Drawing Snake Scales on a Cylindrical Dowel: Curvature and Foreshortening

Original tasks 1, 2 / complete keys

Task 1

A dowel measures 72 mm around. You choose 12 scales around and a scale height of 4 mm with one-third overlap. Calculate arc width per scale and visible row spacing. Describe the pattern at the front center and at the silhouette.

Answer: Arc width is 72 divided by 12, which equals 6 mm. Visible row spacing is 4 mm minus one third of 4 mm, about 2.67 mm. At the front center, scales are about 6 mm wide along the curved guide arc. Near the silhouette, taper apparent width toward zero and omit side edges that would be hidden.

Reason: Dividing circumference by scale count gives arc width. Subtracting the overlap fraction from scale height gives visible row spacing. Foreshortening requires tapering width toward the silhouette.

Check: Multiply 12 by 6 mm to get 72 mm, matching the measured circumference. Multiply visible row spacing by the number of rows and compare with the intended covered length.

Task 2

A dowel has a circumference of 50 mm. You want scales about 5 mm wide at the front center. How many scales around should you choose, and what is the visible row spacing if scale height is 3 mm with one-third overlap?

Answer: Choose 10 scales around because 50 divided by 5 equals 10. Visible row spacing is 3 mm minus one third of 3 mm, which equals 2 mm. Draw curved guide arcs and taper width toward the silhouette.

Reason: Scale count equals circumference divided by desired arc width. Visible row spacing follows from scale height and overlap fraction.

Check: Multiply 10 by 5 mm to get 50 mm. Check that row spacing times row count is close to the covered length.

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Original tasks 3, 4 / complete keys

Task 3

You have drawn 6 rows with a visible row spacing of 3 mm. The dowel length you intend to cover is 20 mm. Does the pattern fit? Show the arithmetic and state one adjustment if needed.

Answer: Six rows times 3 mm equals 18 mm, which is 2 mm short of 20 mm. Add one more row to reach 21 mm, or increase visible row spacing slightly. Keep units in millimeters and label chosen values as hypothetical.

Reason: Multiplying row count by visible spacing estimates covered length. Comparing with the target length shows whether the pattern fits.

Check: Recalculate after adjustment: 7 rows times 3 mm equals 21 mm, which covers the 20 mm target with a small margin.

Task 4

A drawing shows full-width scales right up to the silhouette line. Identify the problem and describe two changes that would improve the cylinder illusion.

Answer: The problem is missing foreshortening: scales at the silhouette should appear narrower, not full width. First, taper apparent scale width gradually toward each edge. Second, stop drawing side edges that would fall behind the silhouette. Keep the overlap fraction consistent.

Reason: On a cylinder, the surface turns away at the silhouette, so apparent width shrinks. Drawing full-width scales there breaks the curvature illusion.

Check: Review the drawing from a short distance. If the edge scales look flat or pasted on, reduce their apparent width further and remove hidden side edges.

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Source rubric / reflection

- [ ] Scale shape follows a single stated convention consistently across the drawing.
- [ ] Curvature guide arcs are curved, not straight, and bulge at the front center.
- [ ] Apparent scale width tapers toward each silhouette to show foreshortening.
- [ ] Overlap fraction is consistent from row to row.
- [ ] Arithmetic check uses consistent units and is recorded beside the drawing.
- [ ] Valid alternative scale shapes are accepted if applied consistently.

Reflection: What did you check, what did you change, and what will you try next?