Name	Class

♦ MATHS TEACHER HUB

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Probability tree diagrams

(9 – 1) Topic booklet

Higher

These questions have been collated from previous years GCSE Mathematics papers.

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser.

Total Marks

Instructions
•Use **black** ink or ball-point pen.
•**Fill in the boxes** at the top of this page with your name, centre number and candidate number.
•Answer **all** questions.
•Answer the questions in the spaces provided
 – *there may be more space than you need*.
•Diagrams are NOT accurately drawn, unless otherwise indicated.
•You must **show all your working out.**
•If the question is a **1H** question you are not allowed to use a calculator.
•If the question is a **2H** or a **3H** question, you may use a calculator to help you answer.

Information
•The marks for **each** question are shown in brackets
 – *use this as a guide as to how much time to spend on each question*.

Advice
•Read each question carefully before you start to answer it.
•Keep an eye on the time.
•Try to answer every question.
•Check your answers if you have time at the end.

Answer ALL questions
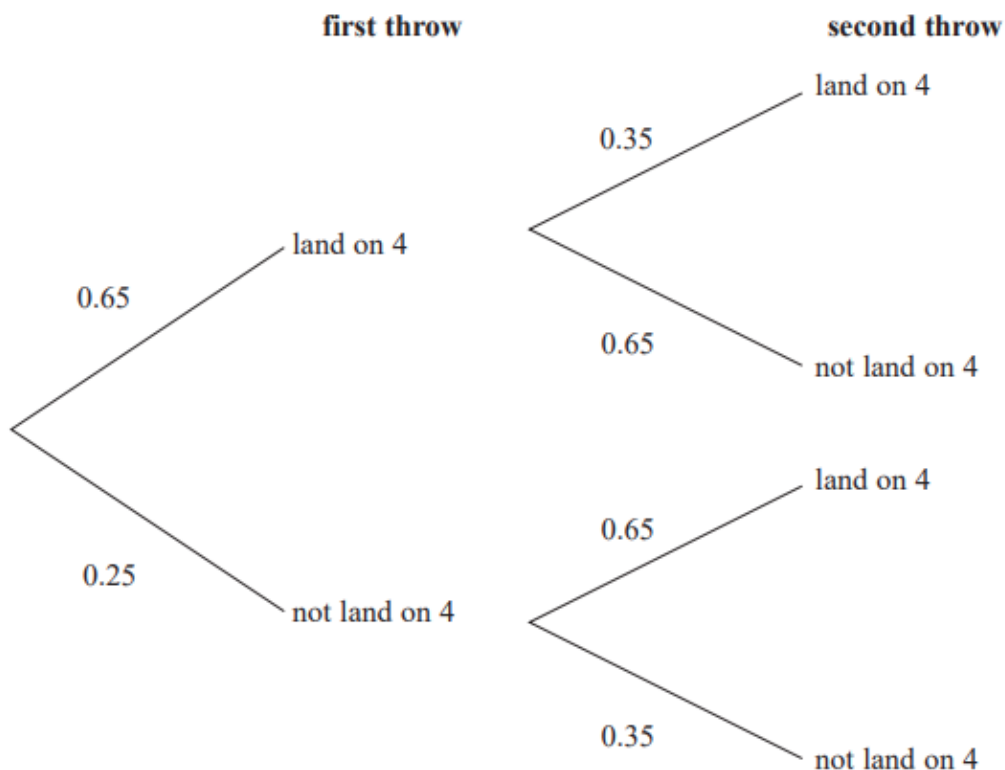**Write your answers in the space provided.**
You must write down all the stages in your working.

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.
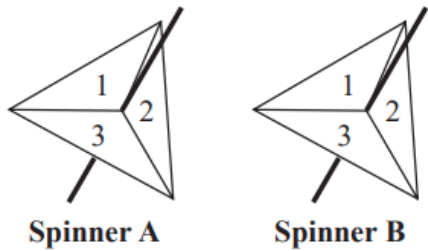   The diagram is **not** correct.

<table>
<tr><td>**first throw**</td><td></td><td>**second throw**</td></tr>
</table>

land on 4

0.35

land on 4

0.65

0.65

not land on 4

land on 4

0.65

0.25

not land on 4

0.35

not land on 4

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

1..

....

2..

....

5 Amanda has two fair 3-sided spinners.

Spinner A   **Spinner B**

Amanda spins each spinner once.

(a) Complete the probability tree diagram.

    Spinner A   Spinner B

                                    ....   lands on 2
                    lands on 2
                                    ....   does **not** land
                                                               on 2
    ....
    ....
                    does **not** land
                    on 2   ....   lands on 2

                                    ....   does **not** land
                                                               on 2

(2)

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

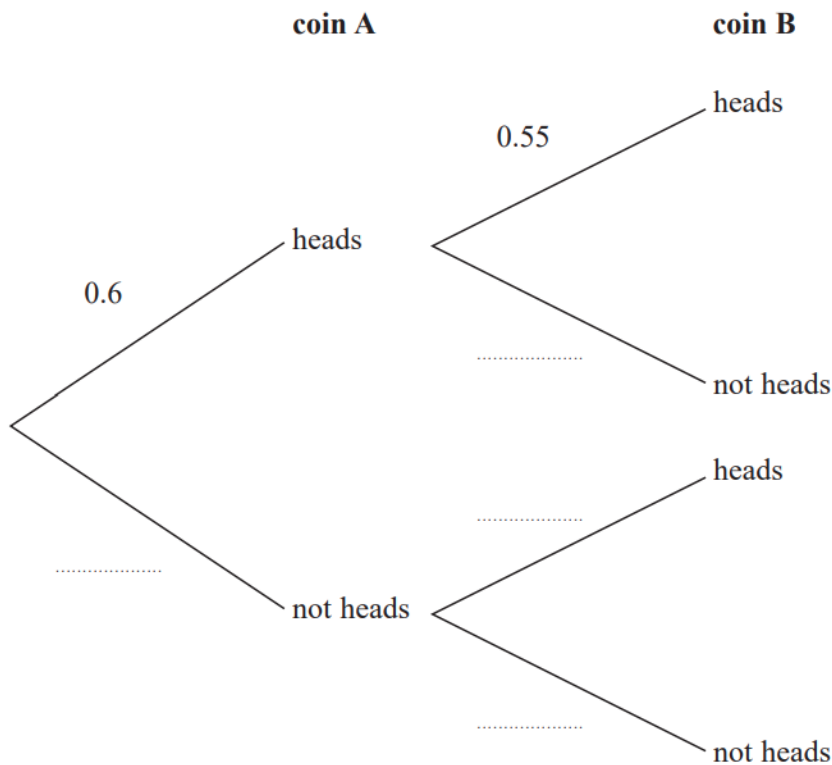...

(2)

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.

coin **A**   coin **B**

(2)

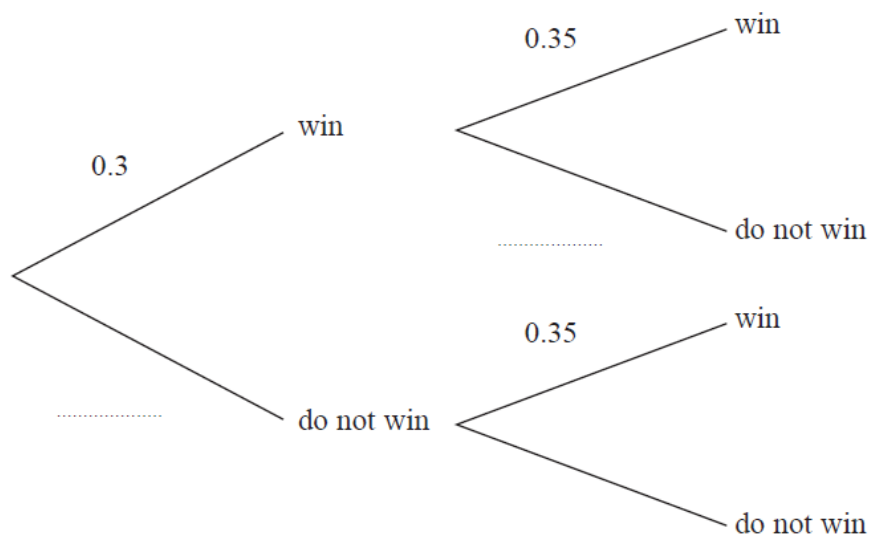Tim throws coin **A** once and he throws coin **B** once.

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

....

(2)

(Total for Question 6 is 4 marks)

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.

Sports quiz   **Music quiz**

```
                                        0.35      win
                              win  ────<
              0.3   ───<            .........  do not win

                                        0.35      win
       ......... ───<  do not win  ───<
                                        .........  do not win
```

(2)

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

....

(2)

(Total for Question 6 is 4 marks)

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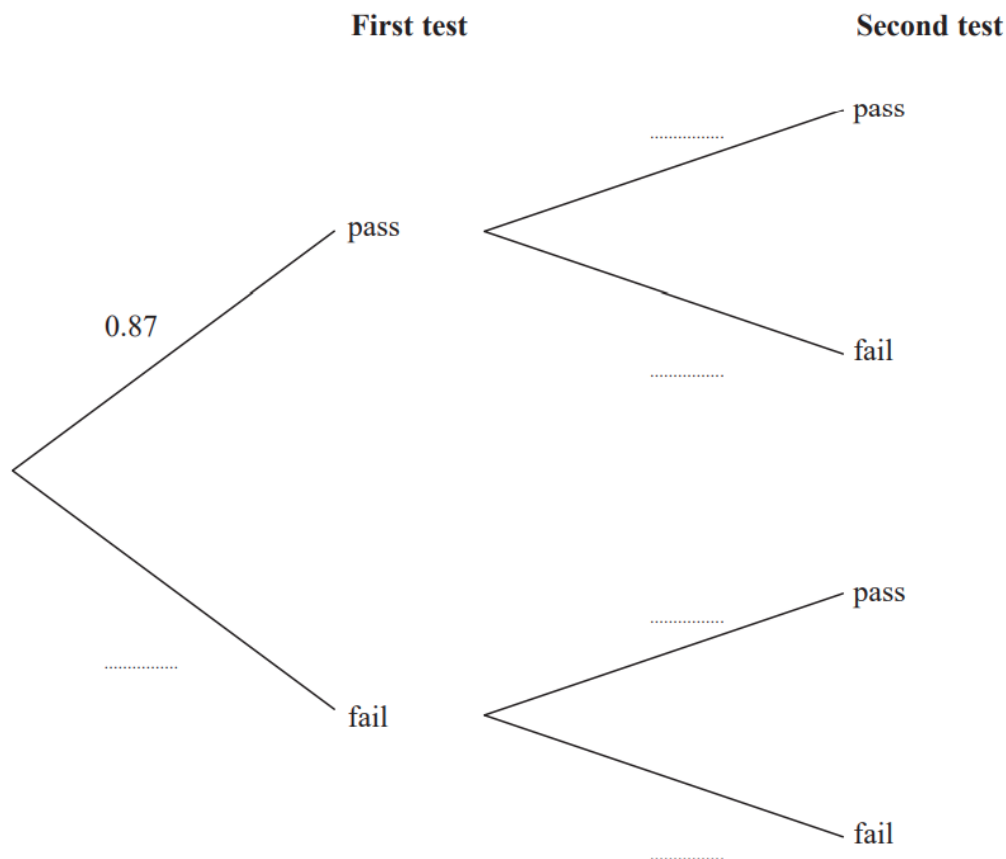He can either pass or fail each test.

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.

First test   **Second test**

                                              pass
                                 ....
                    pass
                      ╱
         0.87
           ╱
                                              fail
                                 ....

                                              pass
                                 ....
         ....
                    fail
                      ╲
                                              fail
                                 ....

(2)

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

....

(3)

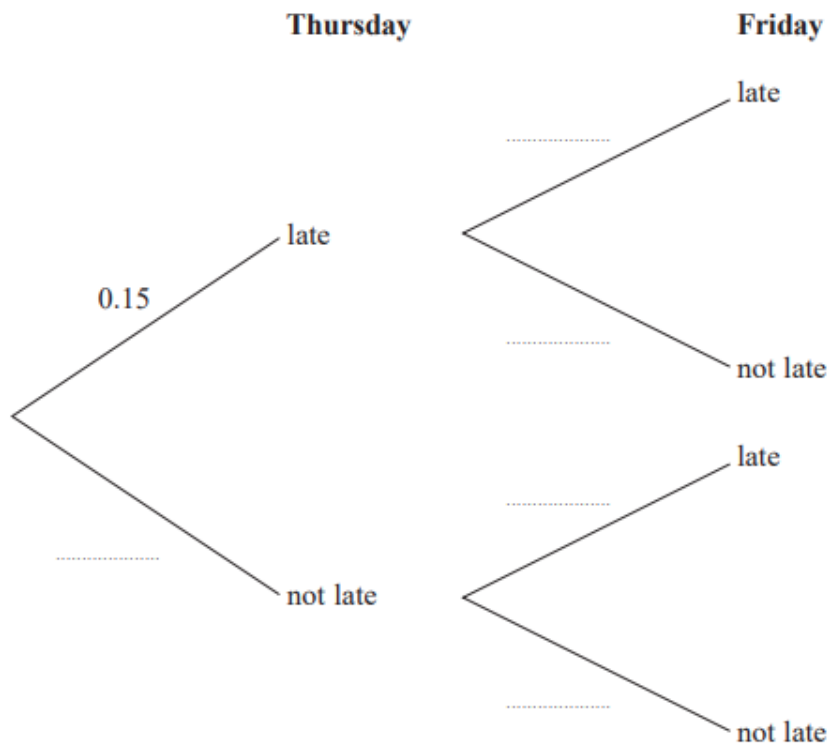**10** Mary travels to work by train every day.
The probability that her train will be late on any day is 0.15

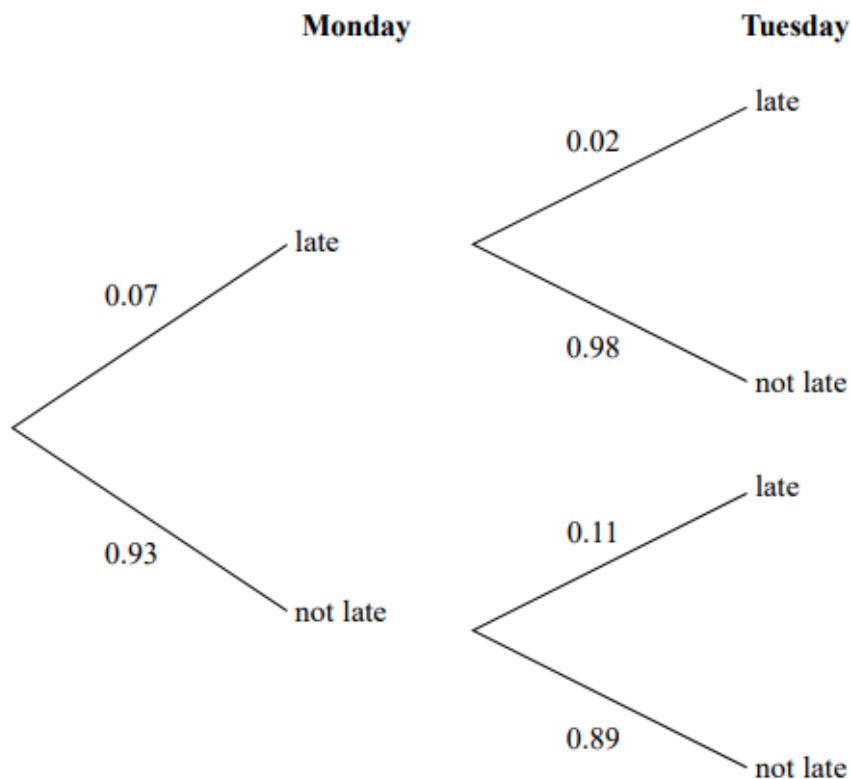(a) Complete the probability tree diagram for Thursday and Friday.

Thursday   **Friday**

.... late

0.15   late

.... not late

.... late

.... not late

.... not late

(2)

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

....

(3)

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

Monday   **Tuesday**
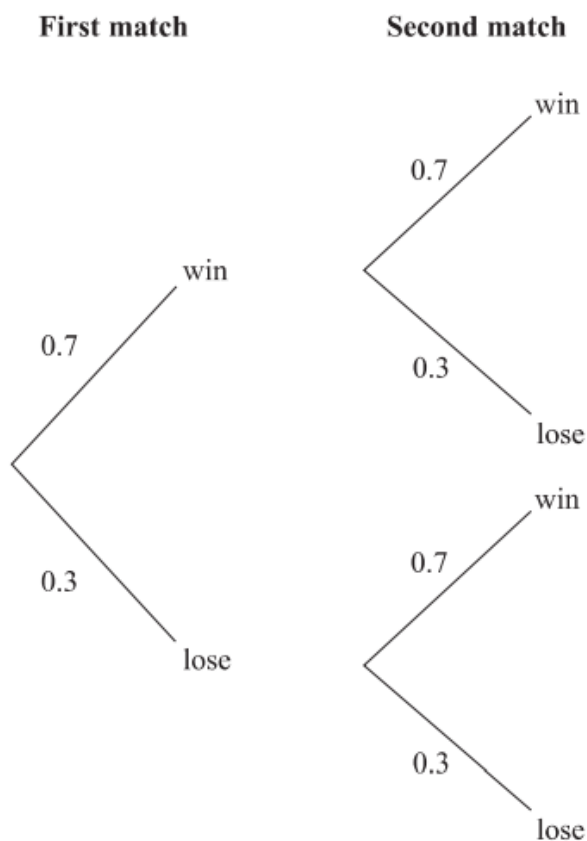
late

0.02

late

0.07

0.98

not late

late

0.11

0.93

not late

0.89

not late

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

(Total for Question 11 is 3 marks)

11 Finlay plays two tennis matches.

The probability that he will win a match and the probability that he will lose a match are shown in the probability tree diagram.

First match   **Second match**

```
                                              win
                                       0.7 /
                          win         /
                    0.7 /            <
                       /         0.3 \
                      /                \
                     <                  lose
                      \
                  0.3  \                 win
                        \          0.7 /
                         lose        /
                                    <
                                0.3 \
                                      \
                                       lose
```

(a) Work out the probability that Finlay wins both matches.

....

(2)

(b) Work out the probability that Finlay loses at least one match.

....

(2)

(Total for Question 11 is 4 marks)

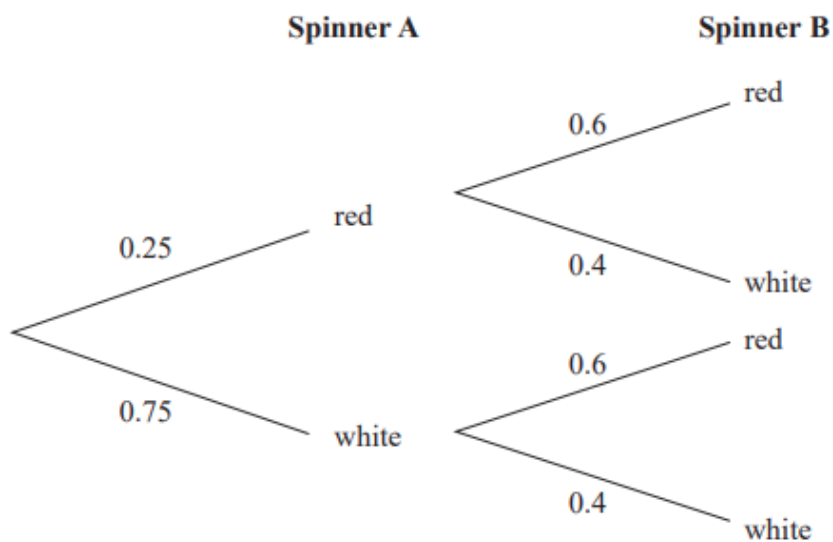**12** Alan has two spinners, spinner **A** and spinner **B**.
Each spinner can land on only red or white.

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.

Spinner A	Spinner B

Alan spins spinner **A** once and he spins spinner **B** once.
He does this a number of times.
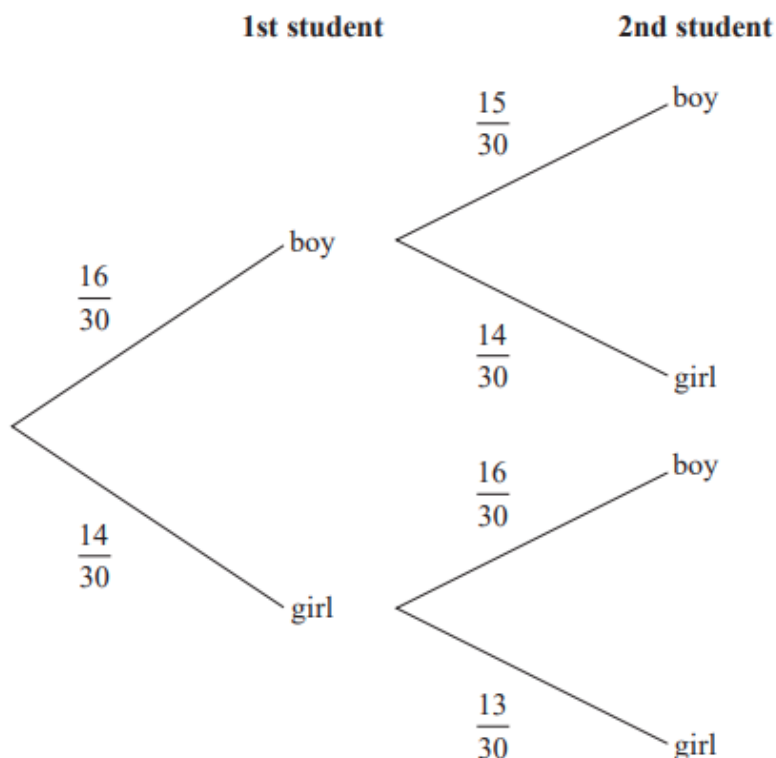
The number of times **both** spinners land on red is 24

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

....

(Total for Question 12 is 3 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.

1st student   2nd student

$\frac{16}{30}$ boy

$\frac{15}{30}$ boy

$\frac{14}{30}$ girl

$\frac{14}{30}$ girl

$\frac{16}{30}$ boy

$\frac{13}{30}$ girl

(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.

....

....

(1)

(Total for Question 12 is 2 marks)

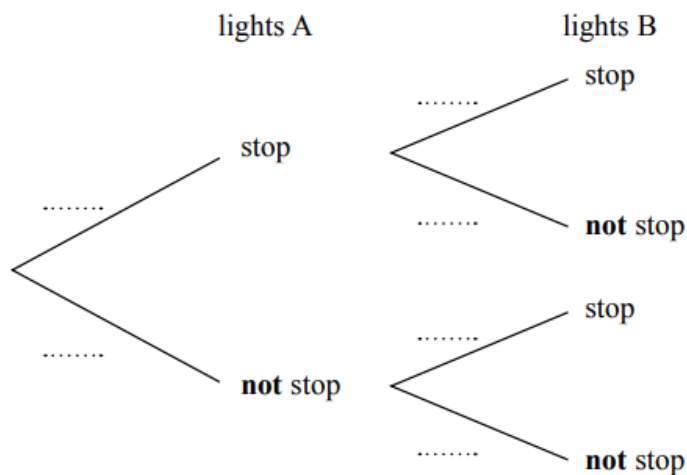**12** A and B are two sets of traffic lights on a road.

The probability that a car is stopped by lights A is 0.4

If a car is stopped by lights A, then the probability that the car is **not** stopped by lights B is 0.7

If a car is **not** stopped by lights A, then the probability that the car is **not** stopped by lights B is 0.2

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

lights A lights B

stop

.... stop

....

.... **not** stop

.... stop

not stop

.... **not** stop

(2)

Mark drove along this road.
He was stopped by just one of the sets of traffic lights.

(b) Is it more likely that he was stopped by lights A or by lights B?
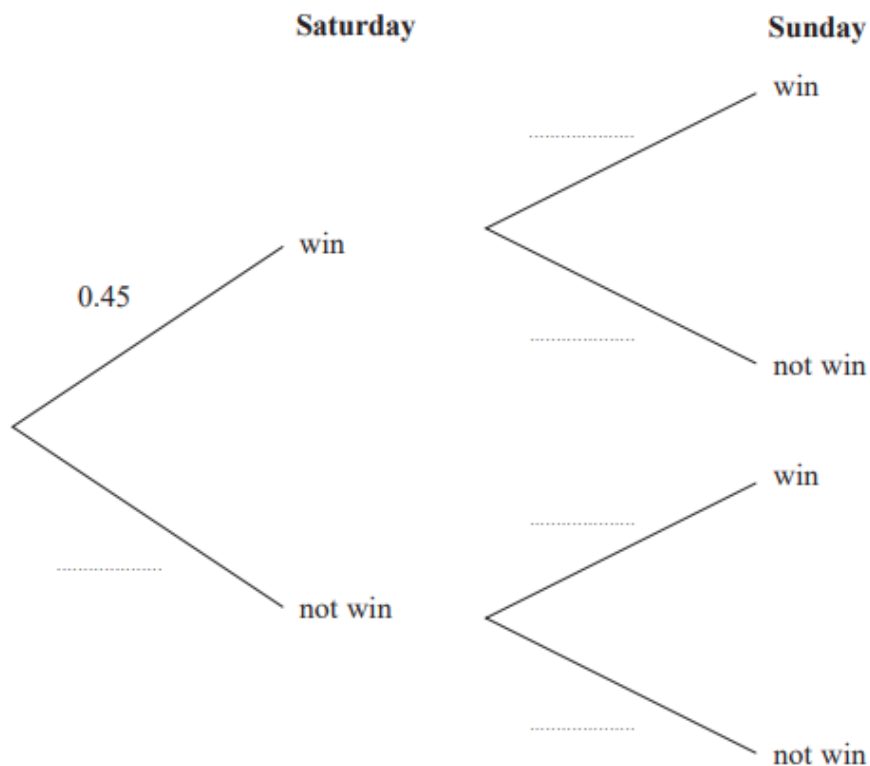You must show your working.

(3)

(Total for Question 12 is 5 marks)

12 Martha plays a game twice.

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

1st game	2nd game

$$\frac{2}{9} \text{ win}$$

win

$$\frac{5}{8}$$

$$\frac{7}{9} \text{ lose}$$

$$\frac{2}{9} \text{ win}$$

$$\frac{3}{8}$$

lose

$$\frac{7}{9} \text{ lose}$$

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

(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.

Saturday   **Sunday**

                win

0.45   win

             not win

            win

   not win

            not win

(2)

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

....

(3)

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.

18 There are only 4 red counters, 3 yellow counters and 1 green counter in a bag.

Tony takes at random three counters from the bag.

Work out the probability that there are now more yellow counters than red counters in the bag.
You must show all your working.

....

(Total for Question 18 is 5 marks)

20 Alfie has 11 cards.

He has

        3 blue cards
        7 green cards
and 1 white card.

Alfie takes at random 2 of these cards.

Work out the probability that he takes cards of different colours.

(Total for Question 20 is 3 marks)