SCHOOL OF FUTURISTIC INTELLIGENCE

PRIVATE MATHEMATICS ASSIGNMENT

From Schläfli Symbols to Geometric Structure

Deriving and interpreting symbols for regular polygons, polyhedra, tessellations, and cubical higher-dimensional forms

Student	Session	Suggested time
SFI Student	August 26, 2026	55 minutes

Complete the problems without using a symbol list on the first attempt. Draw a small local diagram whenever faces meeting at a vertex or cells meeting along an edge are involved. Afterward, verify the geometry with the relevant Mathematics Worlds and correct explanations in your own words.

Reconstruct the notation

Derive each answer from the face shape and the local meeting rule. Include a short explanation.

1. What is the Schläfli symbol for a regular nine-sided polygon? Why does it need only one entry?

2. A regular polyhedron has pentagonal faces, and three faces meet at every vertex. Derive its symbol and identify it.

3. A regular polyhedron has triangular faces, and four faces meet at every vertex. Derive its symbol and identify it.

4. Explain why {5,3} and {3,5} are neither ratios nor interchangeable pairs of numbers.

Read tessellations locally

Focus on one vertex of each repeating pattern rather than trying to count the entire diagram.

5. Six equilateral triangles meet around every vertex of a planar tessellation. Write its symbol and explain both entries.

6. Derive the symbols for (a) a square tessellation and (b) a regular hexagonal tessellation.

7. A student says, “The first entry is always the smaller number, so a hexagonal tessellation must be {3,6}.” Correct the rule and the conclusion.

8. The cube and square tessellation begin with the same number: {4,3} and {4,4}. What common feature does the 4 record, and what different structures do the second entries record?

Projection, unfolding, and the tesseract

Separate the true combinatorial structure from how a projection happens to look.

9. A three-dimensional projection of a tesseract shows several skewed or compressed-looking cubical cells. Why can they still represent regular cubes in the original tesseract?

10. A cube can be unfolded into a two-dimensional net of six squares, while a tesseract can be unfolded into a three-dimensional net of eight cubes. Explain the dimensional analogy.

11. Reconstruct {4,3,3} from the inside out. Explain the geometric meaning of the 4, the first 3, and the final 3.

12. Compare {4,3,3} and {4,3,4}. State what remains unchanged, what changes, and what each complete symbol represents.

Limits and counting connections

Finish by testing the boundary of the notation and reconstructing the opening counting meditation.

13. Suppose a polyhedron has both triangular and square faces, and different vertices have different arrangements. Explain precisely why one simple regular symbol {p,q} cannot describe it.

14. Reconstruct the counting warm-up: (a) find the two Fibonacci terms after 89; (b) write decimal 13 in binary and show its powers-of-two decomposition; (c) list all seven unordered partitions of 5.