Name	Date started	Target end date

WJEC GCSE Mathematics and Numeracy (Double Award) — Question Pack

Probabilities for three or more independent events. Drawing tree diagrams, multiplying along branches, and adding distinct paths that lead to the same

REVISE
.wales

2.23 — Three independent events & tree diagrams

Spec 3.5.6 — Unit 2 (no calculator)

Probabilities for three or more independent events. Drawing tree diagrams, multiplying along branches, and adding distinct paths that lead to the same outcome. Sourced from legacy WJEC GCSE Mathematics / Mathematics–Numeracy Higher non-calculator papers, organised for revision under the 2025 spec.

2025 SPECIFICATION

Estimated time for entire question pack: ~44 minutes

*Derived from the GCSE Higher pace of **~1.5 min/mark** (29 marks across 7 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).*

Three independent events & tree diagrams — what the new spec asks

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

Independent events 3.5.6

- Independent: outcome of one doesn't change probability of the other.
- $P(A \cap B) = P(A) \times P(B)$ for independent A, B.
- Coin flips, separate dice, separate spinners.

Tree diagrams 3.5.6

- One stage per event; label every branch with its probability.
- Branches at each split must sum to 1.
- Each complete root-to-leaf path is one combined outcome.

Combining paths 3.5.6

- Multiply along a single path.
- Add probabilities of distinct paths leading to the same outcome.
- Always identify which paths satisfy the question before multiplying.

At-least-one strategy 3.5.6

- $P(\text{at least one}) = 1 - P(\text{none})$.
- Cleanest when several paths satisfy 'at least one'.
- Only valid for independent events.

Crib sheet »

Three independent events & tree diagrams in one page

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

Independent events

Two events are *independent* if the outcome of one doesn't change the probability of the other.

Coin flips, separate dice rolls, separate spinners.

For independent A, B: $P(A \cap B) = P(A) \times P(B)$.

Three-branch trees

Draw the tree: three stages, each with its own branches.

Label every branch with its probability.

Each *complete path* from root to leaf is one combined outcome.

Multiplying along a path

$$P(\text{path}) = p_1 \times p_2 \times p_3$$

Multiply branch probabilities along one route through the tree.

This works only because the events are independent.

Adding distinct paths

Several paths can produce the same outcome (e.g. exactly two successes).

Compute each path's probability, then *add* them.

E.g. $P(\text{exactly 2 heads in 3 tosses}) = P(HHT) + P(HTH) + P(THH)$.

Branch-sum check

At every split, branches must sum to 1.

If you're given $P = 0.3$ for one branch, the other branch is 0.7.

This is the quickest sanity check on a tree.

Worked example (rain)

$P(\text{rain}) = 0.7$ on each of three days, independent.

$P(\text{rain all 3 days}) = 0.7 \times 0.7 \times 0.7 = 0.343$.

$P(\text{no rain at all}) = 0.3^3 = 0.027$.

$P(\text{at least one rainy day}) = 1 - 0.027 = 0.973$.

At-least-one trick

$$P(\text{at least one}) = 1 - P(\text{none})$$

Counting 'at least one' paths is tedious; the complement is usually one calculation.

Works whenever the events are independent.

Common traps

- Adding along a single path instead of multiplying.
- Forgetting that different paths can lead to the same outcome.
- Treating dependent events (without replacement) as independent — covered in the next pack.
- Branches at a split not summing to 1.

Examiner only

16. The table below shows the three-day rain forecast for Monday, Tuesday and Wednesday in Eglwyswrw.

Day	Probability of rain
Monday	80%
Tuesday	80%
Wednesday	80%

For these three days,

(a) calculate the probability that it will rain on all three days. [2]

(b) calculate the probability that it will rain on exactly 2 consecutive days. [3]

Examiner only

12. The area of a rectangle is 137 cm^2, correct to the nearest cm^2.
Its width is 11 cm, correct to the nearest cm.

Calculate the greatest possible length of the rectangle.
Give your answer correct to 3 significant figures. [2]

13. A bag contains 5 red counters and 5 blue counters.
Three counters are drawn at random from the bag at the same time.
Calculate the probability that the three counters will be the same colour. [3]

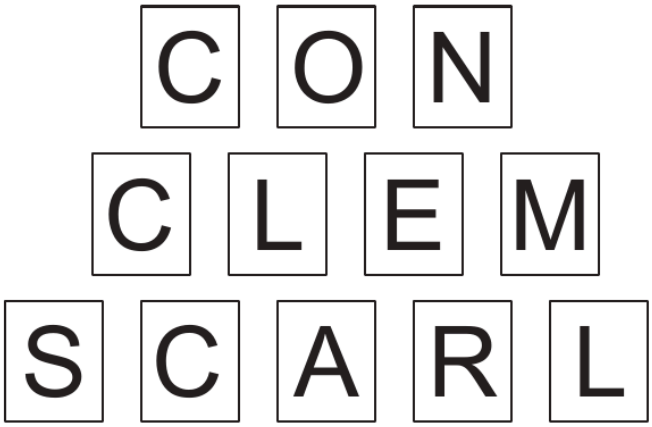
Examiner only

15. *(a)* Three unbiased 6-sided dice are rolled at the same time.
Calculate the probability they will all land on a 5. [2]

(b) Four unbiased 6-sided dice are now rolled.
Calculate the probability that at least three of the dice will land on a 5. [4]

Examiner only

14. The following twelve cards are placed in a box.



Three cards are chosen at random from the box at the same time.

(a) Calculate the probability that the three cards drawn are all the letter 'C'. [2]

(b) The letters A, E and O are vowels. All the other letters on these cards are consonants.

Calculate the probability that the three cards drawn include at least one consonant and at least one vowel. [3]

Examiner only

18. A large number of people took part in a survey that was carried out to find the popularity of three different walks in West Wales.
Each person surveyed was asked, independently, to select their one favourite walk.
The table below shows the results of the survey.

Walk	The percentage of people who selected the walk
The Preseli Ridge	70 %
Ramsey Sound	20 %
Laugharne	10 %

Three girls, Constance, Scarlett and Clementine, were chosen at random from all of the people surveyed.
They were asked which walk they had selected.

Calculate the probability that the three girls had each selected a different walk. [3]

Examiner only

15. Write down an **irrational** number whose value is between 9 and 10.
Write your answer in the box below. [1]

Irrational number is: ☐

16. Fully factorise the expression $k^3p - kp^3$. [3]

Examiner only

17. Zoltan rolls three unbiased 6-sided dice.
Calculate the probability that the sum of the values shown on the dice is 17. [3]