How to Draw Snake Scales: Overlapping Rows and Shading

Original tasks 1, 2 / complete keys

Task 1

A panel is 48 mm wide. Using a 6 mm scale unit, how many scales fit in one row, and how many full-width equivalents fit in a staggered row offset by 3 mm?

Answer: Eight full-width scales fit in the first row (48 divided by 6 equals 8), with centers at 3, 9, 15, 21, 27, 33, 39, and 45 mm; each scale spans 0–6 mm through 42–48 mm. For the staggered row, shift every center by half a unit (3 mm). Full-width scales must span 3–9 mm through 39–45 mm, so their centers fall at 6, 12, 18, 24, 30, 36, and 42 mm; the scale centered at 6 mm spans 3–9 mm and the scale centered at 42 mm spans 39–45 mm, so both are full width. The remaining edge pieces are half-width: one spans 0–3 mm (visible center at 1.5 mm) and one spans 45–48 mm (visible center at 46.5 mm). That gives 7 full-width scales plus two half-width pieces, totaling 7 + 0.5 + 0.5 = 8 full-width equivalents. Check: 8 times 6 equals 48 mm, and every staggered full-scale center is 3 mm from the nearest first-row center.

Reason: 48 divided by 6 equals 8 full-width equivalents. Offsetting by half a unit shifts centers by 3 mm, so the staggered row places full-scale centers at 6, 12, ..., 42 mm; the two edge pieces are half-width pieces spanning 0–3 mm and 45–48 mm, and the seven interior scales are full width. The total is 7 + 0.5 + 0.5 = 8 full-width equivalents.

Check: Multiply the full-width equivalents by 6 mm and confirm the total is 48 mm; confirm each staggered full-scale center is 3 mm from the nearest first-row center and that the two edge pieces are half width.

Task 2

Three rows use a 5 mm scale height with 1.25 mm overlap. What is the vertical distance from the top of row one to the top of row three?

Answer: 7.5 mm.

Reason: Each new row advances by scale height minus overlap: 5 minus 1.25 equals 3.75 mm. Two advances give 7.5 mm.

Check: Add 3.75 twice and compare with the drawn baselines.

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Original tasks 3, 4 / complete keys

Task 3

A student shades the upper-left edge of every scale but states light comes from the upper left. What is wrong, and what is the fix?

Answer: The shadow is on the lit side. Shade the lower-right edge instead, or restate the light direction as lower right and shade consistently.

Reason: Shadow falls opposite the light source; the stated direction and shaded edge must agree.

Check: Compare the written light direction with the shaded edge on three scales.

Task 4

A row of 9 scales is followed by a row of 9 scales with no offset. What visual problem appears, and how many scales should the offset row show if half-scales are allowed?

Answer: A vertical seam appears because scale edges line up in columns. For a 9-unit-wide row of 1-unit-wide scales offset by half a unit, place full-scale centers at 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, and 8.0 units, so each full scale spans 0.5–1.5 through 7.5–8.5 units. Add two half-width edge pieces: one spanning 0–0.5 units (visible center at 0.25 units) and one spanning 8.5–9 units (visible center at 8.75 units). That gives 8 full-width scales plus two half-width pieces, covering 8 + 0.5 + 0.5 = 9 units. Check: 8 + 0.5 + 0.5 = 9 units, and every staggered full-scale center is 0.5 units from the nearest unoffset center.

Reason: No offset aligns scale edges into columns. A half-unit offset staggers centers and permits edge half-scales, so the staggered row contains eight full-width scales and two half-width edge pieces, totaling 9 units.

Check: Trace a vertical line through the panel; it should cross staggered, not aligned, scale edges.

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Source rubric / reflection

- [ ] Scale unit is stated and held constant across rows.
- [ ] Rows are staggered by about half a scale width.
- [ ] Overlap is visible and roughly equal between rows.
- [ ] One light direction is stated and applied consistently.
- [ ] Overlap contact lines are darker than scale bodies.
- [ ] Valid alternatives in shape or light direction are accepted if internally consistent.

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