Name	Date started	Target end date

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

Probability when items are drawn without replacement — the second pick depends on the first. Tree diagrams with adjusted fractions, dependent ev

REVISE
.wales

2.24 — Sampling without replacement (conditional)

Spec 3.5.7 — Unit 2 (no calculator)

Probability when items are drawn without replacement — the second pick depends on the first. Tree diagrams with adjusted fractions, dependent events, and basic conditional probability. 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: ~2 hours 10 minutes

*Derived from the GCSE Higher pace of **~1.5 min/mark** (87 marks across 17 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).*

Sampling without replacement (conditional) — what the new spec asks

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

Without replacement 3.5.7

- Item not returned — total available drops by 1.
- Favourable count drops by 1 when the relevant item was drawn first.
- Second-draw probabilities depend on the first.

Tree diagrams (dependent) 3.5.7

- Each second-stage branch shows the post-draw probability.
- Branches at each split must still sum to 1.
- Multiply along a path; add across paths.

Same vs different colour 3.5.7

- $P(\text{same})$ = sum of 'same' paths in the tree.
- $P(\text{different}) = 1 - P(\text{same})$ or sum of mixed paths.
- Both methods should agree — useful for self-checking.

Multi-stage draws 3.5.7

- Numerator and denominator both decrement at each stage.
- Track which case you're in — the tree branches diverge.
- Keep fractions unsimplified until the end on non-calc papers.

Crib sheet »

Sampling without replacement (conditional) in one page

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

Without replacement

When an item is drawn and *not* returned, the next draw has fewer items to choose from.

Both the numerator (favourable count) *and* the denominator (total) drop by 1.

The second draw's probability depends on what was drawn first.

Dependent events

The two draws are *not* independent — the first changes the probability of the second.

Still multiply along a path, but use the *adjusted* probability for the second branch.

Use a tree diagram to track which case you're in.

Worked example (balls)

Bag: 5 red, 3 blue. Pick two without replacement.

$P(\text{both red}) = \frac{5}{8} \times \frac{4}{7} = \frac{20}{56} = \frac{5}{14}$.

After taking one red, only 4 reds remain out of 7.

Two-stage tree

First stage: branches at $5/8$ (R) and $3/8$ (B).

Second stage from R: $4/7$ (R) and $3/7$ (B).

Second stage from B: $5/7$ (R) and $2/7$ (B).

Each second-stage branch reflects what's left.

Same-colour rule

$$P(\text{same colour}) = P(RR) + P(BB)$$

Add the two diagonal paths in the tree.

For three or more colours, sum every 'same' path.

Different-colour shortcut

$P(\text{different colours}) = 1 - P(\text{same colour})$.

Or sum the two off-diagonal paths: $P(RB) + P(BR)$.

Both give the same answer — pick whichever is faster.

Three draws

Same idea: numerator and denominator each shrink by 1 at every stage.

$P(RRR) = \frac{5}{8} \times \frac{4}{7} \times \frac{3}{6}$.

Be patient with the arithmetic on a non-calc paper — keep fractions, simplify at the end.

Common traps

- Using the original denominator on the second draw (treating it as *with* replacement).
- Forgetting to decrement the favourable count when relevant.
- Mixing tree paths — only multiply *along* a path, only add *across* paths.
- Cancelling too early and losing track of common factors.

Examiner only

17. A bag contains 6 red blocks, 4 green blocks and 2 yellow blocks.
Three blocks are taken from the bag, at random, **without replacement**.

(a) What is the probability that the first block removed is red, the second is green and the third is yellow? [2]

(b) Calculate the probability that all three blocks will be the same colour. [3]

(c) Write down the probability that the three blocks will **not** be the same colour. [1]

Examiner only

19.

Two of the cards shown above are selected at random, without being replaced.

Find the probability that

(a) the product of the two numbers selected is 12, [3]

(b) the **sum** of the two numbers selected is **even**. [4]

END OF PAPER

Examiner only

17. At a children's party, the children play a number of games.
The winner of each game chooses a ticket for a prize, at random, from a box.
The ticket is not returned to the box.
At the start of the party, there are 12 prizes available: 1 book, 3 key-rings and 8 pencils.

(a) Find the probability that the winners of the first two games choose the same type of prize. [3]

(b) After the winners of the first **three** games have chosen their prizes, find the probability that the ticket for the book is still in the box. [2]

Examiner only

17. A box contains 4 red balls, 5 yellow balls and 1 green ball.
Two balls are to be chosen at random, without replacement.

(a) Find the probability of choosing 1 red ball and 1 green ball. [3]

(b) Find the probability that the two balls chosen will **not** be the same colour. [4]

Examiner only

17. A raffle is held at a school fair and a total of 100 tickets are sold.
Angharad buys three of the tickets and Meirion buys one ticket.
Tickets are selected at random and not replaced.
The first prize to be awarded is a calculator.
The second prize to be awarded is a voucher.
No other prizes are awarded.

(a) Calculate the probability that Angharad wins the calculator and Meirion wins the voucher. [2]

(b) Calculate the probability that no one wins a prize apart from Angharad or Meirion. [3]

Examiner only

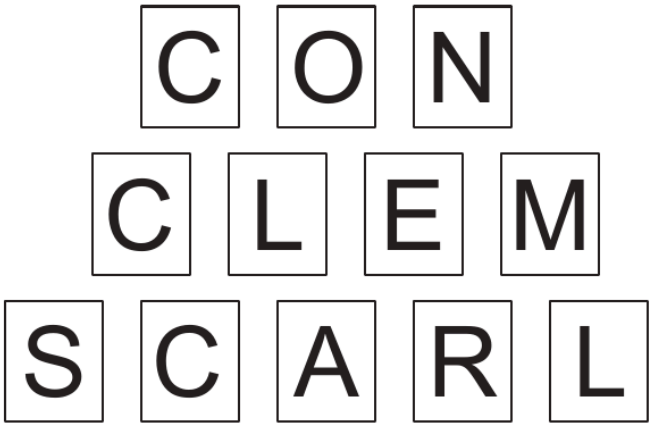
18. A box contains 4 yellow cards and 6 red cards.
Three cards are chosen at random, one at a time, without replacement.

(a) Calculate the probability that the first two cards are yellow and the third card is red.
You must show all your working. [2]

(b) Calculate the probability that at least one yellow card is chosen. [3]

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. Sixteen balls are placed in a bag.
Ten of the balls are green and six are yellow.
Two balls are selected at random and not replaced.

Benjamin states that the probability of selecting two balls of the **same colour** is equal to the probability of selecting two balls of **different colours.**

Is Benjamin correct?
You must show all your working to justify your answer. [4]

END OF PAPER

Examiner only

19. Dewi has a box containing eleven socks.
Six of the socks are red, four are green and one is yellow.

Early one morning, without switching on the light, Dewi selects two socks at random.

(a) Calculate the probability that the first sock selected is yellow and the second is red. [2]

(b) Calculate the probability that Dewi selects two socks of the same colour. [3]

(c) Calculate the probability that at least one green sock is selected. [3]

Examiner only

17. A bag contains 10 balls.
5 of the balls are blue, 4 of the balls are red and 1 ball is green.
Three balls are chosen at random, one at a time, without replacement.

(a) Calculate the probability that the first ball is blue, the second ball is red and the third ball is green.
You must show all your working. [2]

(b) Calculate the probability that at least one blue ball is chosen.
You must show all your working. [3]

Examiner only

18. Ffion has some blue cards and some yellow cards.
She takes 7 of the blue cards and 3 of the yellow cards and puts them in a box.

Ffion removes one card from the box at random and replaces it with **two** cards of the other colour.

Then she removes a second card from the box at random.

Calculate the probability that the two cards that Ffion removed are of different colours. [4]

Examiner only

18. The following nine cards are placed in a box.

Catherine chooses **three** cards at random from the box, without replacement.

(a) Calculate the probability that the three cards drawn show the letters 'A', 'F' and 'O' in that order. [2]

(b) Calculate the probability that two of the three cards show the same letter. [3]

Examiner only

(b) Use your graph to solve the equation $x+\frac{1}{x}=3$. [2]

15. A box contains 5 blue discs and 3 yellow discs.
Three discs are to be chosen at random, without replacement.

(a) Calculate the probability that the three discs chosen will all be the same colour. [3]

(b) Calculate the probability that exactly one blue disc is selected. [3]

Examiner only

17. Eleven cards are placed in a box.
Seven of the cards are red and the rest are blue.

Gareth selects two cards at random and does not replace them.

He claims that the probability of selecting two cards of the same colour is equal to the probability of selecting two cards of different colours.

Is Gareth correct?
You must show your working and justify your answer. [4]

Examiner only

18. A bag contains 3 red counters, 5 blue counters and 7 yellow counters.

Sali takes three counters at random from the bag. These counters are not replaced.

Calculate the probability that **at least two** of the counters are the same colour. [4]