GCSE MATHEMATICS

FOUNDATION TIER
COMPREHENSIVE LESSON NOTEBOOK

UNIT 8 | PROBABILITY

TEACH-FROM-SCRATCH • PUBLICATION EDITION

10 detailed chapters • original diagrams • worked examples • guided practice • answers

INDEPENDENT PUBLICATION NOTICE

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COMPREHENSIVE LESSON NOTEBOOK

How to learn from this notebook

Meaning first. Method second. Practice third.

FIVE-PASS ROUTINE

1 Read the key idea without a calculator. 2 Cover each worked solution and reproduce it. 3 Complete practice independently. 4 Mark in a different colour and repair errors. 5 Retest after 2–7 days.

What a complete mathematics answer contains

- A clear model or calculation, not only a calculator display.
- Enough working for another person to follow the reasoning.
- Exact values until approximation is requested.
- Units and sensible rounding in context.
- A final statement when interpretation is required.

Error loop

REPAIR, DO NOT MERELY CORRECT

Label each error: concept, operation, arithmetic, calculator entry, accuracy, unit or interpretation. Write the corrected step and one sentence explaining the change.

Foundation does not mean superficial

OCR Foundation questions can combine familiar skills in unfamiliar contexts. Grade 4–5 success depends on selecting a method, connecting several steps and deciding whether the answer is reasonable.

COMPREHENSIVE LESSON NOTEBOOK

Unit 8 coverage map

OCR J560 Probability content organised into a teachable sequence.

CH 01	OCR 11.01a	Probability language and the 0-to-1 scale
CH 02	OCR 11.01d	Theoretical probability
CH 03	OCR 11.01a; 11.02e	Complements and exhaustive outcomes
CH 04	OCR 11.02a-11.02b	Sample spaces and systematic enumeration
CH 05	OCR 11.01b	Experimental probability
CH 06	OCR 11.01c-11.01d	Expected frequency and fairness
CH 07	OCR 11.02c	Set notation and Venn diagrams
CH 08	OCR 11.02d-11.02f	Tree diagrams with replacement
CH 09	OCR 11.02d-11.02f	Tree diagrams without replacement
CH 10	OCR 11.01-11.02 synthesis	Mixed probability reasoning

IMPORTANT TIER NOTE

This notebook covers OCR J560 section 11 at Foundation Tier: probability scales, theoretical and experimental probability, expected frequency, sample spaces, sets and tree diagrams. Specification references are identifiers, not copied specification wording.

COMPREHENSIVE LESSON NOTEBOOK

Fast-reference method bank

Understand each relationship before memorising it.

Probability scale	$0 \leq P(A) \leq 1$
Complement	$P(\text{not } A) = 1 - P(A)$
Equally likely	favourable outcomes÷total outcomes
Relative frequency	event frequency÷number of trials
Expected frequency	trials×probability
Mutually exclusive	$P(A \text{ or } B) = P(A) + P(B)$
Union count	$n(A \cup B) = n(A) + n(B) - n(A \cap B)$
Tree route	multiply along branches
Alternative routes	add mutually exclusive paths
Without replacement	update numerator and denominator

CURRENT ASSESSMENT NOTE

OCR has announced Foundation and Higher formula sheets for GCSE Mathematics examinations in 2025, 2026 and 2027. Use the current official OCR sheet alongside this learning bank and check OCR for later exam-series arrangements.

COMPREHENSIVE LESSON NOTEBOOK

Probability language and the 0-to-1 scale

Represent likelihood using words, fractions, decimals and percentages.

SPECIFICATION FOCUS

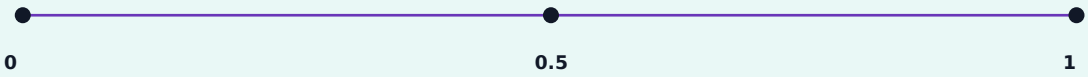
OCR reference OCR 11.01a. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Probability measures modelled likelihood from 0 to 1. Words are approximate descriptions, while fractions, decimals and percentages give comparable numerical values.

KEY VOCABULARY

probability • impossible • certain • likely • scale



Why the method works

- The representation accounts for the complete outcome structure.
- Addition combines disjoint alternatives; multiplication follows sequential conditions.
- Complements and totals provide independent checks.

CHECK BEFORE MOVING ON

Answer mentally: Write “three chances in ten” as a probability. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Probability language and the 0-to-1 scale — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Probability lies from 0 to 1 inclusive.
- Impossible=0, even chance=0.5 and certain=1.
- Convert representations before comparing.

WORKED EXAMPLE 1

Write “three chances in ten” as a probability.

SOLUTION

1. Probability=favourable proportion 3 out of 10.

ANSWER: 3/10 or 0.3

WORKED EXAMPLE 2

Place impossible, unlikely, even chance, likely and certain in order.

SOLUTION

1. Order from probability 0 to 1.

ANSWER: Impossible, unlikely, even chance, likely, certain

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Probability language and the 0-to-1 scale — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Risk communication and forecasts use probability scales.

Common misconceptions

- Assuming outcomes are equally likely without evidence.
- Adding when a sequential path requires multiplication.
- Failing to update totals or double-counting overlap.

GUIDED TRY

Write 65% as a probability decimal. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

Explain why “unlikely” does not mean impossible. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Probability language and the 0-to-1 scale

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. **Write “three chances in ten” as a probability.** **[1]**

2. **Place impossible, unlikely, even chance, likely and certain in order.** **[2]**

3. **Write 65% as a probability decimal.** **[1]**

4. **Is probability 1.2 possible?** **[1]**

5. **An event has probability 0. State its meaning.** **[1]**

6. **Compare 3/5 and 0.58. Which is more likely?** **[2]**

7. **Write 0.125 as a fraction in simplest form.** **[2]**

8. **Explain why “unlikely” does not mean impossible.** **[2]**

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Theoretical probability

Calculate probabilities from equally likely outcomes.

SPECIFICATION FOCUS

OCR reference OCR 11.01d. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Theoretical probability counts favourable outcomes within a complete equally likely sample space. The model, not appearance alone, determines whether outcomes are equally likely.

KEY VOCABULARY

outcome • event • equally likely • favourable • sample space

Why the method works

- The representation accounts for the complete outcome structure.
- Addition combines disjoint alternatives; multiplication follows sequential conditions.
- Complements and totals provide independent checks.

CHECK BEFORE MOVING ON

Answer mentally: A fair die is rolled. Find P(5). Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Theoretical probability — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- List the complete outcome set.
- Use favourable outcomes ÷ total equally likely outcomes.
- Simplify and check the result is between 0 and 1.

WORKED EXAMPLE 1

A fair die is rolled. Find P(5).

SOLUTION

1. One favourable face out of six.

ANSWER: 1/6

WORKED EXAMPLE 2

Find P(even) on a fair die.

SOLUTION

1. Even faces 2,4,6: 3/6=1/2.

ANSWER: 1/2

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Theoretical probability — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Games, random selection and quality models use theoretical probability.

Common misconceptions

- Assuming outcomes are equally likely without evidence.
- Adding when a sequential path requires multiplication.
- Failing to update totals or double-counting overlap.

GUIDED TRY

A bag has 4 red and 6 blue counters. Find P(red). First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

Why is counting sectors invalid if spinner sectors have unequal areas? Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Theoretical probability

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. **A fair die is rolled. Find P(5).** **[1]**

2. **Find P(even) on a fair die.** **[2]**

3. **A bag has 4 red and 6 blue counters. Find P(red).** **[2]**

4. **Choose a letter from MATHS. Find P(A).** **[1]**

5. **A spinner has 8 equal sectors, 3 green. Find P(not green).** **[2]**

6. **Choose an integer from 1 to 12. Find P(factor of 12).** **[3]**

7. **A fair coin is tossed. Find P(tail).** **[1]**

8. **Why is counting sectors invalid if spinner sectors have unequal areas?** **[2]**

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Complements and exhaustive outcomes

Use the probability scale and addition law to complete a whole outcome set.

SPECIFICATION FOCUS

OCR reference OCR 11.01a; 11.02e. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Complementary events cover all possibilities between them. Exhaustive mutually exclusive outcomes partition the sample space and therefore have total probability 1.

KEY VOCABULARY

complement • exhaustive • mutually exclusive • total

P(A) + P(not A) = 1

all exhaustive outcomes complete the whole

Why the method works

- The representation accounts for the complete outcome structure.
- Addition combines disjoint alternatives; multiplication follows sequential conditions.
- Complements and totals provide independent checks.

CHECK BEFORE MOVING ON

Answer mentally: P(rain)=0.35. Find P(no rain). Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Complements and exhaustive outcomes — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- P(not A)=1-P(A).
- Probabilities of mutually exclusive exhaustive outcomes sum to 1.
- Find missing probabilities by subtraction.

WORKED EXAMPLE 1

P(rain)=0.35. Find P(no rain).

SOLUTION

1. 1-0.35=0.65.

ANSWER: 0.65

WORKED EXAMPLE 2

A spinner gives A,B,C with probabilities 0.2,0.45,x. Find x.

SOLUTION

1. x=1-0.2-0.45=0.35.

ANSWER: 0.35

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Complements and exhaustive outcomes — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Binary decisions and missing probability tables use complements.

Common misconceptions

- Assuming outcomes are equally likely without evidence.
- Adding when a sequential path requires multiplication.
- Failing to update totals or double-counting overlap.

GUIDED TRY

P(win)=3/8. Find P(not win). First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

Explain “mutually exclusive”. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Complements and exhaustive outcomes

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. **P(rain)=0.35. Find P(no rain).** [1]

2. **A spinner gives A,B,C with probabilities 0.2,0.45,x. Find x.** [2]

3. **P(win)=3/8. Find P(not win).** [2]

4. **Outcomes red, blue, green have probabilities 1/4,1/2,1/4. Are they exhaustive?** [2]

5. **Can disjoint events each have probability 0.7?** [2]

6. **P(bus late)=0.18. In 200 days, estimate days not late.** [3]

7. **A biased coin has P(head)=0.62. Find P(tail).** [1]

8. **Explain “mutually exclusive”.** [2]

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Sample spaces and systematic enumeration

List all possible combined outcomes systematically.

SPECIFICATION FOCUS

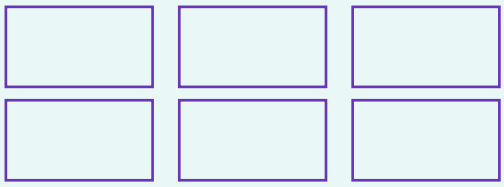
OCR reference OCR 11.02a-11.02b. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

A sample-space diagram lists combined outcomes systematically. Ordered outcomes remain distinct even when they produce the same total.

KEY VOCABULARY

ordered pair • grid • sample space • total • combination



Why the method works

- The representation accounts for the complete outcome structure.
- Addition combines disjoint alternatives; multiplication follows sequential conditions.
- Complements and totals provide independent checks.

CHECK BEFORE MOVING ON

Answer mentally: Toss two coins. List the sample space. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Sample spaces and systematic enumeration — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Use a table, grid or ordered pairs.
- Include every combination exactly once.
- Count equally likely cells, not merely distinct totals.

WORKED EXAMPLE 1

Toss two coins. List the sample space.

SOLUTION

1. Use ordered outcomes for first and second toss.

ANSWER: HH, HT, TH, TT

WORKED EXAMPLE 2

Two fair coins: find P(exactly one head).

SOLUTION

1. HT and TH are favourable.
2. 2/4=1/2.

ANSWER: 1/2

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Sample spaces and systematic enumeration — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Product choices and repeated random trials use sample spaces.

Common misconceptions

- Assuming outcomes are equally likely without evidence.
- Adding when a sequential path requires multiplication.
- Failing to update totals or double-counting overlap.

GUIDED TRY

Roll two dice. How many ordered outcomes? First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

Why are dice totals not equally likely? Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Sample spaces and systematic enumeration

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. **Toss two coins. List the sample space.** **[2]**

2. **Two fair coins: find P(exactly one head).** **[2]**

3. **Roll two dice. How many ordered outcomes?** **[1]**

4. **Two dice: find P(total 7).** **[3]**

5. **Choose from {1,2,3} and {A,B}. How many pairs?** **[1]**

6. **Two dice: find P(double).** **[2]**

7. **Two spinners have 3 and 4 equal sectors. Find total outcomes.** **[1]**

8. **Why are dice totals not equally likely?** **[2]**

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Experimental probability

Estimate probability using relative frequency.

SPECIFICATION FOCUS

OCR reference OCR 11.01b. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Relative frequency uses observed data to estimate an unknown probability. Estimates fluctuate, but larger representative samples generally stabilise.

KEY VOCABULARY

experiment • frequency • relative frequency • estimate • sample size

observed proportion compared with expected proportion

Why the method works

- The representation accounts for the complete outcome structure.
- Addition combines disjoint alternatives; multiplication follows sequential conditions.
- Complements and totals provide independent checks.

CHECK BEFORE MOVING ON

Answer mentally: A coin gives 56 heads in 100 tosses. Estimate P(head). Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Experimental probability — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Relative frequency=event frequency ÷ number of trials.
- Larger samples usually give more stable estimates.
- Use the estimate to predict future frequencies cautiously.

WORKED EXAMPLE 1

A coin gives 56 heads in 100 tosses. Estimate P(head).

SOLUTION

1. 56÷100=0.56.

ANSWER: 0.56

WORKED EXAMPLE 2

A bus is late 18 times in 120 days. Estimate probability.

SOLUTION

1. 18÷120=0.15.

ANSWER: 0.15

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Experimental probability — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Testing equipment and forecasting demand use experimental probability.

Common misconceptions

- Assuming outcomes are equally likely without evidence.
- Adding when a sequential path requires multiplication.
- Failing to update totals or double-counting overlap.

GUIDED TRY

Using P(defect)=0.03, predict defects in 800 items. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

Explain why an experimental probability may differ from theory. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Experimental probability

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. **A coin gives 56 heads in 100 tosses. Estimate P(head).** **[2]**

2. **A bus is late 18 times in 120 days. Estimate probability.** **[2]**

3. **Using P(defect)=0.03, predict defects in 800 items.** **[2]**

4. **A spinner gives red 42 times in 150. Estimate P(red).** **[2]**

5. **Which is more reliable: 20 trials or 2000 trials?** **[1]**

6. **Two experiments estimate 0.48 and 0.53. Must one be wrong?** **[2]**

7. **An event occurs 9 times; relative frequency 0.12. Find trials.** **[3]**

8. **Explain why an experimental probability may differ from theory.** **[2]**

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Expected frequency and fairness

Connect relative frequency with probability, expected counts and model fairness.

SPECIFICATION FOCUS

OCR reference OCR 11.01c-11.01d. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Expected frequency converts probability into a predicted count. It is a long-run benchmark, not a promise that one experiment will match exactly.

KEY VOCABULARY

expected frequency • fairness • prediction • long run • variation

observed proportion compared with expected proportion

Why the method works

- The representation accounts for the complete outcome structure.
- Addition combines disjoint alternatives; multiplication follows sequential conditions.
- Complements and totals provide independent checks.

CHECK BEFORE MOVING ON

Answer mentally: P(win)=0.2. Find expected wins in 350 games. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Expected frequency and fairness — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Expected frequency=number of trials×probability.
- An expectation need not be the exact result.
- Compare observed and expected values using sample size.

WORKED EXAMPLE 1

P(win)=0.2. Find expected wins in 350 games.

SOLUTION

1. 350×0.2=70.

ANSWER: 70

WORKED EXAMPLE 2

A fair die is rolled 240 times. Expected sixes?

SOLUTION

1. 240×1/6=40.

ANSWER: 40

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Expected frequency and fairness — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Games, manufacturing and planning compare observations with expectations.

Common misconceptions

- Assuming outcomes are equally likely without evidence.
- Adding when a sequential path requires multiplication.
- Failing to update totals or double-counting overlap.

GUIDED TRY

A spinner predicts 75 red in 300 spins. Find P(red). First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

State one fairness check for a spinner. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Expected frequency and fairness

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. **P(win)=0.2. Find expected wins in 350 games.** **[2]**

2. **A fair die is rolled 240 times. Expected sixes?** **[2]**

3. **A spinner predicts 75 red in 300 spins. Find P(red).** **[2]**

4. **A coin gives 68 heads in 100 tosses. Is this evidence it may be biased?** **[2]**

5. **P(defect)=1/50. Expected good items in 1000?** **[3]**

6. **A game costs £2 and wins £5 with probability 0.3. Expected payout per play?** **[2]**

7. **Why can expected frequency be non-integer?** **[2]**

8. **State one fairness check for a spinner.** **[2]**

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Set notation and Venn diagrams

Represent unions, intersections and complements.

SPECIFICATION FOCUS

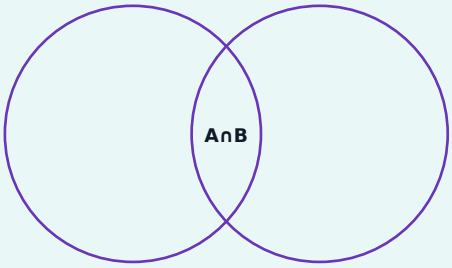
OCR reference OCR 11.02c. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Venn diagrams show membership and overlap. Intersection entries must be allocated first so totals are not counted twice.

KEY VOCABULARY

set • union • intersection • complement • universal set



Why the method works

- The representation accounts for the complete outcome structure.
- Addition combines disjoint alternatives; multiplication follows sequential conditions.
- Complements and totals provide independent checks.

CHECK BEFORE MOVING ON

Answer mentally: In 30 students, 18 study French, 12 Spanish, 5 both. Find French only. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Set notation and Venn diagrams — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Place intersection members first.
- A∪B means A or B or both.
- A∩B means both; A′ means not A.

WORKED EXAMPLE 1

In 30 students, 18 study French, 12 Spanish, 5 both. Find French only.

SOLUTION

1. 18-5=13.

ANSWER: 13

WORKED EXAMPLE 2

Using the same data, find studying at least one.

SOLUTION

1. 18+12-5=25.

ANSWER: 25

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Set notation and Venn diagrams — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Surveys and classification systems use overlapping sets.

Common misconceptions

- Assuming outcomes are equally likely without evidence.
- Adding when a sequential path requires multiplication.
- Failing to update totals or double-counting overlap.

GUIDED TRY

Find neither. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

A Venn diagram has 8 A-only,3 both,5 B-only,4 outside. Find P(A). Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Set notation and Venn diagrams

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. **In 30 students, 18 study French, 12 Spanish, 5 both. Find French only.** **[2]**

2. **Using the same data, find studying at least one.** **[2]**

3. **Find neither.** **[2]**

4. **If $n(A)=20, n(B)=17, n(A\cap B)=6$, find $n(A\cup B)$.** **[2]**

5. **A die event $A=\{2,4,6\}$, $B=\{4,5,6\}$. Find $A\cap B$.** **[1]**

6. **For the same sets, find $A\cup B$.** **[1]**

7. **Why subtract the intersection in $n(A\cup B)$?** **[2]**

8. **A Venn diagram has 8 A-only, 3 both, 5 B-only, 4 outside. Find P(A).** **[3]**

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Tree diagrams with replacement

Use tree diagrams, multiplication and addition laws for combined events.

SPECIFICATION FOCUS

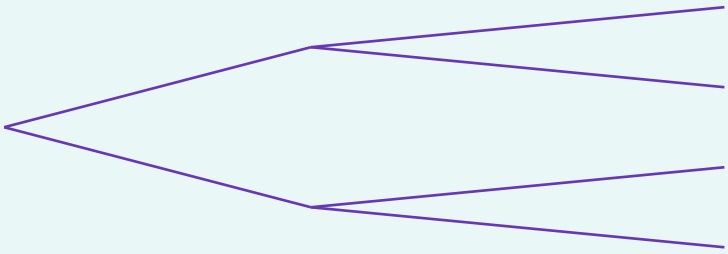
OCR reference OCR 11.02d-11.02f. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

A tree diagram unfolds sequential choices. With replacement or independence, branch probabilities repeat; path probabilities multiply and alternative routes add.

KEY VOCABULARY

branch • independent • replacement • route • product



multiply along a path • add alternative paths

Why the method works

- The representation accounts for the complete outcome structure.
- Addition combines disjoint alternatives; multiplication follows sequential conditions.
- Complements and totals provide independent checks.

CHECK BEFORE MOVING ON

Answer mentally: A coin is tossed twice. Find P(HH). Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Tree diagrams with replacement — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Branch probabilities from a point sum to 1.
- Multiply probabilities along one complete path.
- Add mutually exclusive paths for an “or” event.

WORKED EXAMPLE 1

A coin is tossed twice. Find P(HH).

SOLUTION

1. $1/2 \times 1/2 = 1/4$.

ANSWER: 1/4

WORKED EXAMPLE 2

P(success)=0.7 independently twice. Find both successes.

SOLUTION

1. $0.7 \times 0.7 = 0.49$.

ANSWER: 0.49

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Tree diagrams with replacement — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Repeated tests and staged decisions use probability trees.

Common misconceptions

- Assuming outcomes are equally likely without evidence.
- Adding when a sequential path requires multiplication.
- Failing to update totals or double-counting overlap.

GUIDED TRY

For the same trials, find exactly one success. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

State the tree rule for “A then B” and “either route”. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Tree diagrams with replacement

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. **A coin is tossed twice. Find P(HH).** **[2]**

2. **P(success)=0.7 independently twice. Find both successes.** **[2]**

3. **For the same trials, find exactly one success.** **[3]**

4. **A bag draw with replacement has P(red)=0.4. Find two reds.** **[2]**

5. **Find at least one red in those two draws.** **[3]**

6. **A branch has probabilities 0.35 and x. Find x.** **[1]**

7. **Why do replacement branch probabilities stay constant?** **[2]**

8. **State the tree rule for “A then B” and “either route”.** **[2]**

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Tree diagrams without replacement

Update tree probabilities and calculate dependent combined events.

SPECIFICATION FOCUS

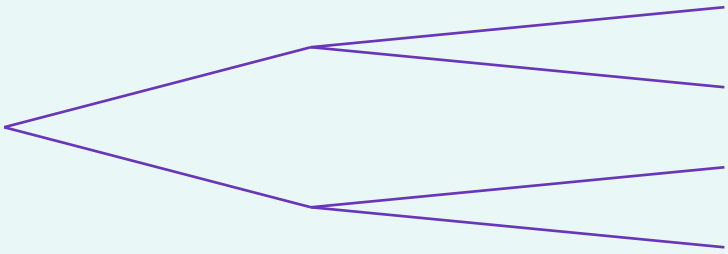
OCR reference OCR 11.02d-11.02f. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Without replacement changes the population. Second-stage probabilities depend on what happened first, so both the numerator and total may need updating.

KEY VOCABULARY

without replacement • conditional • remaining • denominator • update



multiply along a path • add alternative paths

Why the method works

- The representation accounts for the complete outcome structure.
- Addition combines disjoint alternatives; multiplication follows sequential conditions.
- Complements and totals provide independent checks.

CHECK BEFORE MOVING ON

Answer mentally: Bag: 3 red,2 blue. Draw two without replacement. Find P(RR). Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Tree diagrams without replacement — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Reduce the total after the first draw.
- Reduce the selected category if it was not replaced.
- Check each new pair of branches sums to 1.

WORKED EXAMPLE 1

Bag: 3 red,2 blue. Draw two without replacement. Find P(RR).

SOLUTION

1. 3/5×2/4=6/20=3/10.

ANSWER: 3/10

WORKED EXAMPLE 2

Find P(BB).

SOLUTION

1. 2/5×1/4=2/20=1/10.

ANSWER: 1/10

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Tree diagrams without replacement — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Card, counter and sampling problems use dependent trees.

Common misconceptions

- Assuming outcomes are equally likely without evidence.
- Adding when a sequential path requires multiplication.
- Failing to update totals or double-counting overlap.

GUIDED TRY

Find P(one of each). First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

State one check on a without-replacement tree. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Tree diagrams without replacement

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. **Bag: 3 red,2 blue. Draw two without replacement. Find P(RR).** **[3]**

2. **Find P(BB).** **[3]**

3. **Find P(one of each).** **[4]**

4. **Bag: 5 green,1 yellow. Find P(yellow then green).** **[2]**

5. **Why is the second denominator one smaller?** **[2]**

6. **Bag 4 red,3 blue. After red first, find P(blue second).** **[2]**

7. **Find P(at least one yellow) when 2 yellow,3 white and two draws.** **[4]**

8. **State one check on a without-replacement tree.** **[2]**

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Mixed probability reasoning

Choose a representation and test assumptions.

SPECIFICATION FOCUS

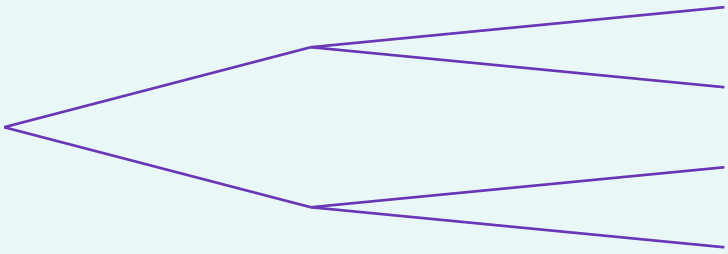
OCR reference OCR 11.01-11.02 synthesis. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Mixed probability problems require a model choice. Equal likelihood, replacement, exclusivity and independence are assumptions that must be justified, not guessed.

KEY VOCABULARY

model • assumption • exhaustive • independence • validation



multiply along a path • add alternative paths

Why the method works

- The representation accounts for the complete outcome structure.
- Addition combines disjoint alternatives; multiplication follows sequential conditions.
- Complements and totals provide independent checks.

CHECK BEFORE MOVING ON

Answer mentally: A fair die and coin are used. Find P(even and head). Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Mixed probability reasoning — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Decide whether outcomes are equally likely, independent and exhaustive.
- Choose fractions, tables, Venn diagrams or trees.
- Check totals and probabilities against $0 \leq P \leq 1$.

WORKED EXAMPLE 1

A fair die and coin are used. Find P(even and head).

SOLUTION

1. P(even)=1/2 and P(head)=1/2.
2. Multiply:1/4.

ANSWER: 1/4

WORKED EXAMPLE 2

P(A)=0.55, P(B)=0.25, disjoint. Find P(A or B).

SOLUTION

1. Add disjoint probabilities.

ANSWER: 0.80

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Mixed probability reasoning — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Real risk decisions combine data, models and careful interpretation.

Common misconceptions

- Assuming outcomes are equally likely without evidence.
- Adding when a sequential path requires multiplication.
- Failing to update totals or double-counting overlap.

GUIDED TRY

In 80 people, 46 like tea,35 coffee,12 both. Find neither. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

State two checks for a probability solution. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Mixed probability reasoning

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. **A fair die and coin are used. Find P(even and head).** **[3]**

2. **P(A)=0.55, P(B)=0.25, disjoint. Find P(A or B).** **[2]**

3. **In 80 people, 46 like tea,35 coffee,12 both. Find neither.** **[3]**

4. **A machine has defect probability 0.04. Find P(no defect).** **[1]**

5. **Two independent successes have probabilities 0.8 and 0.6. Find both.** **[2]**

6. **A sample gives 27 successes in 45. Predict in 300.** **[3]**

7. **A bag has 2 red,3 blue. Two without replacement. Find P(two same colour).** **[4]**

8. **State two checks for a probability solution.** **[2]**

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Probability language and the 0-to-1 scale

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. Write “three chances in ten” as a probability.

ANSWER: 3/10 or 0.3

Method cue: Probability=favourable proportion 3 out of 10. Check sign, size, accuracy and units.

2. Place impossible, unlikely, even chance, likely and certain in order.

ANSWER: Impossible, unlikely, even chance, likely, certain

Method cue: Order from probability 0 to 1. Check sign, size, accuracy and units.

3. Write 65% as a probability decimal.

ANSWER: 0.65

Method cue: Divide by 100. Check sign, size, accuracy and units.

4. Is probability 1.2 possible?

ANSWER: No

Method cue: Probabilities cannot exceed 1. Check sign, size, accuracy and units.

5. An event has probability 0. State its meaning.

ANSWER: It is impossible in the model

Method cue: It should not occur under stated conditions. Check sign, size, accuracy and units.

6. Compare 3/5 and 0.58. Which is more likely?

ANSWER: 3/5

Method cue: 3/5=0.6, which exceeds 0.58. Check sign, size, accuracy and units.

7. Write 0.125 as a fraction in simplest form.

ANSWER: 1/8

Method cue: 0.125=125/1000. Check sign, size, accuracy and units.

8. Explain why “unlikely” does not mean impossible.

ANSWER: An unlikely event has probability greater than 0 but below an even chance.

Method cue: Impossible has probability exactly 0. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Theoretical probability

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. A fair die is rolled. Find P(5).

ANSWER: 1/6

Method cue: One favourable face out of six. Check sign, size, accuracy and units.

2. Find P(even) on a fair die.

ANSWER: 1/2

Method cue: Even faces 2,4,6: 3/6=1/2. Check sign, size, accuracy and units.

3. A bag has 4 red and 6 blue counters. Find P(red).

ANSWER: 2/5

Method cue: 4 favourable out of 10. Check sign, size, accuracy and units.

4. Choose a letter from MATHS. Find P(A).

ANSWER: 1/5

Method cue: One A among five positions. Check sign, size, accuracy and units.

5. A spinner has 8 equal sectors, 3 green. Find P(not green).

ANSWER: 5/8

Method cue: Five sectors are not green. Check sign, size, accuracy and units.

6. Choose an integer from 1 to 12. Find P(factor of 12).

ANSWER: 1/2

Method cue: Factors:1,2,3,4,6,12: six outcomes. Check sign, size, accuracy and units.

7. A fair coin is tossed. Find P(tail).

ANSWER: 1/2

Method cue: Two equally likely outcomes. Check sign, size, accuracy and units.

8. Why is counting sectors invalid if spinner sectors have unequal areas?

ANSWER: The outcomes are not equally likely.

Method cue: Probability must account for sector size, not only number. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Complements and exhaustive outcomes

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. P(rain)=0.35. Find P(no rain).

ANSWER: 0.65

Method cue: 1-0.35=0.65. Check sign, size, accuracy and units.

2. A spinner gives A,B,C with probabilities 0.2,0.45,x. Find x.

ANSWER: 0.35

Method cue: x=1-0.2-0.45=0.35. Check sign, size, accuracy and units.

3. P(win)=3/8. Find P(not win).

ANSWER: 5/8

Method cue: 1-3/8=5/8. Check sign, size, accuracy and units.

4. Outcomes red, blue, green have probabilities 1/4,1/2,1/4. Are they exhaustive?

ANSWER: Yes

Method cue: Their probabilities sum to 1. Check sign, size, accuracy and units.

5. Can disjoint events each have probability 0.7?

ANSWER: No

Method cue: Their sum would be 1.4>1. Check sign, size, accuracy and units.

6. P(bus late)=0.18. In 200 days, estimate days not late.

ANSWER: 164

Method cue: P(not late)=0.82. Check sign, size, accuracy and units.

7. A biased coin has P(head)=0.62. Find P(tail).

ANSWER: 0.38

Method cue: 1-0.62=0.38. Check sign, size, accuracy and units.

8. Explain “mutually exclusive”.

ANSWER: The events cannot happen on the same trial.

Method cue: Their intersection is empty. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Sample spaces and systematic enumeration

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. Toss two coins. List the sample space.

ANSWER: HH, HT, TH, TT

Method cue: Use ordered outcomes for first and second toss. Check sign, size, accuracy and units.

2. Two fair coins: find P(exactly one head).

ANSWER: 1/2

Method cue: HT and TH are favourable. Check sign, size, accuracy and units.

3. Roll two dice. How many ordered outcomes?

ANSWER: 36

Method cue: 6×6=36. Check sign, size, accuracy and units.

4. Two dice: find P(total 7).

ANSWER: 1/6

Method cue: Six pairs sum to 7. Check sign, size, accuracy and units.

5. Choose from {1,2,3} and {A,B}. How many pairs?

ANSWER: 6

Method cue: 3×2=6. Check sign, size, accuracy and units.

6. Two dice: find P(double).

ANSWER: 1/6

Method cue: Six doubles among 36 outcomes. Check sign, size, accuracy and units.

7. Two spinners have 3 and 4 equal sectors. Find total outcomes.

ANSWER: 12

Method cue: 3×4=12. Check sign, size, accuracy and units.

8. Why are dice totals not equally likely?

ANSWER: Different totals have different numbers of ordered pairs.

Method cue: For example 7 has six pairs but 2 has one. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Experimental probability

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. A coin gives 56 heads in 100 tosses. Estimate P(head).

ANSWER: 0.56

Method cue: 56÷100=0.56. Check sign, size, accuracy and units.

2. A bus is late 18 times in 120 days. Estimate probability.

ANSWER: 0.15

Method cue: 18÷120=0.15. Check sign, size, accuracy and units.

3. Using P(defect)=0.03, predict defects in 800 items.

ANSWER: 24

Method cue: 800×0.03=24. Check sign, size, accuracy and units.

4. A spinner gives red 42 times in 150. Estimate P(red).

ANSWER: 0.28

Method cue: 42÷150=0.28. Check sign, size, accuracy and units.

5. Which is more reliable: 20 trials or 2000 trials?

ANSWER: 2000 trials

Method cue: Larger samples reduce random variation. Check sign, size, accuracy and units.

6. Two experiments estimate 0.48 and 0.53. Must one be wrong?

ANSWER: No

Method cue: Random samples vary. Check sign, size, accuracy and units.

7. An event occurs 9 times; relative frequency 0.12. Find trials.

ANSWER: 75

Method cue: 9/n=0.12. Check sign, size, accuracy and units.

8. Explain why an experimental probability may differ from theory.

ANSWER: Random variation occurs in finite samples.

Method cue: Bias or imperfect equipment may also affect results. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Expected frequency and fairness

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. P(win)=0.2. Find expected wins in 350 games.

ANSWER: 70

Method cue: 350×0.2=70. Check sign, size, accuracy and units.

2. A fair die is rolled 240 times. Expected sixes?

ANSWER: 40

Method cue: 240×1/6=40. Check sign, size, accuracy and units.

3. A spinner predicts 75 red in 300 spins. Find P(red).

ANSWER: 0.25

Method cue: 75÷300=0.25. Check sign, size, accuracy and units.

4. A coin gives 68 heads in 100 tosses. Is this evidence it may be biased?

ANSWER: Possibly; investigate with more trials

Method cue: Expected is 50, observed differs by 18. Check sign, size, accuracy and units.

5. P(defect)=1/50. Expected good items in 1000?

ANSWER: 980

Method cue: Expected defects=20. Check sign, size, accuracy and units.

6. A game costs £2 and wins £5 with probability 0.3. Expected payout per play?

ANSWER: £1.50

Method cue: 0.3×£5=£1.50. Check sign, size, accuracy and units.

7. Why can expected frequency be non-integer?

ANSWER: It is a long-run average, not a guaranteed trial count.

Method cue: Actual counts must be whole, expectation need not be. Check sign, size, accuracy and units.

8. State one fairness check for a spinner.

ANSWER: Spin many times and compare relative frequencies with sector proportions.

Method cue: Use a sufficiently large sample. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Set notation and Venn diagrams

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. In 30 students, 18 study French, 12 Spanish, 5 both. Find French only.

ANSWER: 13

Method cue: 18-5=13. Check sign, size, accuracy and units.

2. Using the same data, find studying at least one.

ANSWER: 25

Method cue: 18+12-5=25. Check sign, size, accuracy and units.

3. Find neither.

ANSWER: 5

Method cue: 30-25=5. Check sign, size, accuracy and units.

4. If n(A)=20,n(B)=17,n(A∩B)=6, find n(A∪B).

ANSWER: 31

Method cue: 20+17-6=31. Check sign, size, accuracy and units.

5. A die event A={2,4,6}, B={4,5,6}. Find A∩B.

ANSWER: {4, 6}

Method cue: List common members. Check sign, size, accuracy and units.

6. For the same sets, find A∪B.

ANSWER: {2, 4, 5, 6}

Method cue: Include every member once. Check sign, size, accuracy and units.

7. Why subtract the intersection in n(A∪B)?

ANSWER: It was counted once in A and once in B.

Method cue: Subtract one copy to avoid double counting. Check sign, size, accuracy and units.

8. A Venn diagram has 8 A-only,3 both,5 B-only,4 outside. Find P(A).

ANSWER: 11/20

Method cue: Total=20. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Tree diagrams with replacement

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. A coin is tossed twice. Find P(HH).

ANSWER: 1/4

Method cue: 1/2×1/2=1/4. Check sign, size, accuracy and units.

2. P(success)=0.7 independently twice. Find both successes.

ANSWER: 0.49

Method cue: 0.7×0.7=0.49. Check sign, size, accuracy and units.

3. For the same trials, find exactly one success.

ANSWER: 0.42

Method cue: Paths SF and FS each 0.7×0.3=0.21. Check sign, size, accuracy and units.

4. A bag draw with replacement has P(red)=0.4. Find two reds.

ANSWER: 0.16

Method cue: 0.4×0.4=0.16. Check sign, size, accuracy and units.

5. Find at least one red in those two draws.

ANSWER: 0.64

Method cue: P(no red)=0.6^2=0.36. Check sign, size, accuracy and units.

6. A branch has probabilities 0.35 and x. Find x.

ANSWER: 0.65

Method cue: Branches sum to 1. Check sign, size, accuracy and units.

7. Why do replacement branch probabilities stay constant?

ANSWER: The composition is restored after each draw.

Method cue: The second trial has the same model as the first. Check sign, size, accuracy and units.

8. State the tree rule for “A then B” and “either route”.

ANSWER: Multiply along a route; add mutually exclusive routes.

Method cue: Follow one path first. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Tree diagrams without replacement

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. Bag: 3 red,2 blue. Draw two without replacement. Find P(RR).

ANSWER: 3/10

Method cue: 3/5×2/4=6/20=3/10. Check sign, size, accuracy and units.

2. Find P(BB).

ANSWER: 1/10

Method cue: 2/5×1/4=2/20=1/10. Check sign, size, accuracy and units.

3. Find P(one of each).

ANSWER: 3/5

Method cue: RB=3/5×2/4=3/10. Check sign, size, accuracy and units.

4. Bag: 5 green,1 yellow. Find P(yellow then green).

ANSWER: 1/6

Method cue: 1/6×5/5=1/6. Check sign, size, accuracy and units.

5. Why is the second denominator one smaller?

ANSWER: One item has been removed and not returned.

Method cue: The total population decreases by one. Check sign, size, accuracy and units.

6. Bag 4 red,3 blue. After red first, find P(blue second).

ANSWER: 1/2

Method cue: Six remain, three blue. Check sign, size, accuracy and units.

7. Find P(at least one yellow) when 2 yellow,3 white and two draws.

ANSWER: 7/10

Method cue: P(no yellow)=3/5×2/4=3/10. Check sign, size, accuracy and units.

8. State one check on a without-replacement tree.

ANSWER: Second-stage probabilities must reflect the first outcome and sum to 1.

Method cue: Update numerator and denominator. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Mixed probability reasoning

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. A fair die and coin are used. Find P(even and head).

ANSWER: 1/4

Method cue: P(even)=1/2 and P(head)=1/2. Check sign, size, accuracy and units.

2. P(A)=0.55, P(B)=0.25, disjoint. Find P(A or B).

ANSWER: 0.80

Method cue: Add disjoint probabilities. Check sign, size, accuracy and units.

3. In 80 people, 46 like tea,35 coffee,12 both. Find neither.

ANSWER: 11

Method cue: At least one=46+35-12=69. Check sign, size, accuracy and units.

4. A machine has defect probability 0.04. Find P(no defect).

ANSWER: 0.96

Method cue: 1-0.04=0.96. Check sign, size, accuracy and units.

5. Two independent successes have probabilities 0.8 and 0.6. Find both.

ANSWER: 0.48

Method cue: 0.8×0.6=0.48. Check sign, size, accuracy and units.

6. A sample gives 27 successes in 45. Predict in 300.

ANSWER: 180

Method cue: Relative frequency=27/45=0.6. Check sign, size, accuracy and units.

7. A bag has 2 red,3 blue. Two without replacement. Find P(two same colour).

ANSWER: 2/5

Method cue: RR=2/5×1/4=1/10. Check sign, size, accuracy and units.

8. State two checks for a probability solution.

ANSWER: Probabilities lie from 0 to 1 and exhaustive branches/cells total 1.

Method cue: Check assumptions. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Independent authorship and release check

OCR Foundation Mathematics • Unit 8 Probability

ORIGINAL-CONTENT STATEMENT

This publication contains independently written teaching explanations, examples, practice questions, numerical data, diagrams and solutions. OCR is referenced solely to identify the J560 qualification. No OCR logo, official assessment question, mark scheme, examiner-report text or protected assessment layout is reproduced.

Release checklist

- 10 publisher-organised chapters mapped to OCR J560 section 11.
- Every chapter begins on a new page and contains conceptual explanation.
- Original vector diagrams and two worked examples appear in every chapter.
- Applications, misconceptions, guided reasoning and independent practice are included.
- Answers are collected at the end with method cues.
- Copyright, trademark and non-endorsement wording included.

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