Draw Overlapping Fish-Scale Rows with Shading

Original tasks 1, 2, 3 / complete keys

Task 1

A row is 8 cm wide with 5 equal scales. The scale height is 4 cm and the next row overlaps by one-quarter of the height. Find the scale width, the row spacing, and the sideways offset.

Answer: Scale width = 8 ÷ 5 = 1.6 cm. Overlap = 4 × 1/4 = 1 cm. Row spacing = 4 − 1 = 3 cm. Offset = 1.6 ÷ 2 = 0.8 cm.

Reason: Divide row width by scale count. Multiply height by the overlap fraction, subtract from height for spacing, and halve scale width for offset.

Check: Row spacing plus overlap equals scale height: 3 + 1 = 4 cm. Scale width times count equals row width: 1.6 × 5 = 8 cm.

Task 2

You draw three rows with 6 scales each. Each scale overlaps the row below by 1 cm, and the scale height is 3 cm. How far below the first baseline is the third baseline?

Answer: Row spacing = 3 − 1 = 2 cm. Two gaps between three baselines = 2 × 2 = 4 cm below the first baseline.

Reason: Find spacing per row, then multiply by the number of gaps between baselines, which is one less than the row count.

Check: Add overlaps back: 4 cm total spacing plus 2 gaps × 1 cm overlap = 6 cm, equal to 2 gaps × 3 cm scale height.

Task 3

A scale is 2 cm wide and 3 cm tall. The light comes from the upper right. Describe where the light area, mid area, and dark contact band go on each scale, and state one check.

Answer: Light area on the upper right, mid area on the lower left body, dark narrow band under the lower overlap edge. Check: every scale's light area faces upper right and every dark band sits under the overlap edge.

Reason: Shading follows the stated light direction; the contact shadow belongs where the upper scale meets the lower one.

Check: Look at three scales in different rows and confirm the light area and dark band positions match the stated direction.

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Original tasks 4 / complete keys

Task 4

A practice plate has 4 rows. Row 1 has 7 scales, and each row below has one fewer scale. Scale width is 1.5 cm. What is the total number of scales, and how wide is the widest row?

Answer: Scales: 7 + 6 + 5 + 4 = 22. Widest row = 7 × 1.5 = 10.5 cm.

Reason: Decrease the count by one per row and sum. Multiply the largest count by scale width for the widest row.

Check: Average count is 22 ÷ 4 = 5.5, which lies between 4 and 7. Widest row check: 10.5 ÷ 7 = 1.5 cm.

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Source rubric / reflection

- [ ] Rows are offset by about half a scale and read as distinct bands.
- [ ] Every scale overlaps the row below with a visible lower edge.
- [ ] Shading follows one stated light direction across all scales.
- [ ] Contact shadows are narrow and sit under overlap edges.
- [ ] Guide marks are erased and spacing stays consistent.
- [ ] Valid alternatives in scale shape or light direction are accepted if applied consistently.

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