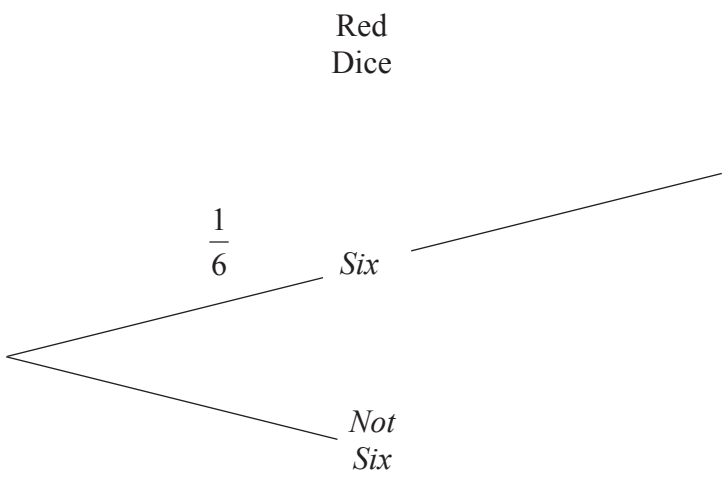
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(1)

Julie then throws a fair red dice once and a fair blue dice once.

(b) Complete the probability tree diagram to show the outcomes.
Label clearly the branches of the probability tree diagram.
The probability tree diagram has been started in the space below.



(3)

(c) (i) Julie throws a fair red dice once and a fair blue dice once. Calculate the probability that Julie gets a six on both the red dice and the blue dice.

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(ii) Calculate the probability that Julie gets at least one six.

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(5)

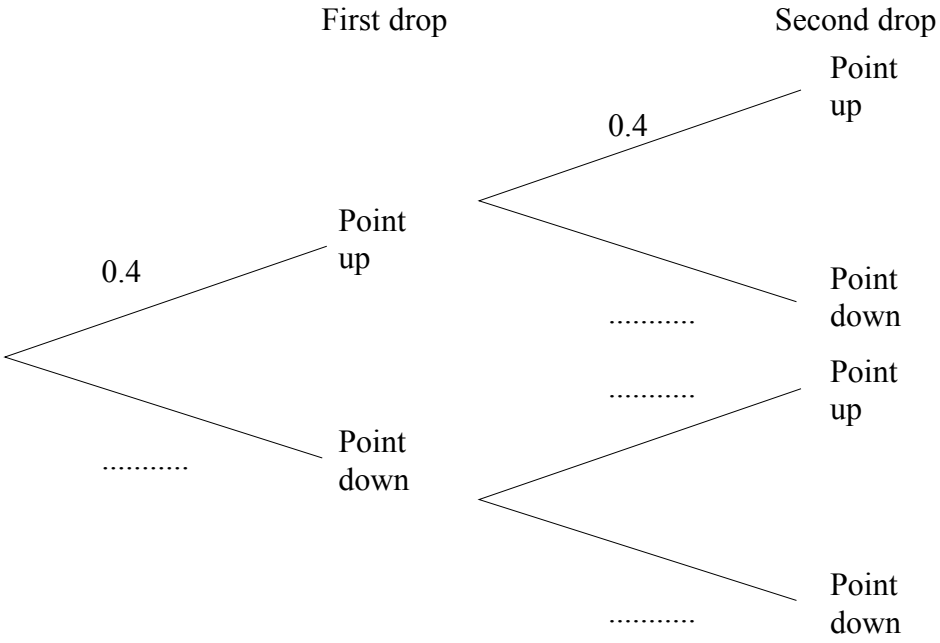
Page Total

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14. Mary has a drawing pin.
When the drawing pin is dropped it can land either 'point up' or 'point down'.
The probability of it landing 'point up' is 0.4

Mary drops the drawing pin twice.

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that the drawing pin will land 'point up' both times.

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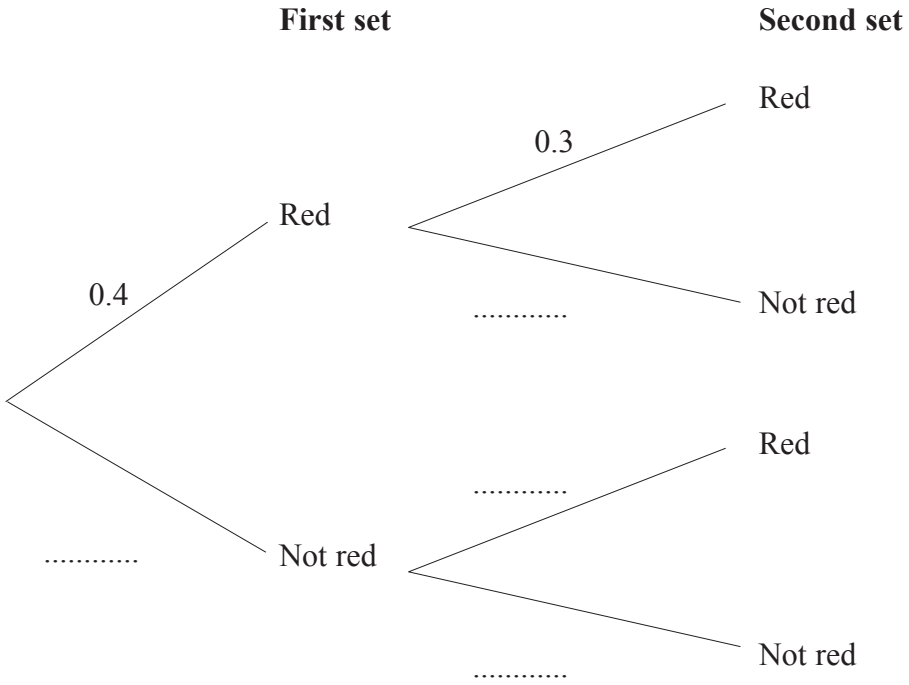
(2)

Q14

(Total 4 marks)

17. There are two sets of traffic lights on Georgina's route to school.
The probability that the first set of traffic lights will be red is 0.4
The probability that the second set of traffic lights will be red is 0.3

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that both sets of traffic lights will be red.

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(2)

(c) Work out the probability that exactly one set of traffic lights will be red.

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(3)

(Total 7 marks)

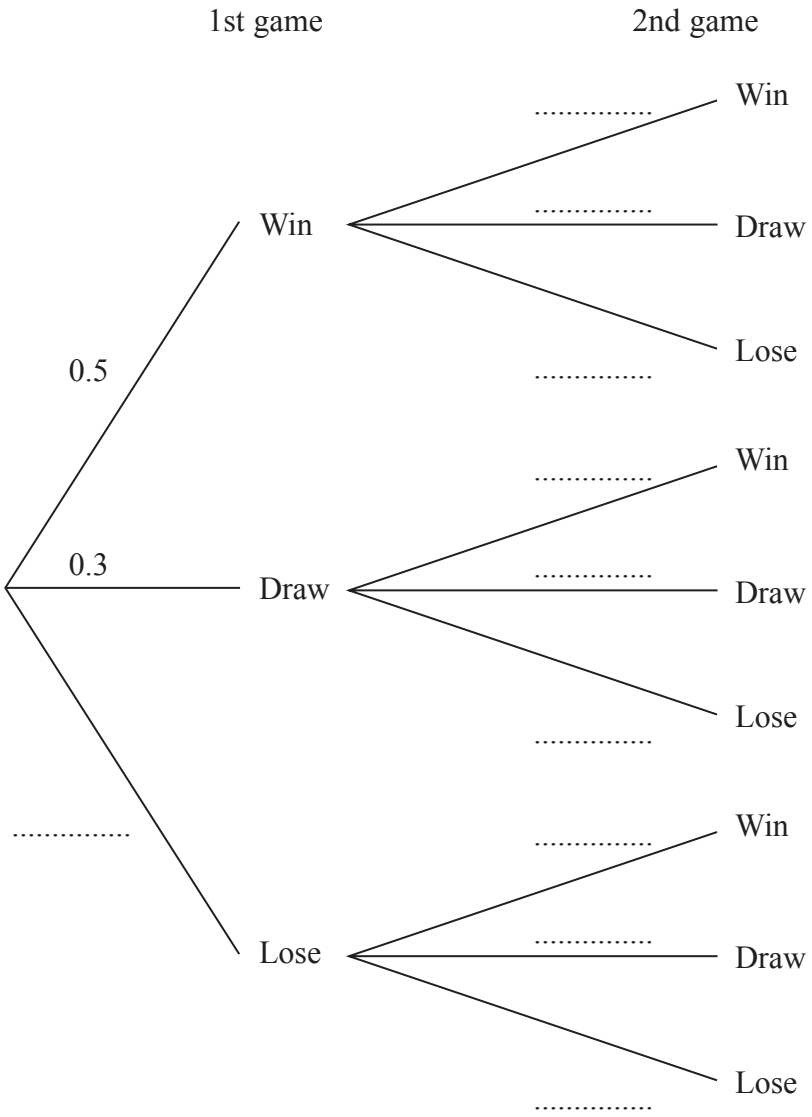
Q17

23. In a game of chess, a player can either win, draw or lose.

The probability that Vishi wins any game of chess is 0.5
The probability that Vishi draws any game of chess is 0.3

Vishi plays 2 games of chess.

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that Vishi will win both games.

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(2)

(Total 4 marks)

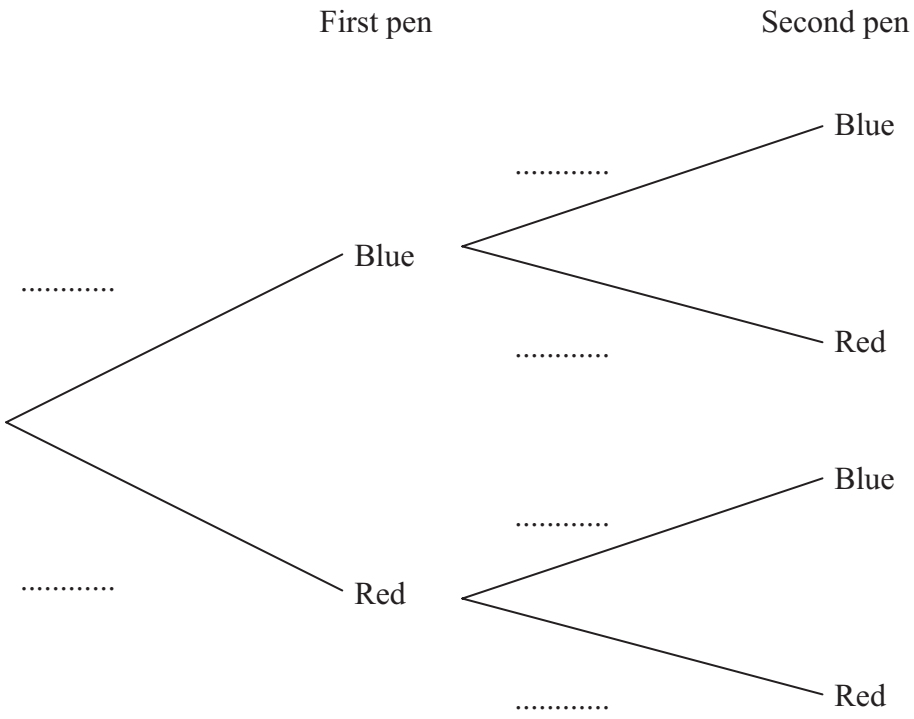
Q23

19. Emma has 7 pens in a box.
5 of the pens are blue.
2 of the pens are red.

Emma takes at random a pen from the box and writes down its colour.
Emma puts the pen back in the box.

Then Emma takes at random a second pen from the box, and writes down its colour.

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that Emma takes exactly one pen of each colour from the box.

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(3)

Q19

(Total 5 marks)

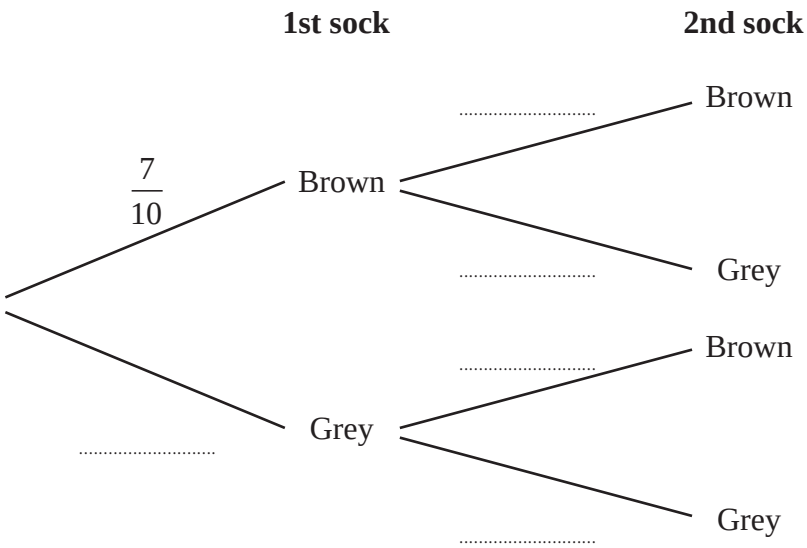
12 There are 10 socks in a drawer.

7 of the socks are brown.
3 of the socks are grey.

Bevan takes at random two socks from the drawer at the same time.

(a) Complete the probability tree diagram.

(2)



(b) Work out the probability that Bevan takes two socks of the same colour.

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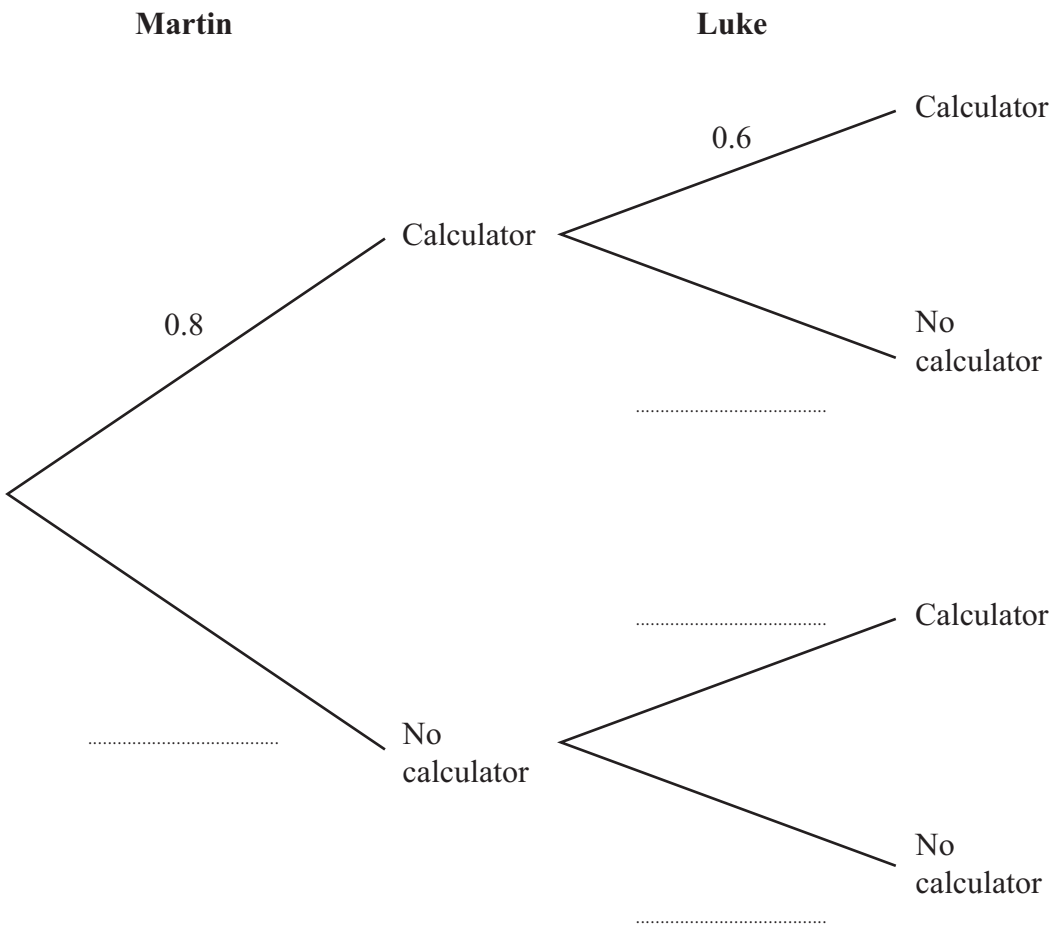
(3)

(Total for Question 12 is 5 marks)

11 Martin and Luke are students in the same maths class.

The probability that Martin will bring a calculator to a lesson is 0.8
The probability that Luke will bring a calculator to a lesson is 0.6

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that **both** Martin and Luke will **not** bring a calculator to a lesson.

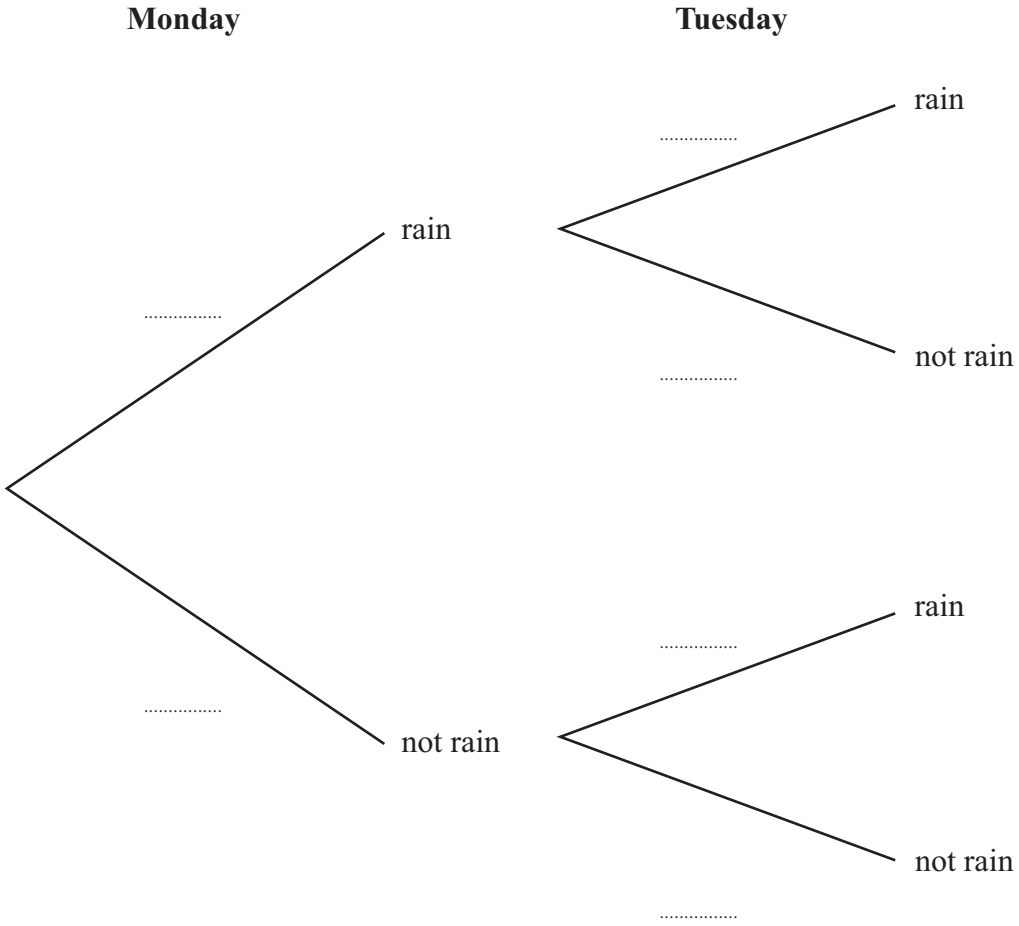
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(2)

(Total for Question 11 is 4 marks)

10 The probability that it will rain on Monday is 0.6

When it rains on Monday, the probability that it will rain on Tuesday is 0.8
When it does **not** rain on Monday, the probability that it will rain on Tuesday is 0.5



(a) Complete the probability tree diagram.

(2)

(b) Work out the probability that it will rain on both Monday and Tuesday.

.....

(2)

(c) Work out the probability that it will rain on at least one of the two days.

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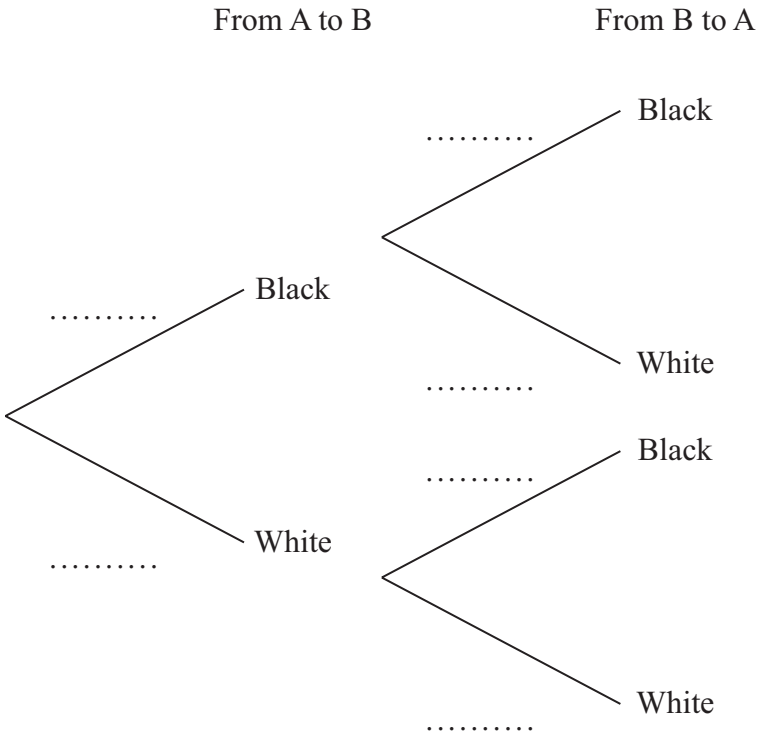
(3)

(Total for Question 10 is 7 marks)

22. Jan has two boxes.
There are 6 black and 4 white counters in box A.
There are 7 black and 3 white counters in box B.

Jan takes at random a counter from box A and puts it in box B.
She then takes at random a counter from box B and puts it in box A.

(a) Complete the probability tree diagram.



(2)

(b) Find the probability that after Jan has put the counter from box B into box A there will still be 6 black counters and 4 white counters in box A.

.....

(4)

(Total 6 marks)

Q22

8 Josh plays a game with two sets of cards.

Set A	1	2	4	5	7
Set B	3	6	8	9	

Josh takes at random one card from each set.
He adds the numbers on the two cards to get the total score.

(a) Complete the table to show all the possible total scores.

		Set A				
		1	**2**	**4**	**5**	**7**
Set B	**3**	4	5	7	8	10
	6	7	8	10		
	8					
	9					

(1)

(b) What is the probability that Josh's total score will be greater than 12?

.....

(2)

Josh's year group are raising money for a sponsored skydive.

60 students are each going to play Josh's card game once.
Each student pays 50p to play the game.

Josh pays £1.50 to any player getting a total of 8

(c) Show that Josh can expect to make a profit of £21 from his game.

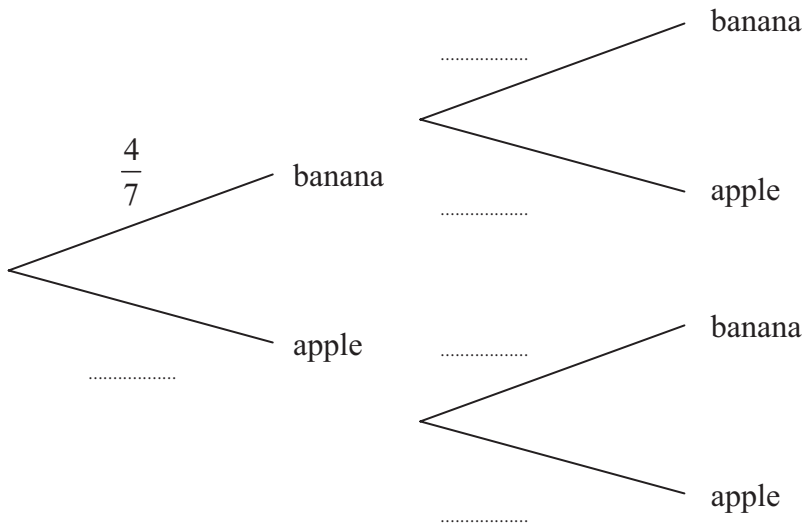
(4)

(Total for Question 8 is 7 marks)

13 There are 4 banana smoothies and 3 apple smoothies in a box.

Jenny takes at random 1 smoothie from the box.
She writes down its flavour, and puts it back in the box.
Jenny then takes at random a second smoothie from the box.

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that both smoothies are apple flavour.

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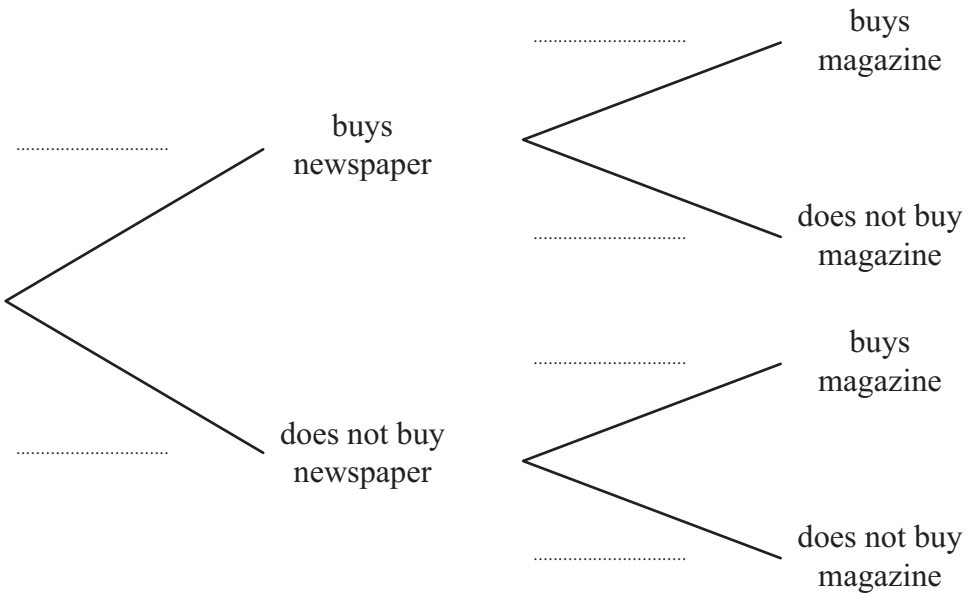
(2)

(Total for Question 13 is 4 marks)

9 In a newsagent's shop, the probability that any customer buys a newspaper is 0.6

In the same shop, the probability that any customer buys a magazine is 0.3

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that a customer will buy either a newspaper or a magazine but not both.

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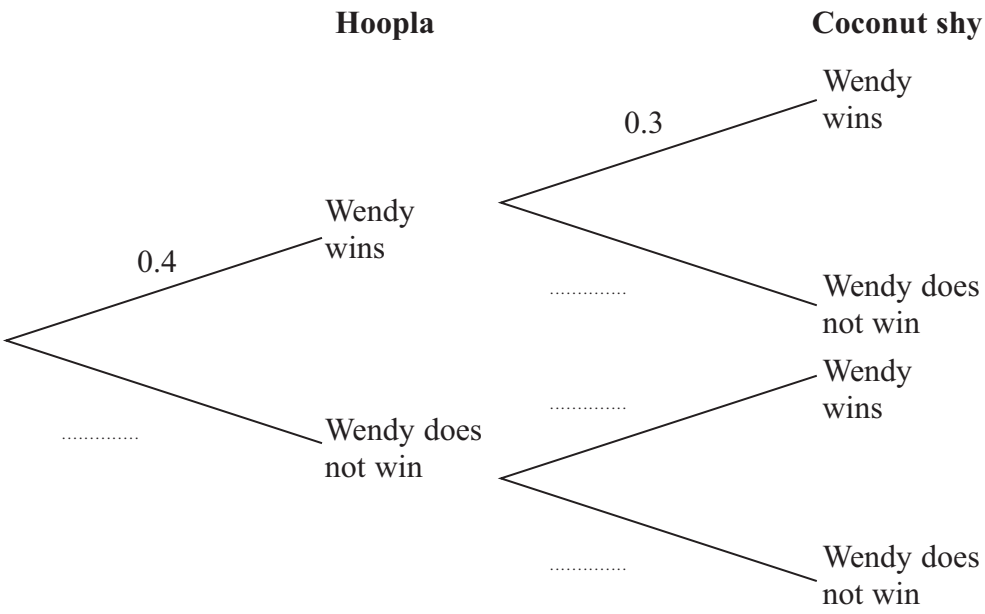
(3)

(Total for Question 9 is 5 marks)

19 Wendy goes to a fun fair.
She has one go at Hoopla.
She has one go on the Coconut shy.

The probability that she wins at Hoopla is 0.4
The probability that she wins on the Coconut shy is 0.3

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that Wendy wins at Hoopla and also wins on the Coconut shy.

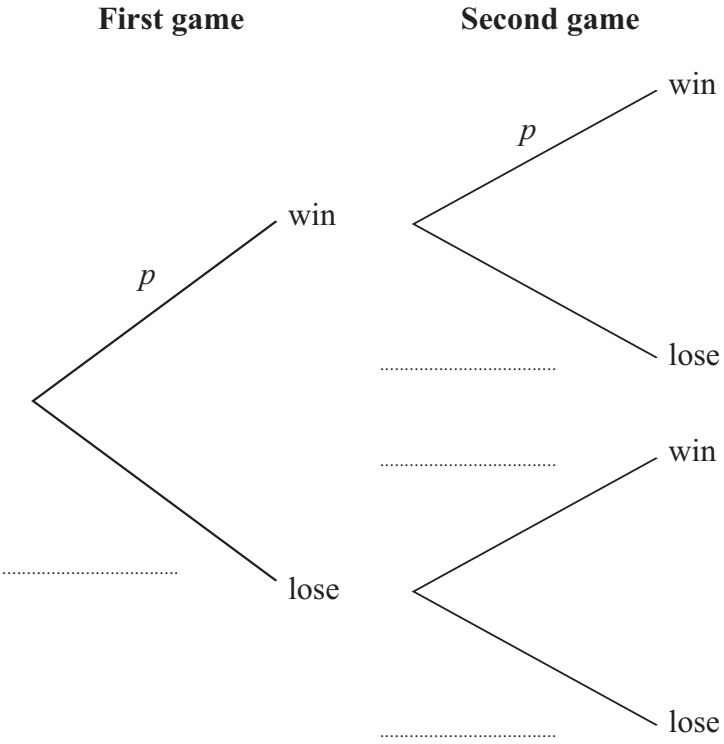
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(2)

(Total for Question 19 is 4 marks)

12 The probability that Rebecca will win any game of snooker is p.
She plays two games of snooker.

(a) Complete, in terms of p, the probability tree diagram.



(2)

(b) Write down an expression, in terms of p, for the probability that Rebecca will win both games.

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(1)

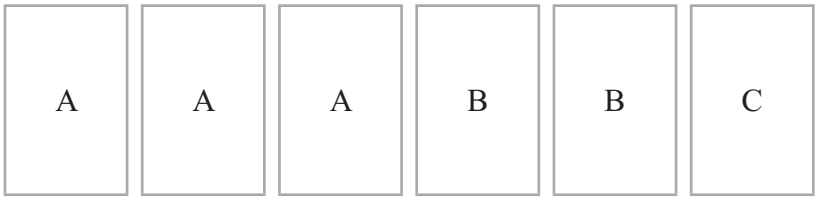
(c) Write down an expression, in terms of p, for the probability that Rebecca will win exactly one of the games.

.....

(2)

(Total for Question 12 is 5 marks)

14 Here are some cards.
Each card has a letter on it.



Rachel takes at random two of these cards.

Work out the probability that there are different letters on the two cards.

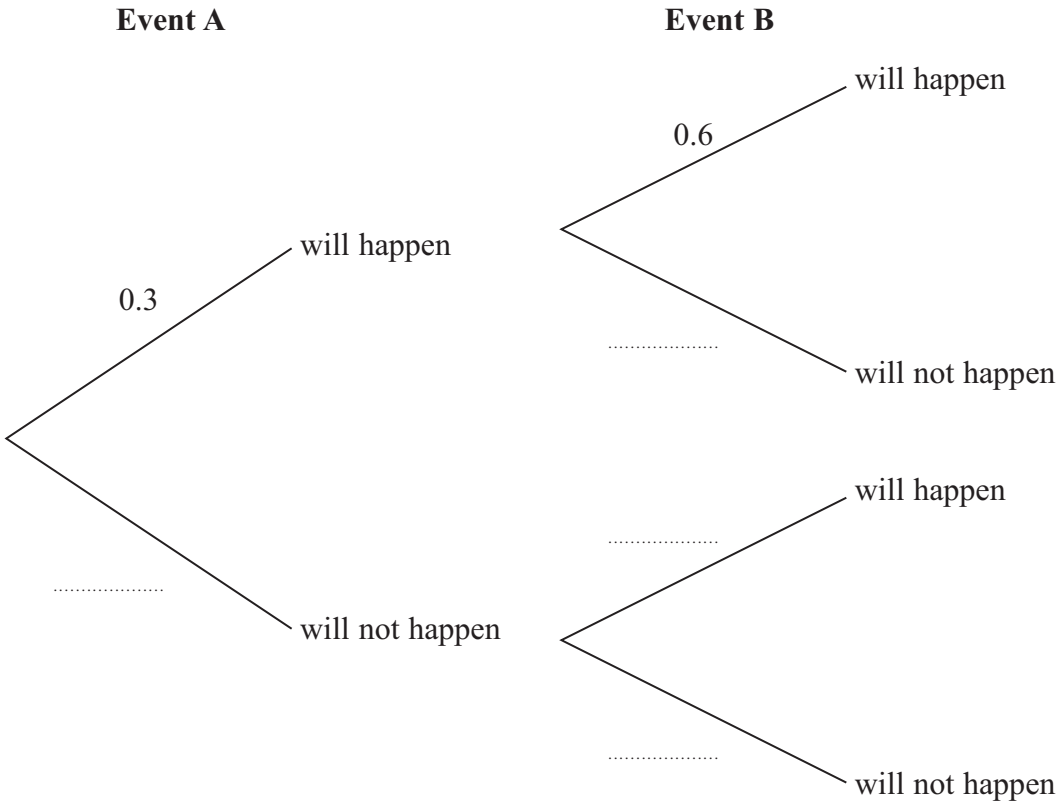
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(Total for Question 14 is 4 marks)

13 Event A and event B are independent events.

The probability that event A will happen is 0.3
The probability that event B will happen is 0.6

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that either event A will happen or event B will happen but not both.

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(2)

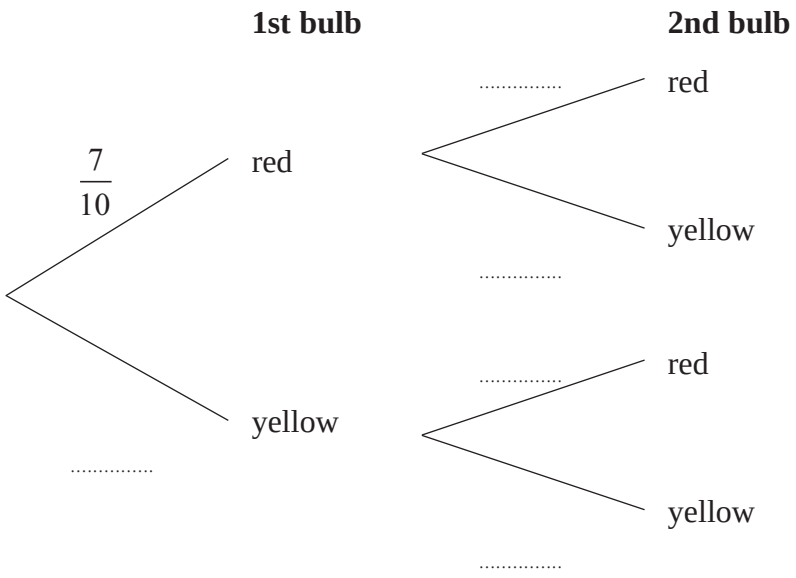
(Total for Question 13 is 4 marks)

23 Yvonne has 10 tulip bulbs in a bag.

7 of the tulip bulbs will grow into red tulips.
3 of the tulip bulbs will grow into yellow tulips.

Yvonne takes at random two tulip bulbs from the bag.
She plants the bulbs.

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that at least one of the bulbs will grow into a yellow tulip.

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(3)

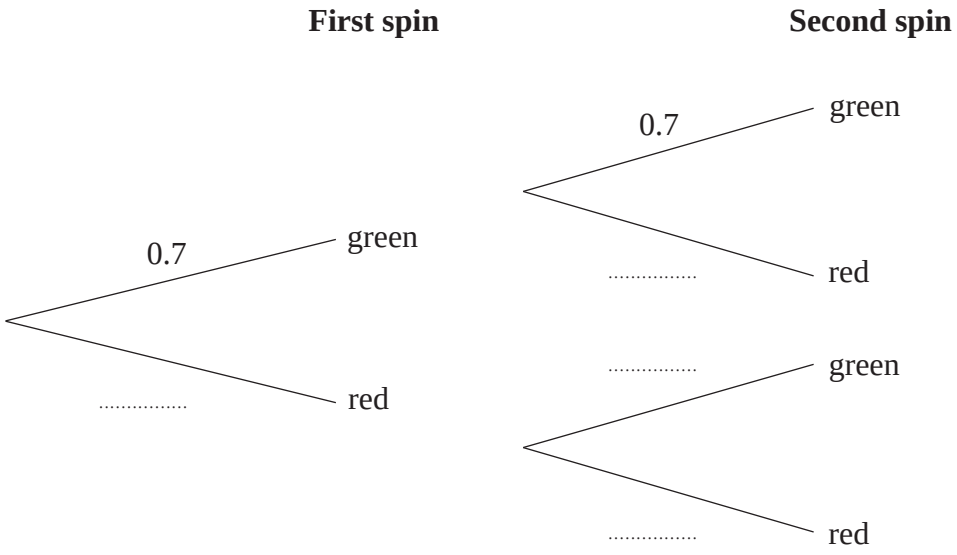
(Total for Question 23 is 5 marks)

19 Louise makes a spinner.

The spinner can land on green or on red.
The probability that the spinner will land on green is 0.7

Louise spins the spinner twice.

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that the spinner lands on two different colours.

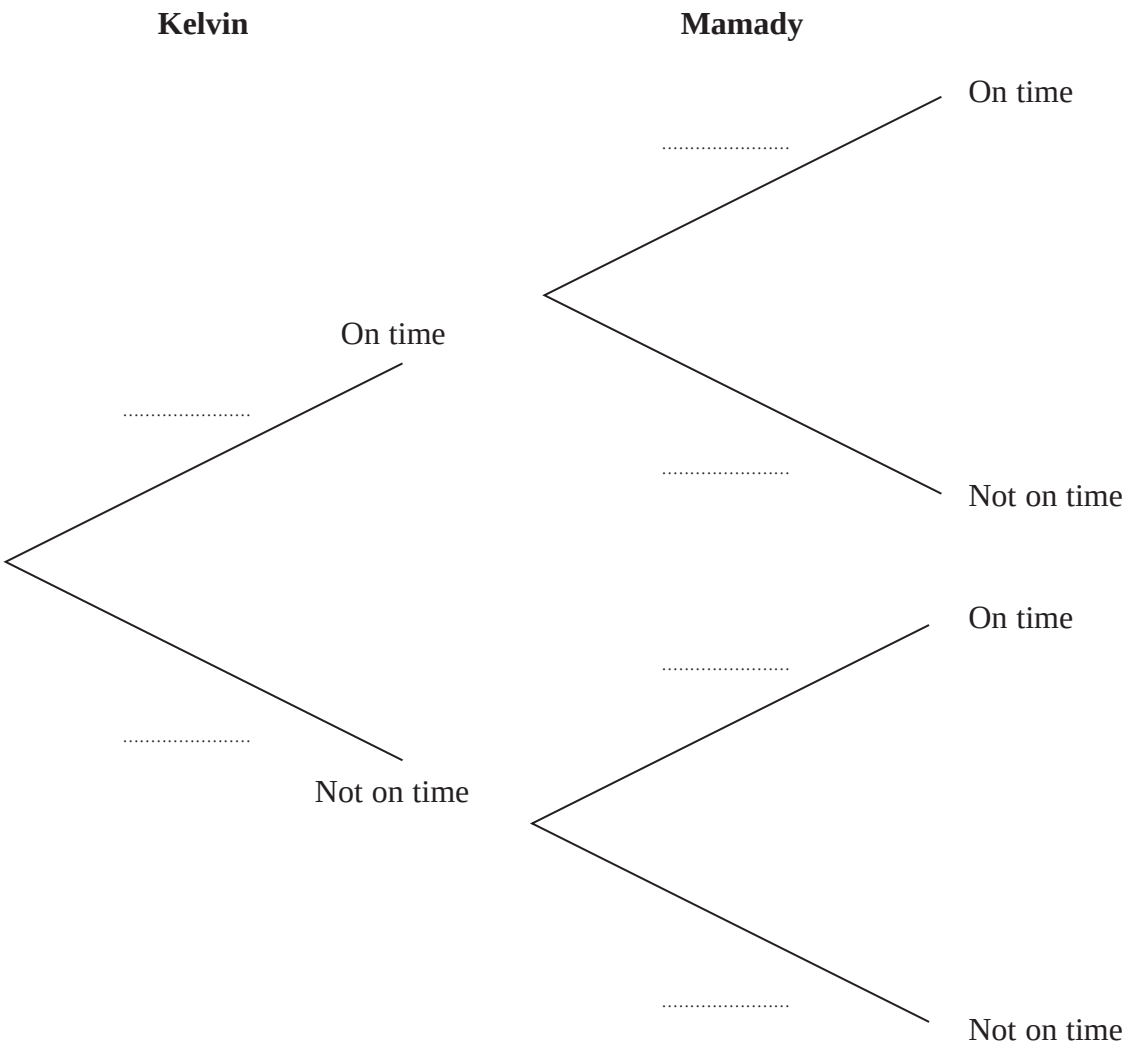
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(3)

(Total for Question 19 is 5 marks)

8 Kelvin and Mamady are in the same class.
The probability that Kelvin arrives on time is 0.7
The probability that Mamady arrives on time is 0.9

Complete the probability tree diagram.



(Total for Question 8 is 2 marks)

15 These 6 coins are in a box.

10p	10p	10p	20p	20p	50p

Pritesh takes at random 2 coins from the box.

Work out the probability that the total value of the 2 coins is at least 40p.

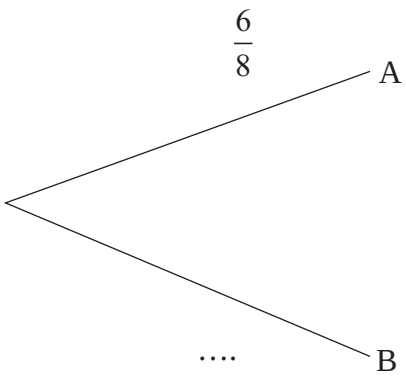
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(Total for Question 15 is 4 marks)

12 There are 8 counters in a box.
The letter A is on 6 of the counters.
The letter B is on the other 2 counters.

Sally takes at random a counter from the box.
She keeps the counter.
Then Tina takes at random a counter from the box.

(a) Complete the probability tree diagram.



(3)

(b) Work out the probability that both Sally and Tina take a counter with the letter A on it.

.....

(2)

(c) Work out the probability that at least one counter with the letter A on it is taken.

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(3)

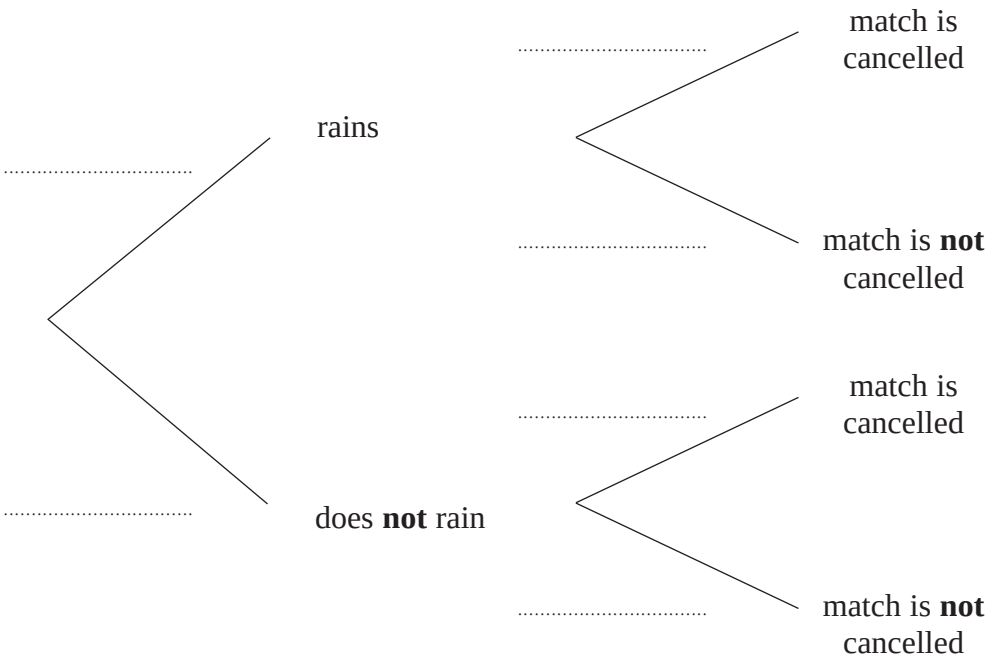
(Total for Question 12 is 8 marks)

21 The probability that it will rain on a day in June is 0.2

When it rains the probability that my tennis match is cancelled is 0.7

When it does **not** rain, the probability that my tennis match is **not** cancelled is 0.95

(a) Complete the probability tree diagram for this information.



(3)

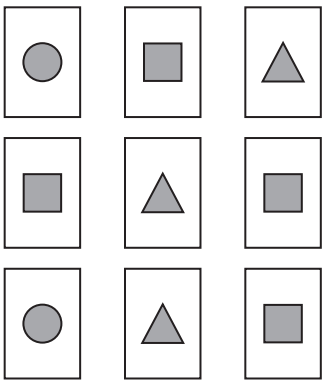
(b) Work out the probability that, on a day in June, it does **not** rain and my tennis match is cancelled.

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(2)

(Total for Question 21 is 5 marks)

25 Here are 9 cards.
Each card has a shape on it.



In a game the cards are turned over so that the shapes are hidden.
The cards are then mixed up.

Katie turns over at random two of the cards.

Work out the probability that these two cards have different shapes on them.
You must show all your working.

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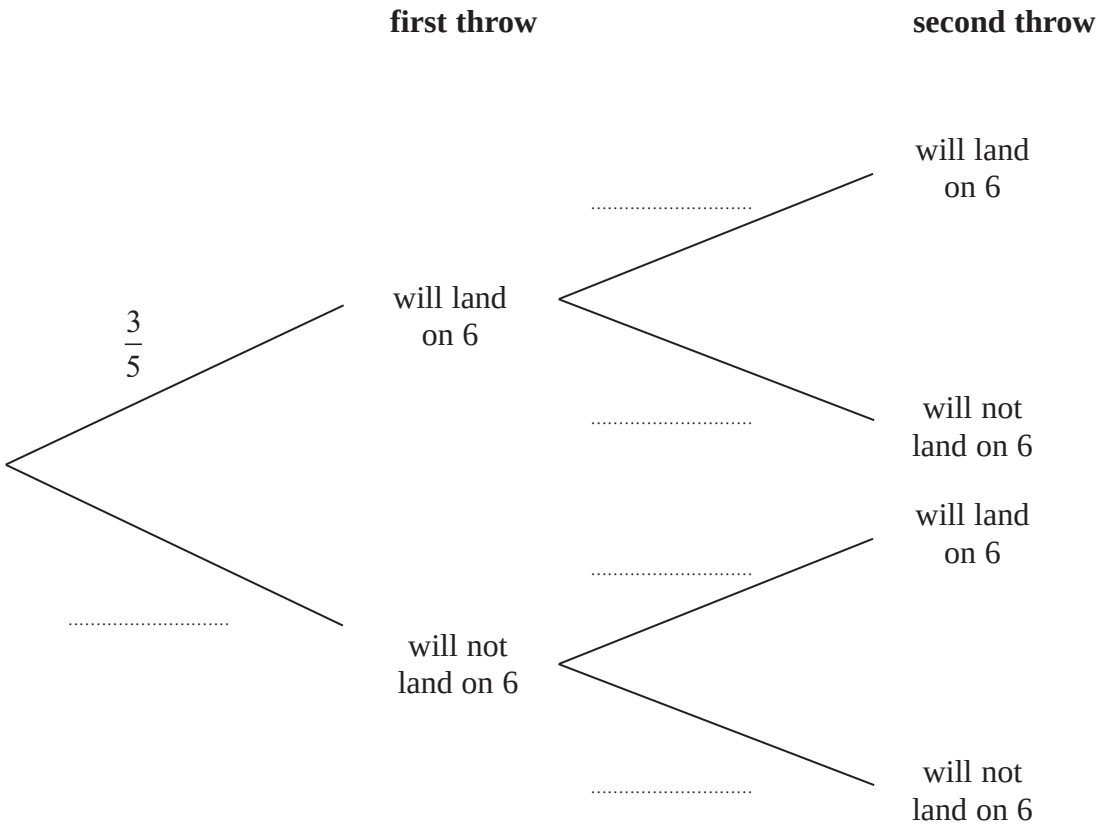
(Total for Question 25 is 4 marks)

13 Seb has a biased dice.

When the dice is thrown once, the probability that it will land on 6 is $\frac{3}{5}$

Seb is going to throw the dice twice.

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that the dice will land on 6 on the first throw and will **not** land on 6 on the second throw.

.....

(2)

(Total for Question 13 is 4 marks)

23 There are 7 blue counters, 3 green counters and 1 red counter in a bag.
There are no other counters in the bag.

Hubert takes at random 2 counters from the bag.

(a) Work out the probability that both counters are blue.

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(3)

(b) Work out the probability that the 2 counters are different colours.

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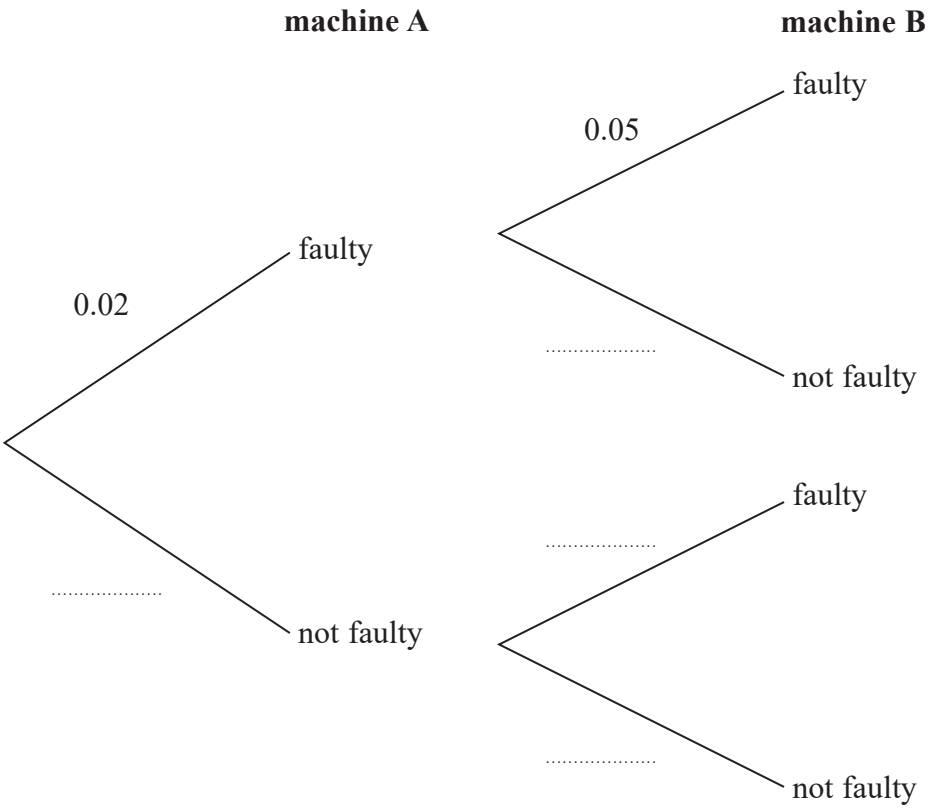
(3)

(Total for Question 23 is 6 marks)

19 Machine A and machine B make bottles.

The probability that a bottle made by machine A is faulty is 0.02
The probability that a bottle made by machine B is faulty is 0.05

(a) Complete the probability tree diagram.



(2)

Shazia takes at random one bottle made by machine A and one bottle made by machine B.

(b) Work out the probability that at least one of these bottles is faulty.

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(3)

(Total for Question 19 is 5 marks)

Question 27

17 There are 9 counters in a bag.

7 of the counters are green.
2 of the counters are blue.

Ria takes at random two counters from the bag.

Work out the probability that Ria takes one counter of each colour.
You must show your working.

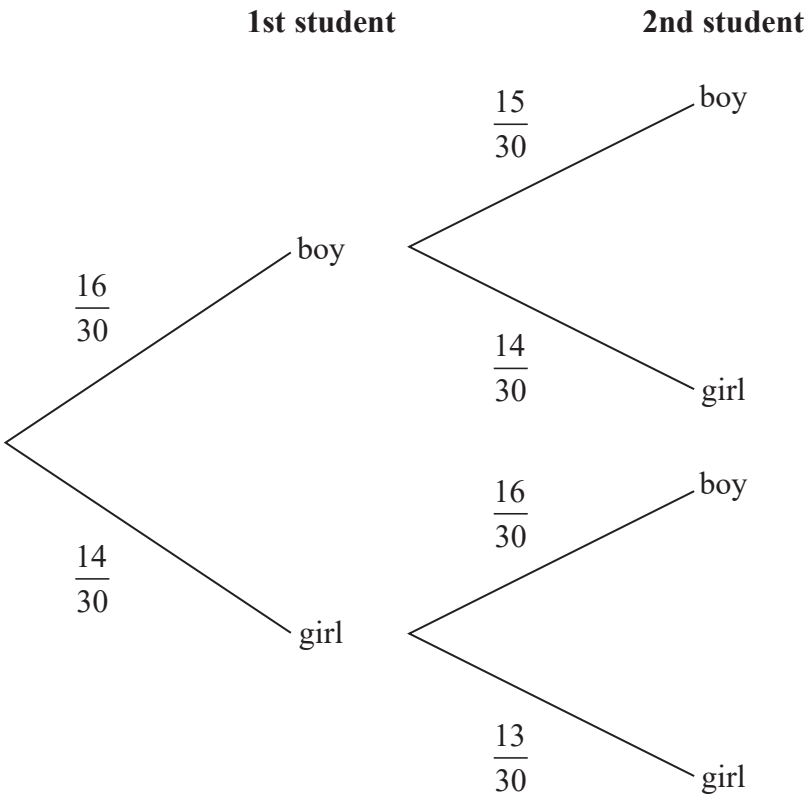
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(Total for Question 17 is 4 marks)

12 There are 30 students in Mr Lear's class.
16 of the students are boys.

Two students from the class are chosen at random.

Mr Lear draws this probability tree diagram for this information.



(a) Write down **one** thing that is wrong with the probabilities in the probability tree diagram.

.....

.....

(1)

Owen and Wasim play for the school football team.

The probability that Owen will score a goal in the next match is 0.4
The probability that Wasim will score a goal in the next match is 0.25

Mr Slater says,

"The probability that both boys will score a goal in the next match is 0.4 + 0.25"

(b) Is Mr Slater right?
Give a reason for your answer.

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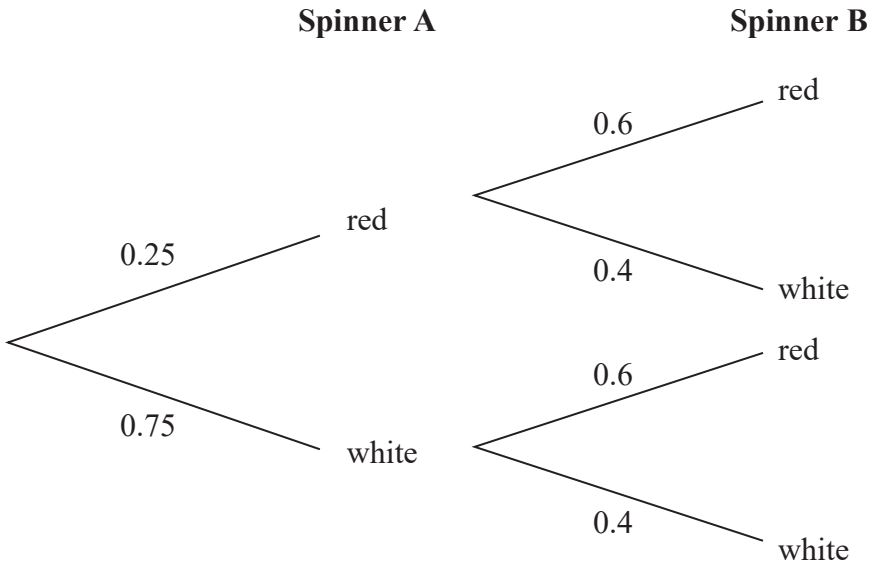
(1)

(Total for Question 12 is 2 marks)

12 Alan has two spinners, spinner **A** and spinner **B**.
Each spinner can land on only red or white.

The probability that spinner **A** will land on red is 0.25
The probability that spinner **B** will land on red is 0.6

The probability tree diagram shows this information.



Alan spins spinner **A** once and he spins spinner **B** once.
He does this a number of times.

The number of times **both** spinners land on red is 24

Work out an estimate for the number of times **both** spinners land on white.

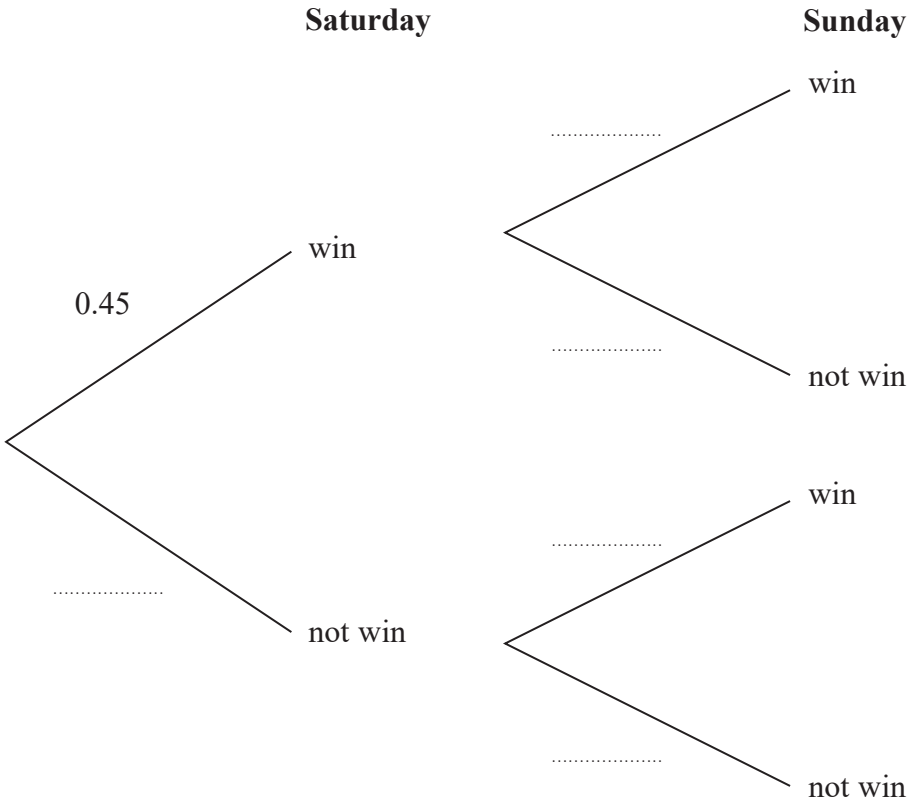
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(Total for Question 12 is 3 marks)

15 A darts team is going to play a match on Saturday and on Sunday.
The probability that the team will win on Saturday is 0.45

If they win on Saturday, the probability that they will win on Sunday is 0.67
If they do **not** win on Saturday, the probability that they will win on Sunday is 0.35

(a) Complete the probability tree diagram.



(2)

(b) Find the probability that the team will win exactly one of the two matches.

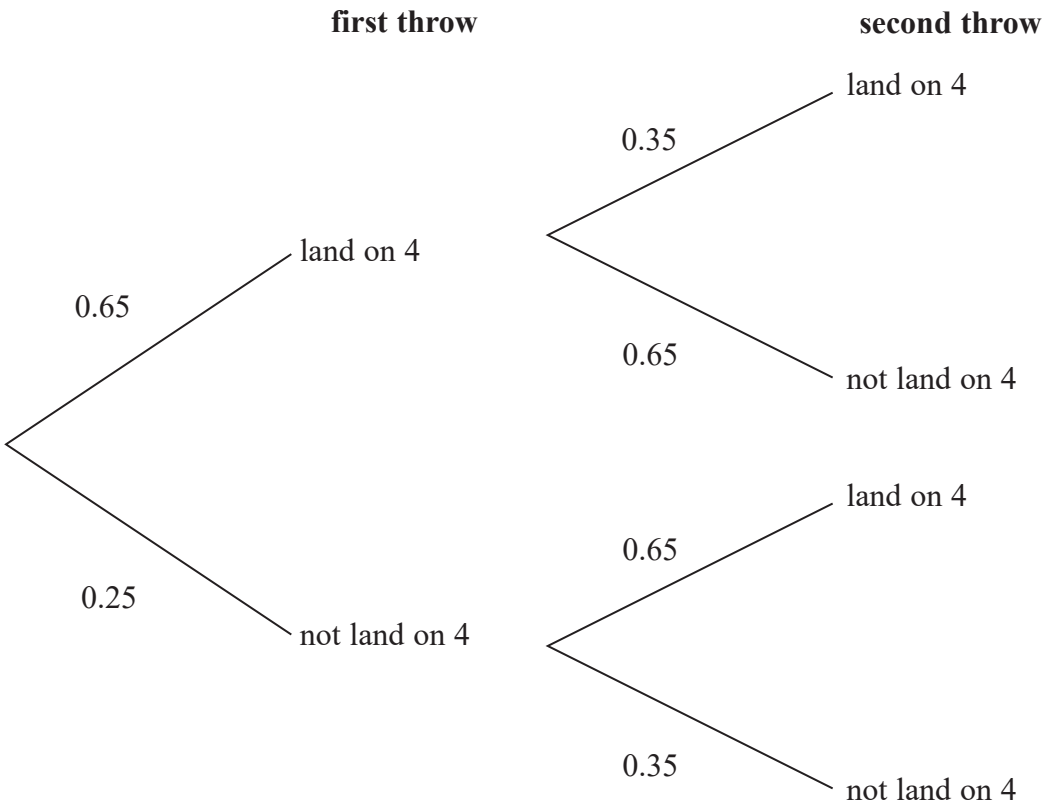
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(3)

(Total for Question 15 is 5 marks)

4 When a biased 6-sided dice is thrown once, the probability that it will land on 4 is 0.65
The biased dice is thrown twice.

Amir draws this probability tree diagram.
The diagram is **not** correct.



Write down **two** things that are wrong with the probability tree diagram.

1 .....

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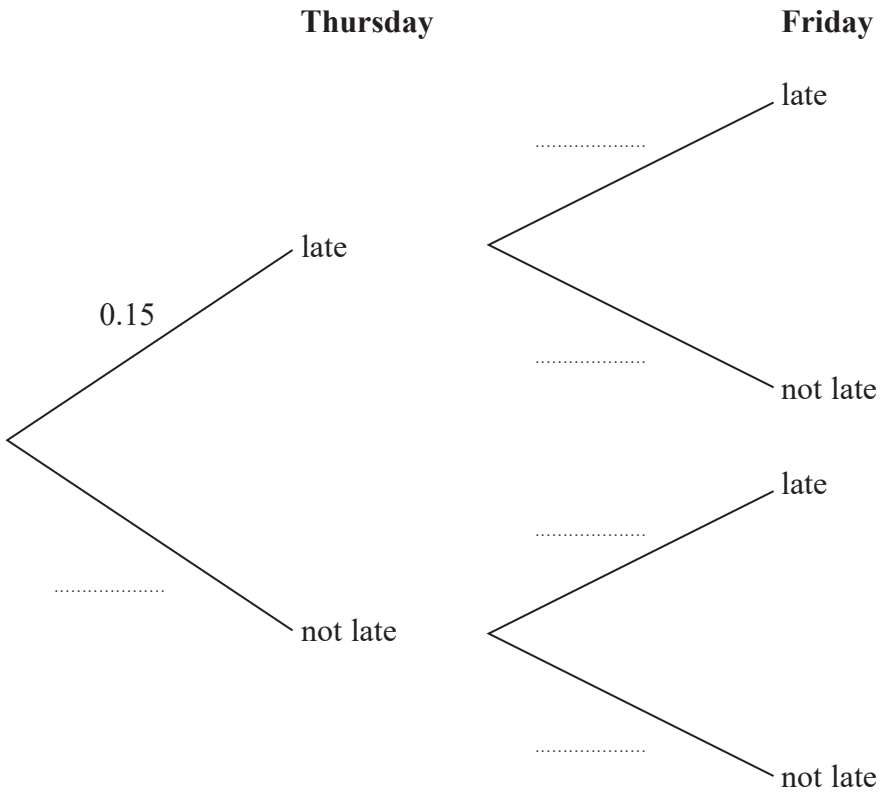
2 .....

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(Total for Question 4 is 2 marks)

10 Mary travels to work by train every day.
The probability that her train will be late on any day is 0.15

(a) Complete the probability tree diagram for Thursday and Friday.



(2)

(b) Work out the probability that her train will be late on at least one of these two days.

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(3)

(Total for Question 10 is 5 marks)

16 Marek has 9 cards.
There is a number on each card.

1	2	3	4	5	6	7	8	9

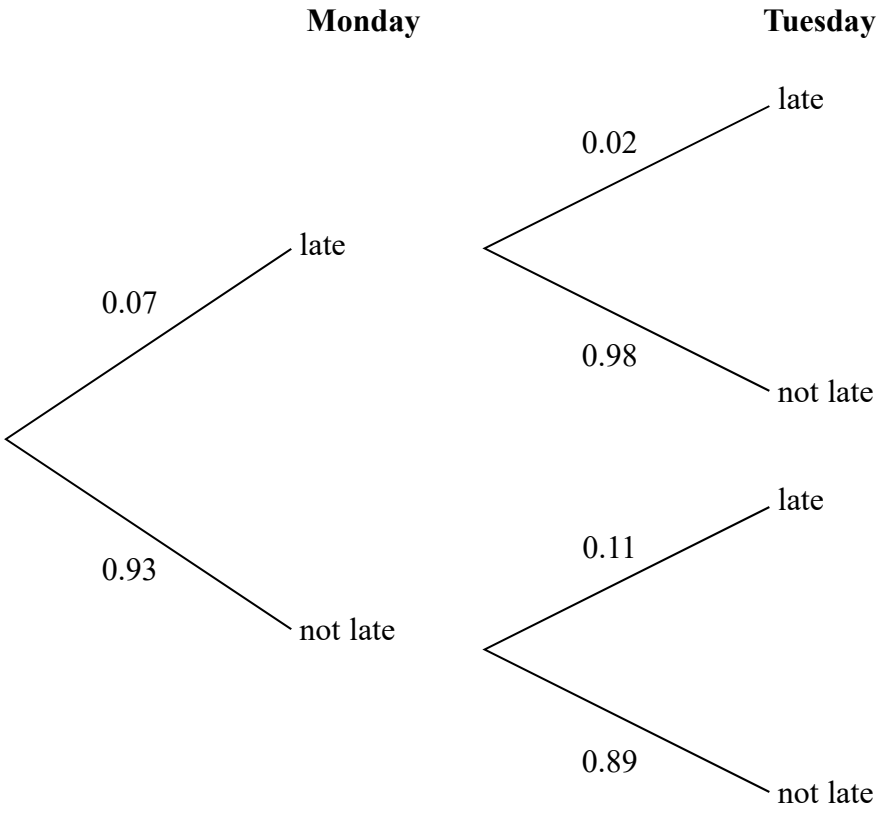
Marek takes at random two of the cards.
He works out the product of the numbers on the two cards.

Work out the probability that the product is an even number.

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(Total for Question 16 is 3 marks)

11 The probability tree diagram shows the probabilities that Bismah will be late for work on two days next week.

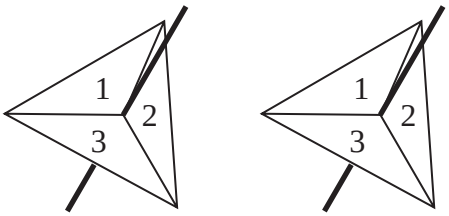


Calculate the probability that Bismah will be late on exactly one of the two days.

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(Total for Question 11 is 3 marks)

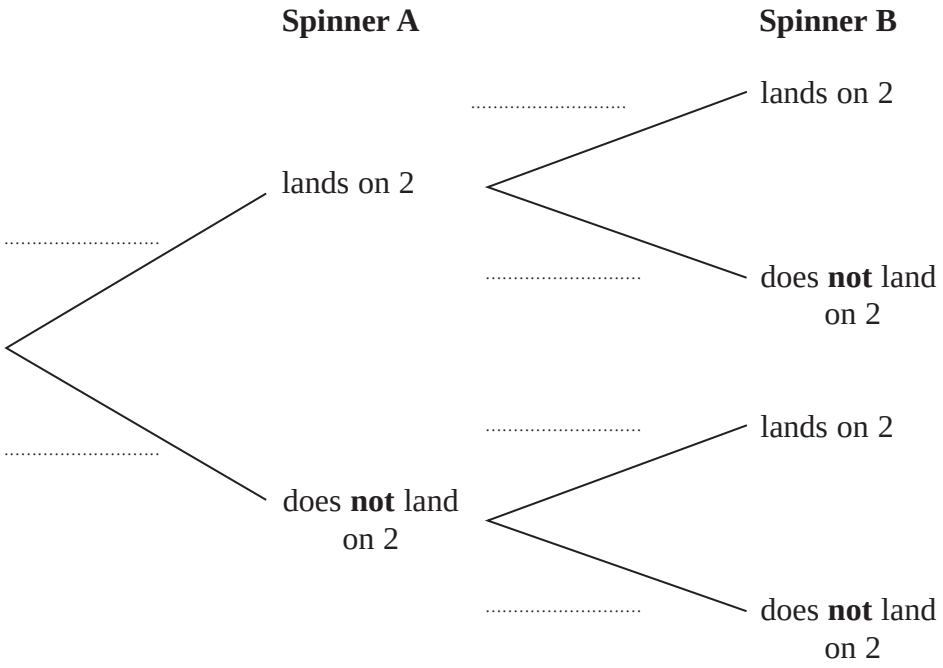
5 Amanda has two fair 3-sided spinners.



Spinner A **Spinner B**

Amanda spins each spinner once.

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that Spinner A lands on 2 and Spinner B does **not** land on 2

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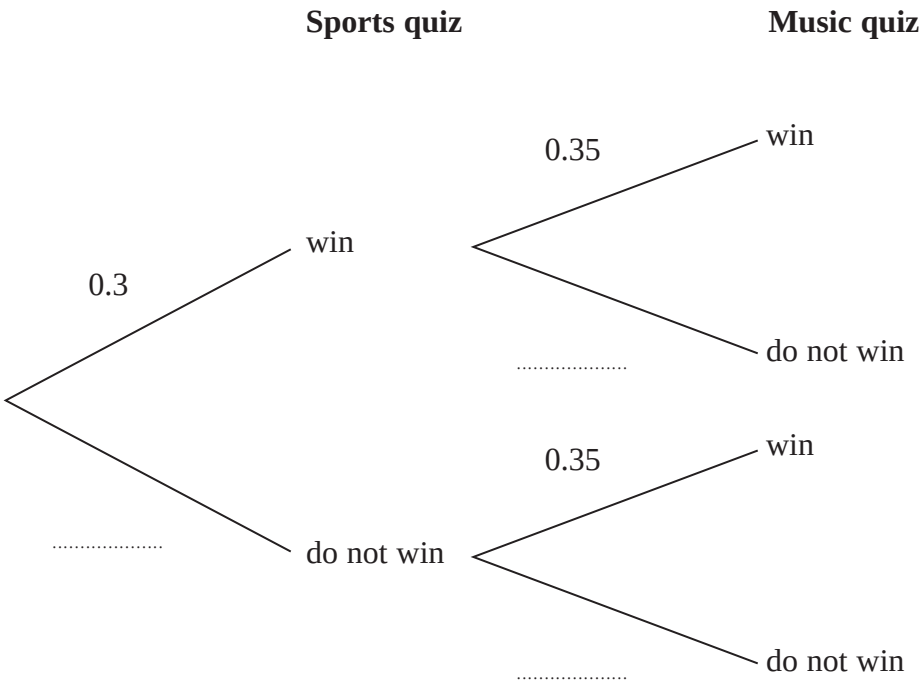
(2)

(Total for Question 5 is 4 marks)

6 One weekend the Keddie family is going to do a sports quiz and a music quiz.

The probability that the family will win the sports quiz is 0.3
The probability that the family will win the music quiz is 0.35

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that the Keddie family will win both the sports quiz and the music quiz.

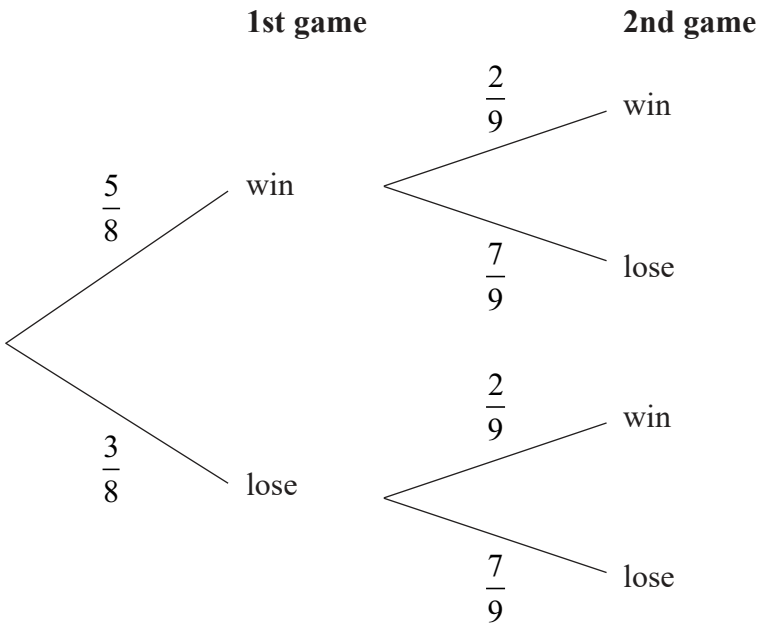
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(2)

(Total for Question 6 is 4 marks)

12 Martha plays a game twice.

The probability tree diagram shows the probabilities that Martha will win or lose each game.



Find the probability that Martha will lose at least one game.

.....

(Total for Question 12 is 3 marks)

24 There is a total of y counters in a box.

There are x pink counters and 5 blue counters in the box.
The rest of the counters are green.

$$x : y = 1 : 3$$

Freda takes at random two counters from the box.

Find, in terms of x, an expression for the probability that Freda takes two counters of the same colour.

Give your answer as a fraction in the form $\frac{ax^2 + bx + c}{dx^2 + ex}$ where a, b, c, d and e are integers.

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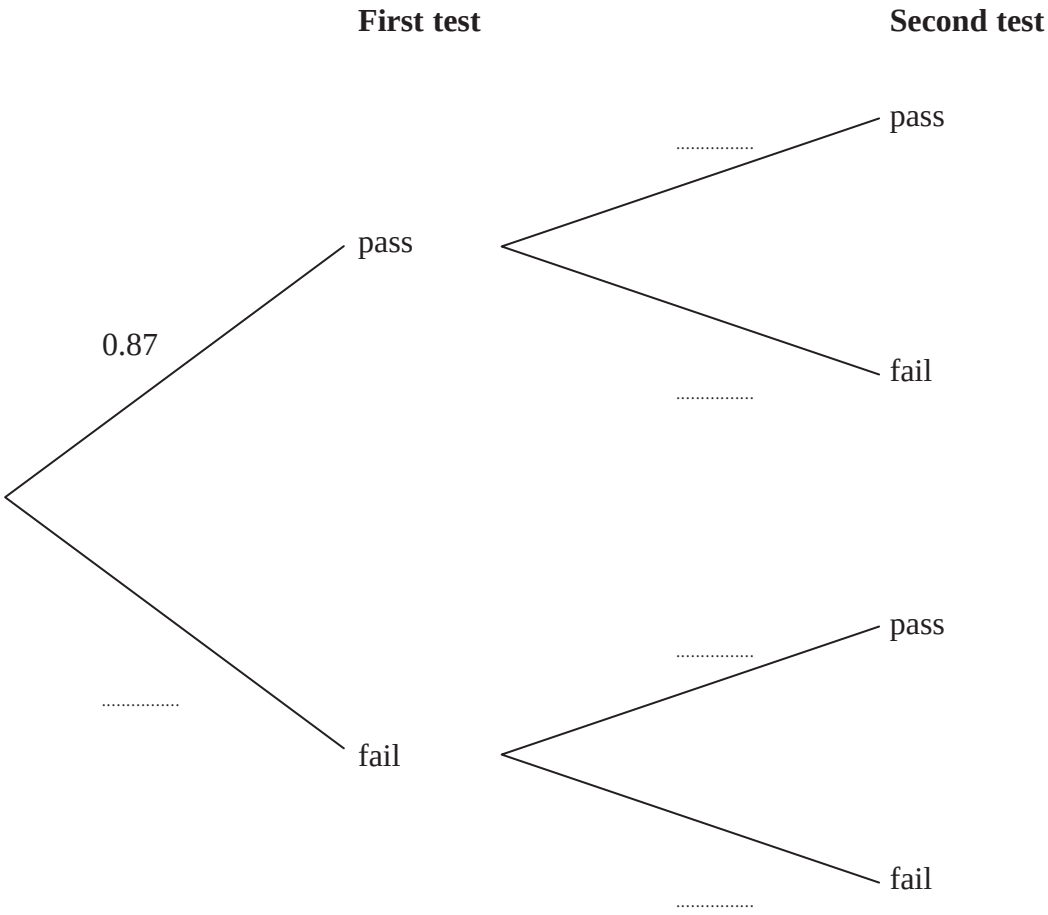
(Total for Question 24 is 5 marks)

10 Shakir has to complete two tests.
He can either pass or fail each test.

The probability that he will pass the first test is 0.87

If he passes the first test the probability he will pass the second test is 0.94
If he fails the first test the probability he will pass the second test is 0.73

(a) Complete the probability tree diagram for this information.



(2)

(b) Work out the probability that Shakir passes at least one of the tests.

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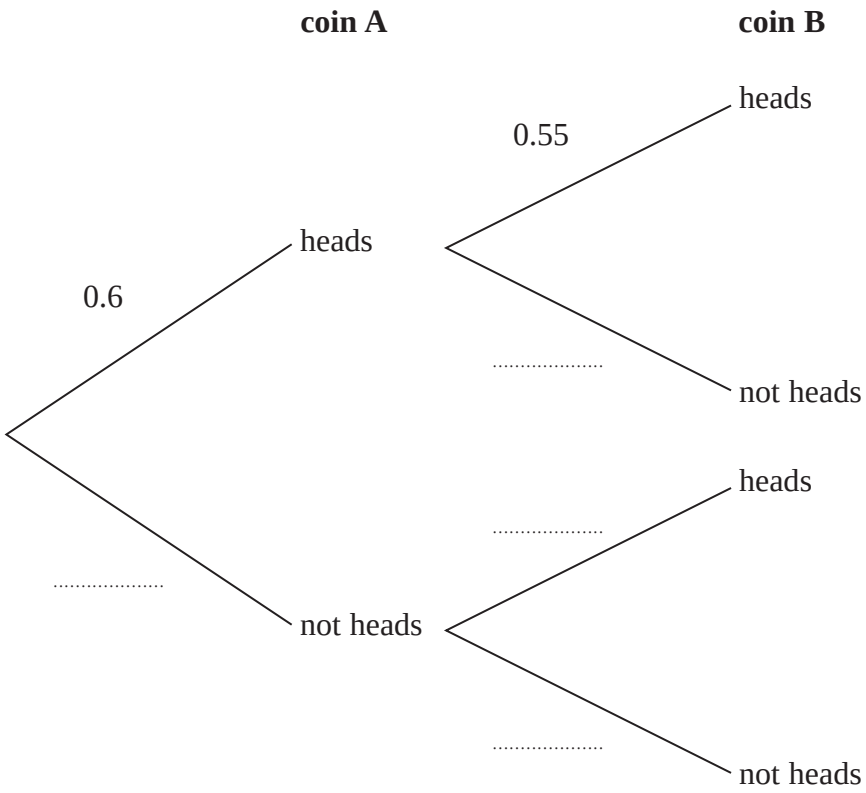
(3)

(Total for Question 10 is 5 marks)

6 Tim has two biased coins, coin **A** and coin **B**.
He is going to throw both coins.

The probability that coin **A** will land on heads is 0.6
The probability that coin **B** will land on heads is 0.55

(a) Complete the probability tree diagram.



(2)

Tim throws coin **A** once and he throws coin **B** once.

(b) Work out the probability that both coins land on heads.

.....

(2)

(Total for Question 6 is 4 marks)

22 There are only red counters and yellow counters in a box.

$\frac{3}{5}$ of the counters are red.

Sophie takes at random two counters from the box.

The probability that the two counters are the same colour is $\frac{41}{80}$

Work out the number of yellow counters in the box.
You must show all your working.

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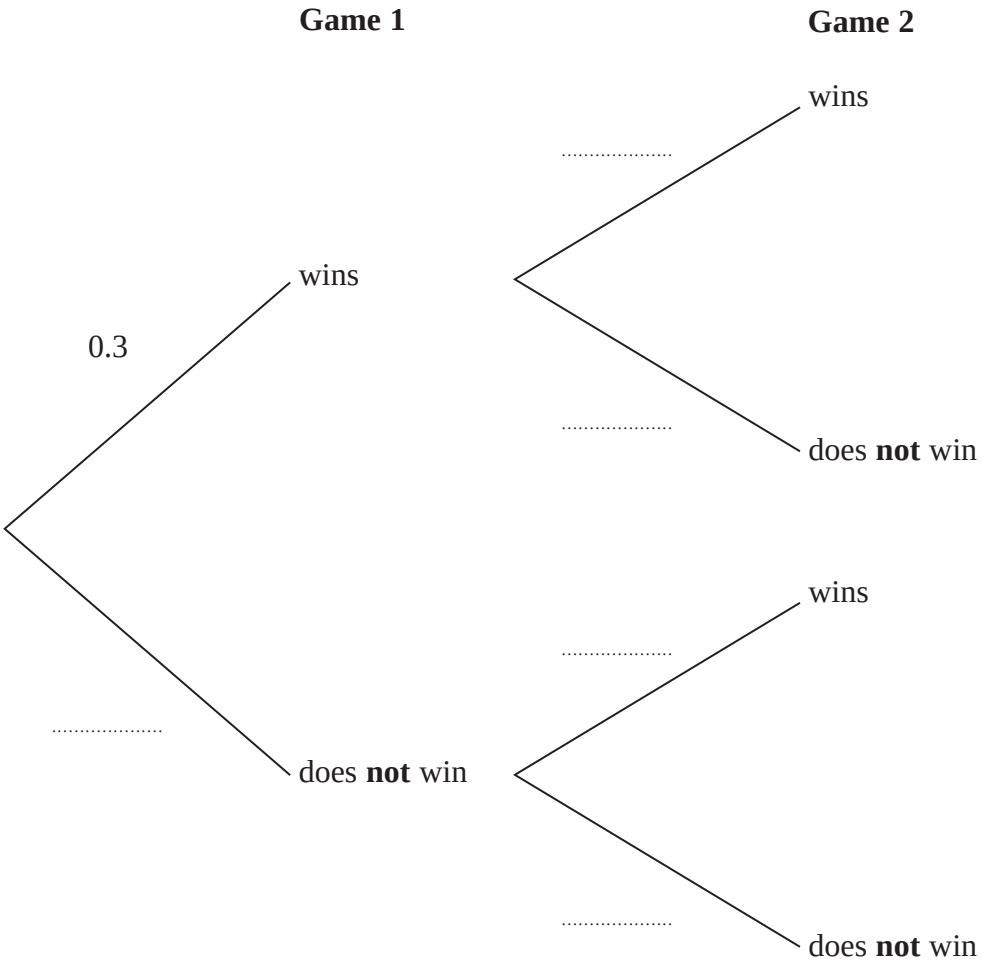
(Total for Question 22 is 5 marks)

4 Dan is playing cards.

The probability that he will win a game of cards is 0.3

Dan plays two games of cards.

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that Dan does **not** win either game.

.....

(2)

(Total for Question 4 is 4 marks)

14 There are nine balls labelled 1 to 9 in a box.

Lee will take at random two balls from the box.

Lee says,

> "The probability that the sum of the numbers on the two balls will be an even number is greater than the probability that the product of the numbers will be an even number."

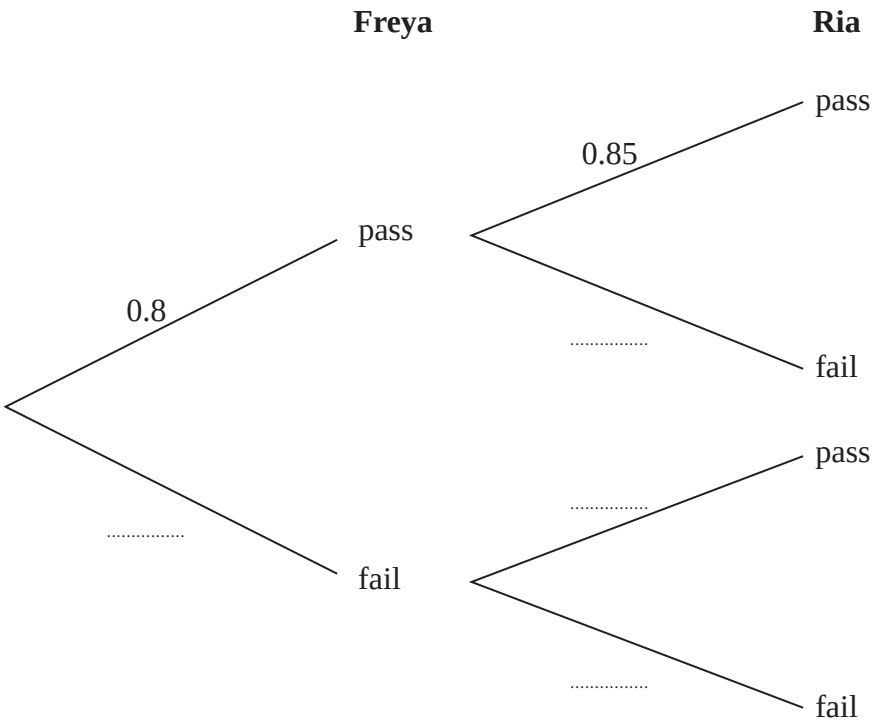
Is Lee correct?
You must show how you get your answer.

(Total for Question 14 is 5 marks)

11 Freya and Ria each do an exam.

The probability that Freya will pass the exam is 0.8
The probability that Ria will pass the exam is 0.85

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that only one of Freya or Ria will pass the exam.

.....

(3)

(Total for Question 11 is 5 marks)