

THE UNIT QUESTION · MATHEMATICS + ENGLISH LANGUAGE & LITERATURE

“Would you trust an algorithm?”

Today: The algorithm that selects

LESSON 1 ✓ Algorithms around us	LESSON 2 ✓ Conditional probability	LESSON 3 ✓ Tests and base rate	LESSON 4 · TODAY The algorithm that selects	LESSON 5 Which criterion is fair?	LESSON 6 Opinion article: revision	LESSON 7 Public debate	LESSON 8 Publication and Unit Report
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THE BIG IDEA

A selection algorithm is a mathematical model with human decisions inside it: which criteria, with what weights, what threshold. Every threshold trades false positives against false negatives; and when the base rate is small, even an “accurate” model makes many mistakes.

THE MISCONCEPTION WE TARGET

“The algorithm is objective, so it is fair” and “90% accuracy means 9 out of 10 of its choices are right”. The worked calculation with natural frequencies shows it can be fewer than half.

1 First pass · Knowledge

WHAT THEY WILL LEARN

#	LEARNING OBJECTIVE	SUCCESS CRITERION	EVIDENCE	MAX
O1	Builds a weighted scoring model in a spreadsheet and checks how sensitive it is to the weights.	Correct weighted-sum formula; shows who changes position when one weight changes.	Spreadsheet · exit ticket, Q1	3
O2	Calculates false positives and false negatives from a two-way table and interprets the base rate.	Correct 2 × 2 table; proportion of correct “yes”; explanation in words.	Hinge question · exit ticket, Q2	4
O3	Writes an argument paragraph with a position, evidence from their own data and a counter-argument.	Position · numerical evidence · counter-argument with a reply · precise terminology.	Draft · exit ticket, Q3	3
R	Recall: 5 questions from lessons 1–3 (conditional probability, two-way tables, sensitivity and specificity).			5

Target vocabulary: weighted sum · decision threshold · false positive / negative · sensitivity · specificity · base rate · counter-argument. **Mastered:** at least 80% correct today; confirmed by recall in lesson 5.

2 Second pass · Growth

WHAT THEY WILL DEVELOP AND THROUGH WHICH ROUTE

GROWTH TARGET	WHY IN THIS LESSON	HOW IT SHOWS TODAY		
HOLISTIC COMPETENCIES Digital and AI literacy ROUTE · WITHIN THE TASK	An AI tool explains the base rate; students check it against their own table.	S · WITH SUPPORT Checks the AI answer with a checklist they are given.	I · INDEPENDENTLY Checks the critical points on their own and notes what they verified.	N · IN A NEW CONTEXT Checks the sources of their article the same way.
HOLISTIC COMPETENCIES Ethical thinking, integrity and responsibility ROUTE · BRIDGE	The group has to decide about a rule that is unfair to one person.	S · WITH SUPPORT Voices an objection when asked.	I · INDEPENDENTLY Voices a reasoned objection on their own, even if the group disagrees.	N · IN A NEW CONTEXT Does the same in another context, outside the lesson.
MENTAL TOUGHNESS Efficiency ROUTE · WAY OF WORKING	Three deliverables in 24 minutes; the group allocates its own time.	S · WITH SUPPORT Follows a timeline they are given.	I · INDEPENDENTLY The group allocates time and adjusts it at the midpoint.	N · IN A NEW CONTEXT Allocates effort the same way in their own project.

Also cultivated, without being recorded today: Empathy (in the Bridge) · Cognitive flexibility (warm-up) · Self-determination (success criteria).
Three routes of cultivation: **within the task** (the academic problem itself) · **Bridge** (a neighbouring social, emotional, ethical or cultural theme) · **way of working** (roles, climate, natural difficulty). Each lesson records the day's mark (S · I · N); a level is given only in the Developmental Profile.

3 The flow of the lesson

90 MINUTES · SIX STAGES

5' Welcome	10' Warm-up	28' Academic core	24' Application & creation	14' Bridge	9' Reflection
5' 0:00–0:05 Welcome	Case: <i>A system rejects 7 in 10 applicants for a council summer job. Is it fair?</i> Anonymous vote. The group agrees with teacher A what counts as success today. LINK TO LESSON 3 SELF-DETERMINATION		A Presents the case; writes up the success criteria. B Keeps the result of the vote for the close.		
10' 0:05–0:15 Warm-up	Recall (5'): 5 questions from lessons 1–3, mixed up. Same data, two headlines (5'): from the same table, one alarming and one reassuring headline. Are both true? RECALL · R/5 COGNITIVE FLEXIBILITY		A Reads the questions; leads the headlines. B Records the recall score.		
28' 0:15–0:43 Academic core	Worked example (8'): 1,000 applicants on a natural-frequency tree; why the proportion of correct “yes” falls when the base rate is small. Hinge question (3'). Model (12'): 40 applicants (fictional), weighted sum, threshold, 2×2 table in the spreadsheet. AI check (5'): they ask an AI tool to explain the result; they mark “verified / accepted”. O1 · O2 AI LITERACY		A Models; asks “show me where in the table”. B Counts the answers to the hinge question; records the AI check.		
24' 0:43–1:07 Application & creation	Sensitivity (10'): they change weights and threshold; who is excluded now? Draft (10'): an argument paragraph with a number from their own model. Feedback (4'): swap with criteria. Roles: analyst, checker, writer. The group makes its own timeline and checks it at 12'. O1 · O3 EFFICIENCY		A Does not correct the timeline; at 12' asks “are you where you wanted to be?”. B Records how the group adjusts its time.		
14' 1:07–1:21 Bridge	“The gap in the CV” . Ellie’s testimony; “what does the algorithm not know?”; a group decision on the rule, with the right to object; two sentences for the article (p. 3). APPLYING O2 ETHICAL THINKING EMPATHY		A Reads the testimony; protects space for the minority view. B Records who voices a reasoned objection.		
9' 1:21–1:30 Reflection	Exit ticket (6'): three questions with confidence 1–4 (p. 4). The vote again (1'): “What would change my mind?” Challenge (2'). O1–O3 SELF-REGULATED LEARNING		A Hands out and collects the exit ticket. B Compares the vote before and after.		

4 Bridge · from knowledge to life

14 MINUTES · A ROUTE OF CULTIVATION

BRIDGE · THE PERSON BEHIND THE NUMBER · CARE AND FAIRNESS

“The gap in the CV”

The model they built deducts points for “gaps” in a CV. Ellie was away for two years to look after her mother. The false negatives in the table acquire a face.

HOW IT UNFOLDS

1. **The testimony (3')**. Ellie, 24, in the first person. Presented as fiction based on real circumstances.
2. **What does the algorithm not know? (3')** A list in pairs.
3. **Group decision (6')**. Change the rule, keep it, or add a human check? Anyone who disagrees records a reasoned objection.
4. **Two sentences (2')** for the article: “An algorithm is fair when...”

Cultivates: Ethical thinking · Empathy.

QUESTIONS FOR DISCUSSION

- Is the number neutral if its rules are not?
- Who is responsible for an algorithm’s mistake?
- What would you want a system to know about you?

CARE

Some students may already be caring for someone at home. No one is asked to talk about their own family. An objection is assessed on its reasoning, not on its side.

The Bridge is not a moral lesson. We ask, we listen, and the children take a position; the day’s learning gives them the tools to think it through.

5 How · Methods, strategies, practices

MODEL 2 IN PRACTICE

METHODS

Case-based learning. A system rejects 7 in 10.
Project-based learning. A model and an article for a real audience.

STRATEGIES

Retrieval practice with interleaving · **Worked example** with natural frequencies · **Hinge question** · **Human–AI collaboration** with verification · **Metacognition**.

CLASSROOM PRACTICES

Spreadsheet · **Group roles** and a timeline · **Peer feedback** against criteria · **Exit ticket**.

6 Differentiation

SAME OBJECTIVES, DIFFERENT SUPPORT

MORE SUPPORT

- Natural-frequency tree template.
- Ready-made formula in the first cell of the sheet.
- Paragraph frame: Position → Evidence → Counter-argument → Reply.

MORE CHALLENGE

- Proportion of correct “yes” for a base rate of 1% and 30%, on a graph.
- The same false-positive rate in two groups of applicants? What does “fair” mean?

FADING THE SUPPORT

In lesson 5 the 2 × 2 table is built from raw data, with no template.

WHERE THEY WILL MEET IT AT SCHOOL

GCSE Mathematics: probability, two-way tables, tree diagrams and conditional probability (Higher tier). The base rate goes a step beyond the specification. GCSE English Language: writing to present a viewpoint; opinion articles.

HOW IT BUILDS ON THE PREVIOUS LESSON

In lesson 3 they calculated sensitivity and specificity for a medical test. Today the same mathematical structure becomes a decision about people.

7 Assessment

EVERY ASSESSMENT LEADS TO A DECISION

HINGE QUESTION · MIDWAY THROUGH THE CORE

"A system correctly identifies 90% of suitable and 90% of unsuitable applicants. Only 5 in 100 applicants are suitable. Of those it labels 'suitable', how many really are?" A: about 90% · B: about 50% · C: about 32%.

CORRECT: C

DECISION RULE

If at least 6 of the 8 choose C, we move on to the model. Otherwise teacher A rebuilds the tree with 100 applicants (3'): 4.5 correct "yes", 9.5 wrong "yes".

WHEN	TYPE	TOOL	WHAT WE DECIDE	WHERE IT IS RECORDED
Warm-up	Diagnostic	Recall: 5 questions from lessons 1–3	Whether conditional probability needs a reminder	Progress: before → today
Core	Formative	Hinge question: base rate	Model, or a second frequency tree	Not scored
Core	Developmental	AI check: "verified / accepted"	Who needs a checklist	Mark S / I / N · AI literacy
Application	Developmental	Timeline and adjustment	Whether the group needs a checkpoint	Mark S / I / N · efficiency
Application	Peer	Feedback on the draft against criteria	What is revised in lesson 6	The article draft
Bridge	Developmental	Objection or agreement, with reasons	What we discuss in lesson 5	Mark S / I / N · ethical thinking
Close	Summative	Exit ticket · 10 marks · confidence 1–4	Mastered (≥80%) or revisited	Score per objective O1–O3

In the Bridge we do not assess what the child believes, but how they think, and only when that is a target for the day.

8 Exit ticket

10 MARKS · ONE QUESTION PER OBJECTIVE · CONFIDENCE 1–4 ON EACH QUESTION

QUESTION 1 · O1

CONFIDENCE ☐1☐2☐3☐4 3 MARKS

Weights: grades 0.5 · experience 0.3 · interview 0.2. A has 80 / 40 / 90 and B has 70 / 90 / 50. Calculate their scores. Who leads if the weights become 0.5 · 0.1 · 0.4?

A = 70, B = 72 (2) · with the new weights A = 80, B = 64: A leads (1).

QUESTION 2 · O2

CONFIDENCE ☐1☐2☐3☐4 4 MARKS

1,000 applicants, 100 suitable. The system says "yes" to 80 suitable and 90 unsuitable applicants. Draw the 2 × 2 table. What percentage of the "yes" answers is correct? Why so low?

Correct table: 80 · 20 · 90 · 810 (2) · 80 / 170 = 47% (1) · explanation using the base rate (1).

	SYSTEM: "YES"	SYSTEM: "NO"
SUITABLE		
UNSUITABLE		

QUESTION 3 · O3

CONFIDENCE ☐1☐2☐3☐4 3 MARKS

In 4–5 sentences: should the council use the model for the summer jobs?

Clear position (1) · numerical evidence from the model (1) · counter-argument with a reply (1).

CHALLENGE · ~15' A TALK AT THE TABLE

Ask an adult in your family: when was a decision about you made by a "system" or a "rule", without anyone listening to you? What would you have wanted it to know?

Bring back: one sentence from the conversation. It could open your article (lesson 6).

MATERIALS

4 laptops with a spreadsheet · file of 40 applicants (fictional) · AI tool on the Academy's shared account, with no personal student data · Ellie's testimony · role cards · feedback criteria · A/B/C cards · exit tickets.

WHAT GOES INTO THE LESSON REPORT

Score and level on each knowledge objective · progress in recall · S / I / N mark for AI literacy, ethical thinking and efficiency · one sentence from the student · the Bridge with one question for home · the Challenge. The family receives the report after the lesson.