Lesson 1 — Discussion Points

Concise plan: Scalar · Vector · Matrix; model vs. view; traversal; intentional inefficiency; authorship.

1) Data representations: Scalar · Vector · Matrix

- Idea: A scalar is a single number (size/step/frequency). A vector is an ordered set of scalars (color RGB = three numbers; position (y, x)). A matrix is a table of scalars ROWS×COLS that defines the picture.
- Key thought: a vector is made of scalars; a matrix is a field of scalars over positions.
- Questions: What changes if you increase TILE_SIZE only? Why can’t color be a single number?
- Mini-tasks: Name one scalar, one vector, and one matrix from the project and explain their roles.

2) Model ↔ View: NumPy (data) and Pygame (rendering)

- Separation of concerns: NumPy stores and changes the data; Pygame draws.
- Mapping rule (palette/LUT): value/index → vector color. One rule generates the whole image.
- Single source of truth: the truth lives in the matrix; the screen is a derivative.
- Questions: Where do the data “live”? What happens if we change the color rule but not the data?
- Mini-task: Describe (in words) flipping the rule (e.g., 0→white, 1→black) and predict the result.

3) Matrix traversal and a uniform rule

- Double loop visits every cell; we apply the same rule at every position.
- Local algorithms: point, full row/column, rectangular block, main diagonal (y == x).
- Questions: How do you describe a border frame in words? Where is the main diagonal, and why y==x?

4) Intentional inefficiency (and estimating complexity)

- Why it’s fine now: clarity over speed in Lesson 1.
- Hot spots: we redraw all cells and the grid every frame; the nested for costs about ROWS×COLS ops per frame.
- Growth: doubling ROWS and COLS → 4× more work.
- Questions: What will slow down first? How could we reduce work without changing meaning (draw the grid once; update only changed cells;

palette/LUT; render once and scale — for later lessons).

5) Authorship and author’s responsibility

- Idea: Each student is the author of a small object (16×16 pixel-art or 1–2 letters) and owns the result: clarity, reproducibility, neatness.
- Requirements: originality; 2–3 “how it’s made” rules in matrix terms (rows/columns/blocks); a small signature (initials) in the corner.
- Quick check: object is visible; signed; rules are described; one deliberate choice is explained (why that placement/shape).