Name	Date started	Target end date

REVISE
.wales

F2.20 — Probability of combined events — sample space & tree diagrams

Spec 4.4.1, 4.4.2, 4.4.3, 4.4.4 — Unit 2 (no calculator)

*Foundation probability of two events combined: building a **sample space** grid to list every outcome of two events, and using **tree diagrams** by multiplying along branches and adding the probabilities of distinct paths to the same outcome. Sourced from legacy WJEC GCSE Mathematics-Numeracy Foundation papers (3300U10/U20) and accessible content from Intermediate papers (3300U30/U40), organised for revision under the 2025 spec.*

2025 SPECIFICATION

Estimated time for entire question pack: ~1 hours 9 minutes

Derived from the GCSE Higher pace of ~1.5 min/mark (46 marks across 16 questions).

You are advised to not attempt to complete all of this in one sitting.

ABOUT THIS QUESTION PACK

This is a focused single-topic practice pack, not a single mock paper. Questions are organised against the 2025 specification.

Questions are ordered chronologically by sitting, with custom-written and SAM questions at the end.

INSTRUCTIONS

Use black ink or black ball-point pen. Show all working — method marks are awarded for clear setup.

A calculator is not permitted on any question in this pack (Unit 2 is the non-calculator paper).

Probability of combined events — sample space & tree diagrams — what the new spec asks

WJEC GCSE Mathematics (first teaching 2025) · Unit 2: non-calculator.

Sample space 4.4.1

- Build a sample-space grid for two simple events.
- Count outcomes to compute combined probability.

Tree diagrams 4.4.2

- Draw a tree diagram with correct branch probabilities.
- Multiply along branches for combined outcomes.

Multiple paths 4.4.3

- Identify all paths leading to the required outcome.
- Add path probabilities to find the final answer.

Exam strategy 4.4.4

- Check that branches from each node sum to 1.
- Use 1 – P(none) for “at least one” problems.

Crib sheet »

Probability of combined events — sample space & tree diagrams in one page

Quick-reference notes — revisit before each question. Don't use during the questions.

Sample space

Build a grid: one event along the top, the other down the side.

Each cell = one outcome — count the favourable ones to get the probability.

Tree diagrams — AND

Multiply probabilities along the branches of a single path.

P(A and B) = P(A) × P(B) for independent events.

Tree diagrams — OR

Add the probabilities of distinct paths that reach the same outcome.

"Exactly one head" = HT path + TH path.

Branch totals

The probabilities on the branches leaving any single point must add to 1.

Use this to fill in a missing branch.

At least one

Easier via complement: P(at least one) = 1 − P(none).

Common traps

- Adding when you should multiply (along a path).
- Forgetting to add multiple paths that hit the same outcome.
- Branch probabilities not summing to 1.

Examiner only

6. David, Jane and Mary are beach inspectors.
Three beaches, Harlech, Rhyl and Porthcawl, are all to be inspected on a certain day.
It is decided to share the work so that the inspectors will visit one beach each, chosen at random.

(a) List all the possible different ways they could share the work.
One has been done for you. [2]

David → Harlech, Jane → Rhyl and Mary → Porthcawl

(b) What is the probability that one of the female inspectors will visit Rhyl? [2]

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Examiner only

17. 100 boxes each contain 10 balls.

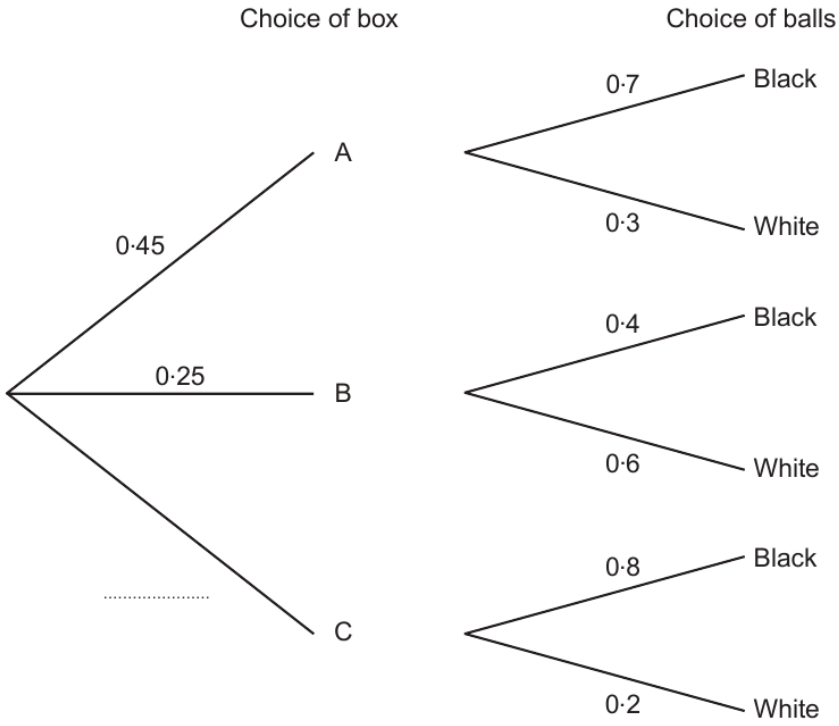
45 of the boxes are labelled A.
They each contain 7 black balls and 3 white balls.

25 of the boxes are labelled B.
They each contain 4 black balls and 6 white balls.

The rest of the boxes are labelled C.
They each contain 8 black balls and 2 white balls.

In a game, a player chooses a box at random, and then chooses a ball at random from that box.

(a) Complete the tree diagram shown below. [1]



(b) What is the probability that a player will select a black ball? [3]

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Examiner only

3. A travel company offers the following holiday options.

Time	Accommodation	Transport
Summer or Winter	Cottage or Hotel	Train or Bus or Car

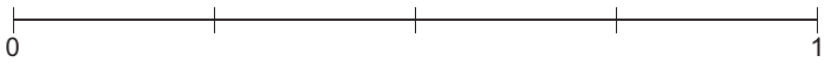
(a) List all the possible different combinations of holiday options that the company offers. One has been done for you. [3]

Time	Accommodation	Transport
Summer	Cottage	Train

(b) A holiday is chosen at random from all the different combinations on offer.
P is the probability that the chosen holiday is a

Summer holiday, staying in a Cottage and travelling by Train.

Mark the point **P** on the probability scale shown below. [1]



Examiner only

14. A travel company offers the following holiday options.

Time	Accommodation	Transport
Summer or Winter	Cottage or Hotel	Train or Bus or Car

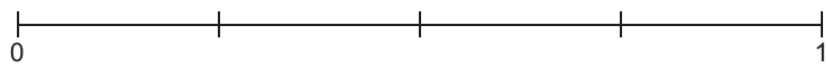
(a) List all the possible different combinations of holiday options that the company offers. One has been done for you. [3]

Time	Accommodation	Transport
Summer	Cottage	Train

(b) A holiday is chosen at random from all the different combinations on offer.
P is the probability that the chosen holiday is a

Summer holiday, staying in a Cottage and travelling by Train.

Mark the point **P** on the probability scale shown below. [1]



Examiner only

15. *PQR* is a right-angled triangle, as shown below.
PQ = 1·41 m and *PR* = 0·89 m.

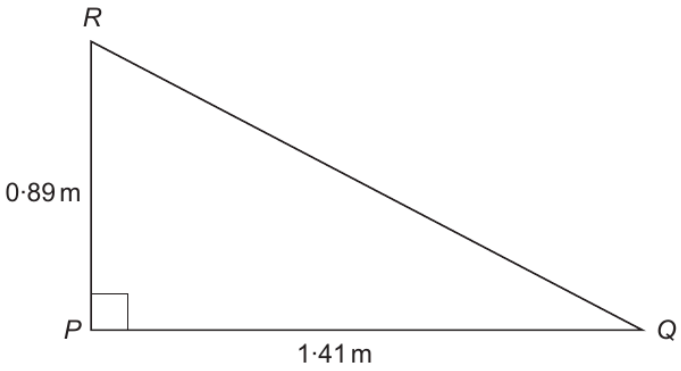


Diagram not drawn to scale

Calculate the length of *QR*. [3]

Examiner only

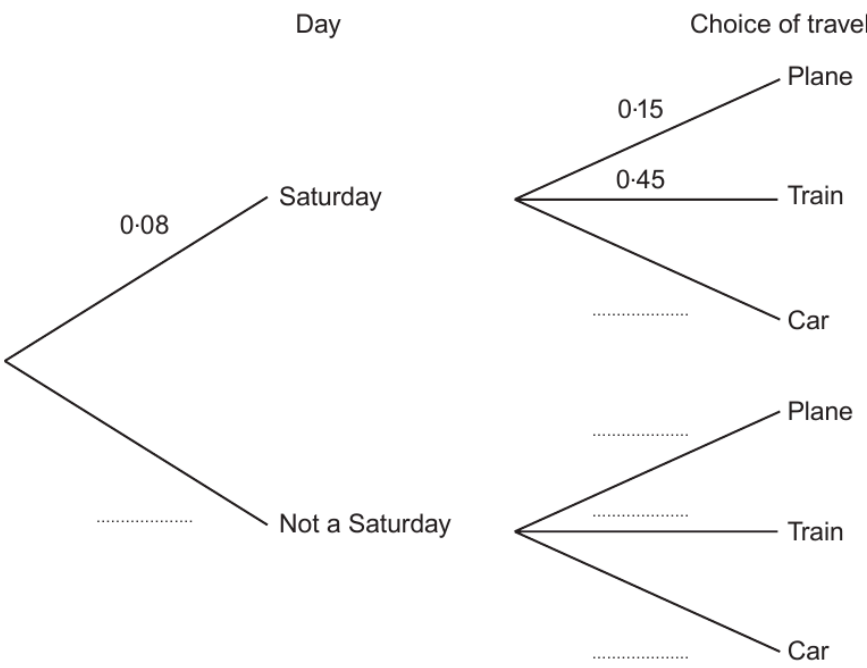
17. Alwena regularly travels from Anglesey to Cardiff to attend meetings.
For each meeting, she chooses one of three ways to travel: by plane, train or car.

The probability of a meeting being held on a Saturday is 0·08.

The probability that Alwena travels by plane to a meeting is 0·15.
The probability that she travels by train is 0·45.

Her decision on how to travel is independent of the day on which the meeting is held.

(a) Complete the following tree diagram. [3]



(b) A meeting is chosen at random.
Calculate the probability that the meeting is held on a Saturday and that Alwena travels by plane or by car. [3]

Examiner only

17. Arthur, Sian and Kezia are all given some £1 coins.

Arthur receives £n.
Sian is given five times as much money as Arthur.
Kezia receives three times as much money as Arthur, plus an extra £7.

Sian was given less money than Kezia.

(a) Write down an inequality in terms of n that illustrates the fact that Sian received less money than Kezia. [2]

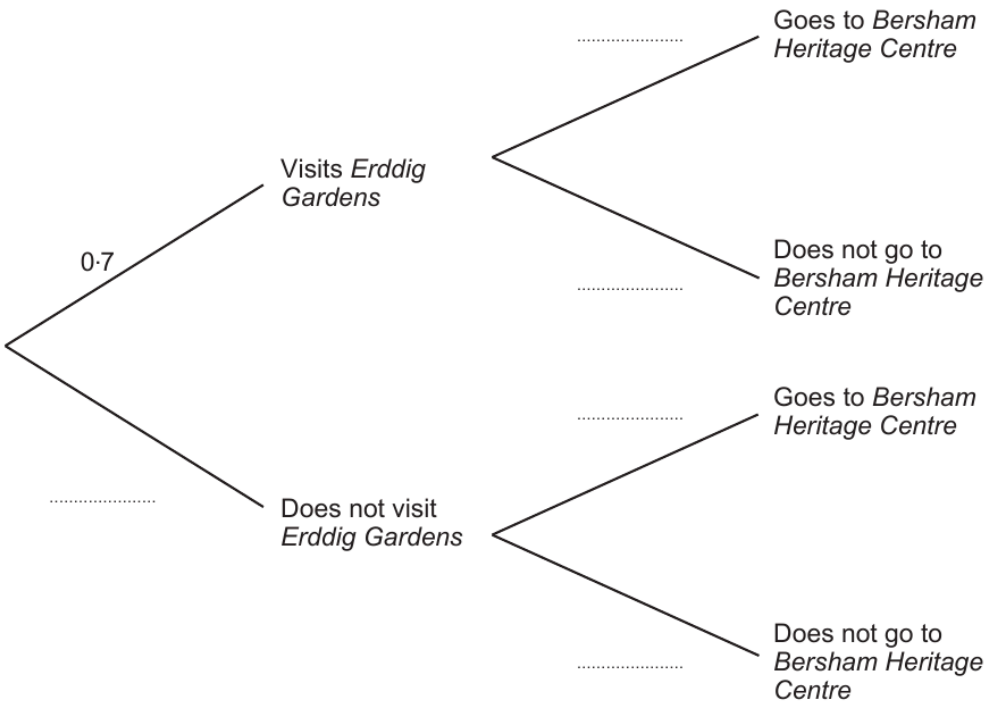
(b) What was the greatest amount of money that Arthur could have been given? [2]

Examiner only

17. Dylan is having a weekend break in Wrexham.
The probability that he will visit *Erddig Gardens* is 0·7.
The probability of Dylan going to the *Bersham Heritage Centre* is independent of him visiting *Erddig Gardens*.

The probability that he visits *Erddig Gardens* **and** goes to the *Bersham Heritage Centre* is 0·28.

(a) Complete the following tree diagram. [4]



(b) Calculate the probability that Dylan visits *Erddig Gardens* but does not go to the *Bersham Heritage Centre*. [2]

Examiner only

17. Alice works for an engineering company.

A working day is chosen at random.
From keeping a record over the last year, Alice knows that, for this working day,

- the probability that she travels to work by car is 0·7,
- the probability that she arrives at work before 8:00 a.m. is 0·4,
- her time of arrival is independent of how she travels to work.

(a) Using the above information, draw and fully label a complete tree diagram.
You must include all probabilities. [4]

(b) What is the probability that, on the randomly-chosen working day, Alice travels to work by car and arrives before 8:00 a.m.? [2]

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Examiner only

14. *(a)* Rearrange the following formula to make k the subject.

$$p = 3k + 2$$ [2]

(b) Does the midpoint of the straight line joining points (3, 15) and (7, 19) lie on the line $y = 3x + 2$?
You must show all your working. [3]

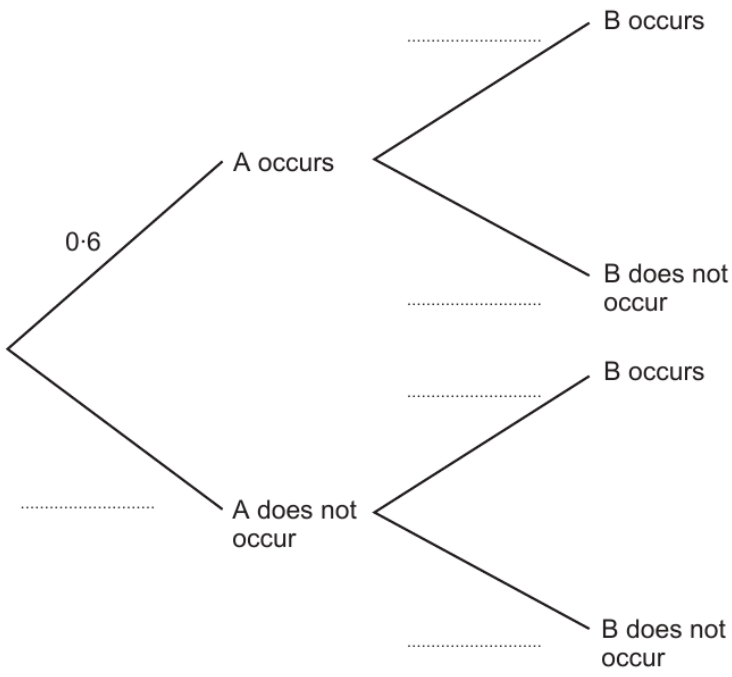
15. *(a)* Express 0·0058 in standard form. [1]

(b) Calculate the value of $\dfrac{1{\cdot}4 \times 10^9}{2 \times 10^3}$.
Give your answer in standard form. [2]

Examiner only

14. A and B are independent events.
The probability of event A occurring is 0·6.
The probability of event A **and** event B occurring is 0·48.

(a) Complete the tree diagram. [4]



(b) Calculate the probability of neither event A nor event B occurring. [2]

Examiner only

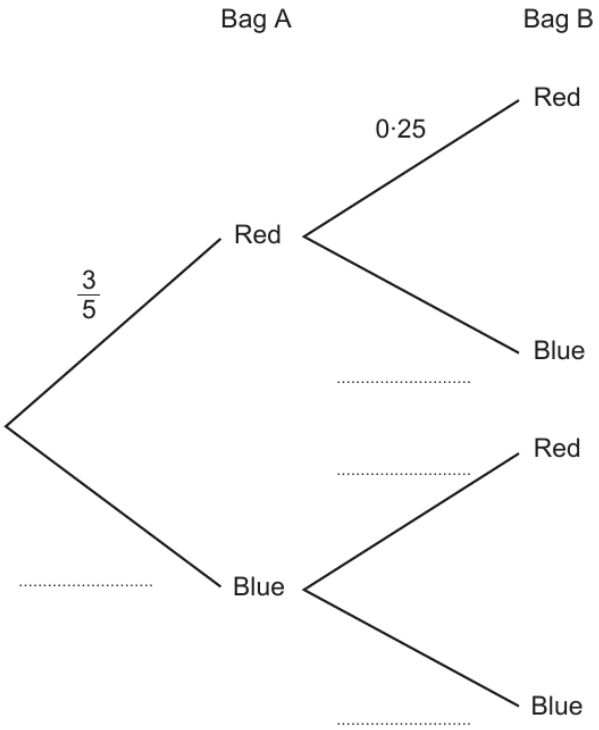
18. Bag A and Bag B contain only red and blue balls.

The probability of choosing a red ball from Bag A is $\frac{3}{5}$.

The probability of choosing a red ball from Bag B is 0·25.

A ball is chosen at random from each bag.

(a) Complete the tree diagram below. [2]



(b) Find the probability that the two balls chosen are the same colour. [3]

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Examiner only

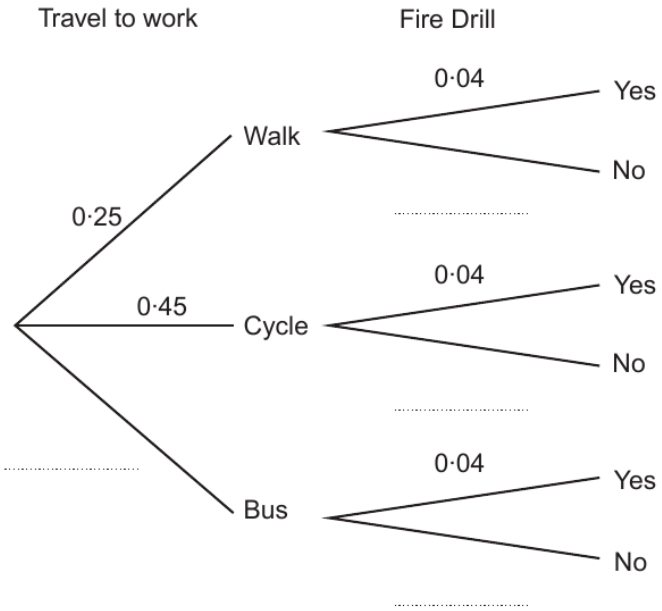
17. Whitney walks, cycles or travels on the bus to work each day.

On any randomly chosen day:
- the probability that she walks to work is 0·25
- the probability that she cycles to work is 0·45.

At work, the probability that there will be a fire drill on any randomly chosen day is 0·04.

How Whitney travels to work is independent of whether or not there is a fire drill.

(a) Complete the tree diagram shown below. [3]



(b) On a randomly chosen day, what is the probability that Whitney walks to work and there is a fire drill? [2]

Examiner only

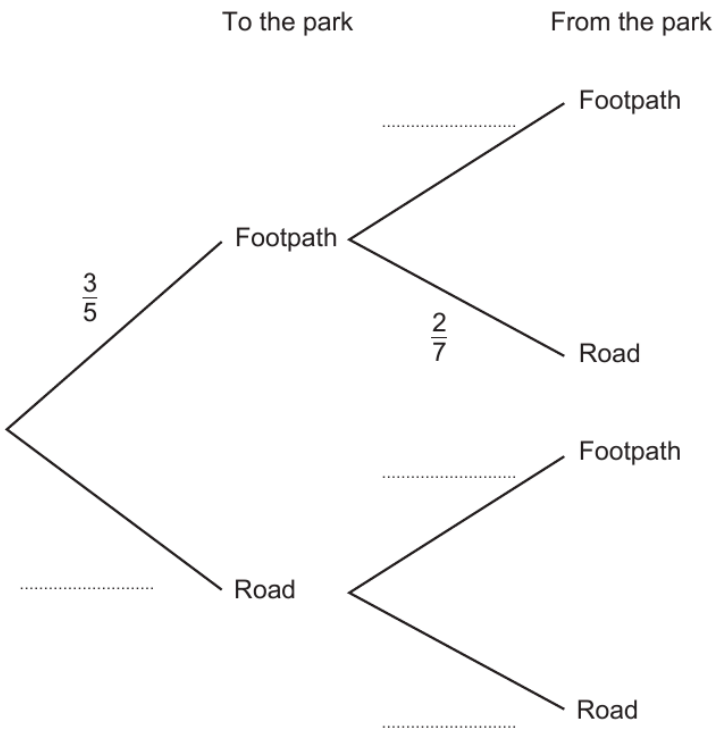
16. Beti walks her dog to a local park and back home every day.
She can either walk along a **footpath** or along a pavement at the side of a **road**.

The probability that Beti walks to the park along the footpath is $\frac{3}{5}$.

The probability that Beti walks home from the park along the road is $\frac{2}{7}$.

Her decisions on which routes to walk to and from the park are independent of each other.

(a) Complete the tree diagram below. [2]



(b) Find the probability that Beti walks to and from the park along the footpath. [2]

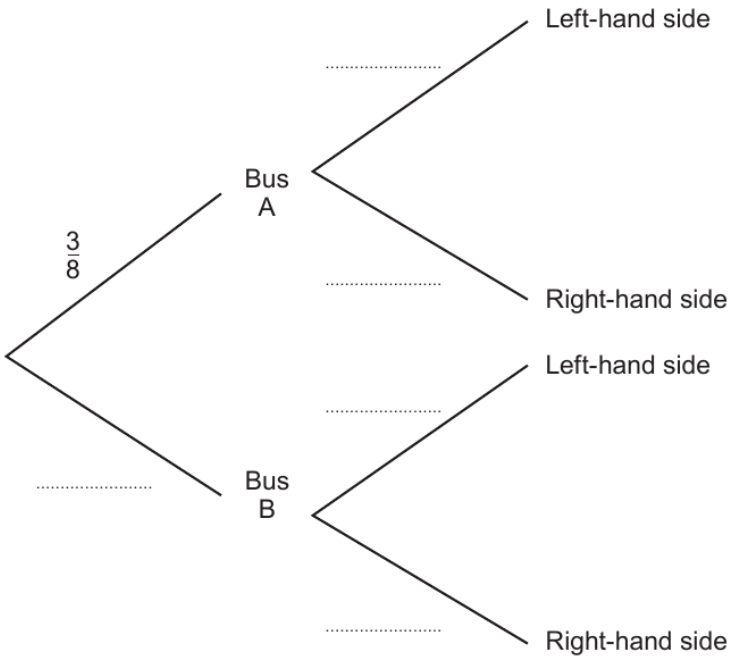
Examiner only

15. A group of people hired two buses, Bus A and Bus B, to take them home from a party.
Bus A left the party at 11:00 p.m.
Bus B left the party at midnight.

A person from the group is chosen at random.
The probability that this person left the party on Bus A is $\frac{3}{8}$.

The probability that this person sat on the left-hand side of the bus is equal to the probability that this person sat on the right-hand side.

(a) Complete the following tree diagram. [2]

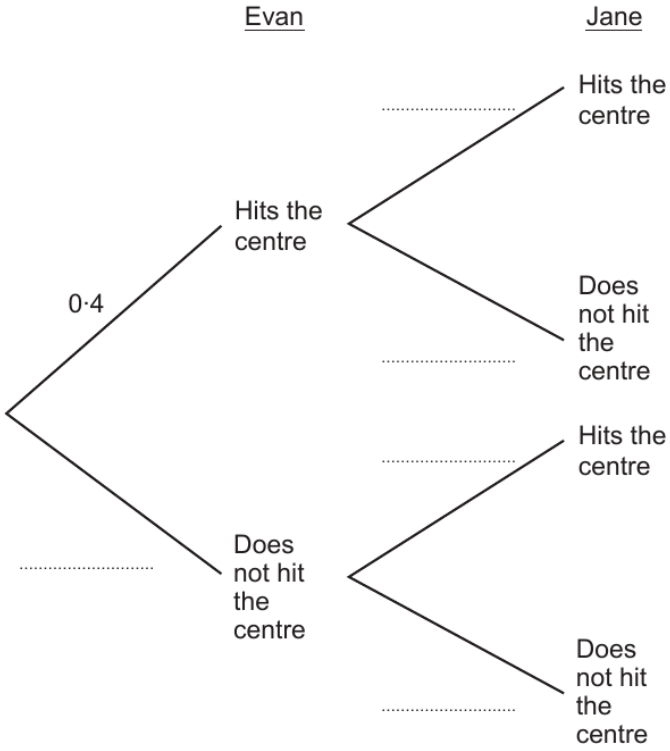


(b) What is the probability that this person sat on the right-hand side of the bus that left at midnight? [2]

Examiner only

15. Evan and Jane each shoot one arrow at a target.
The probability that Evan hits the centre of the target is 0·4.
The probability that Jane hits the centre of the target is 0·45.

(a) Complete the tree diagram below. [3]



(b) Find the probability that Evan and Jane both hit the centre of the target. [2]