Cross-Contour Tree Drawing: Wrap Lines Around Trunk and Branches

Original tasks 1, 2, 3 / complete keys

Task 1

A trunk is 8 cm long with a diameter of 3 cm. A branch is 4 cm long with a diameter of 1.5 cm. Use a trunk spacing of 1 cm. Compute branch spacing, trunk intervals, trunk lines, branch intervals, and branch lines.

Answer: Branch spacing is 1 cm times 1.5/3, which equals 0.5 cm. Trunk intervals: 8 divided by 1 equals 8, so 9 lines. Branch intervals: 4 divided by 0.5 equals 8, so 9 lines.

Reason: Spacing scales with diameter ratio. Intervals equal length divided by spacing; lines equal intervals plus one for the end lines.

Check: Recompute 1.5/3 = 0.5; 8/1 = 8; 4/0.5 = 8; add one to each interval count. Confirm units are centimeters throughout.

Task 2

A trunk is 12 cm long with a diameter of 4 cm. Use a trunk spacing of 1.5 cm. Compute trunk intervals and trunk lines. Then state one valid alternative spacing rule and its line count.

Answer: Trunk intervals: 12 divided by 1.5 equals 8, so 9 lines. A valid alternative is 1 cm spacing: 12 divided by 1 equals 12 intervals, so 13 lines.

Reason: The arithmetic check uses length divided by spacing. The alternative is valid because it states a spacing rule in centimeters and keeps units consistent.

Check: Verify 12/1.5 = 8 and 12/1 = 12; add one to each. Confirm the alternative rule is recorded in centimeters.

Task 3

A branch is 6 cm long with a diameter of 2 cm. The trunk spacing is 1 cm and the trunk diameter is 4 cm. Compute branch spacing, branch intervals, and branch lines. Describe how the lines should wrap around the branch.

Answer: Branch spacing is 1 cm times 2/4, which equals 0.5 cm. Branch intervals: 6 divided by 0.5 equals 12, so 13 lines. Lines should curve around the branch's local axis, crossing the axis at approximately right angles in projection and closing cleanly on the outer contour.

Reason: Spacing scales by diameter ratio. Wrapping direction follows the branch axis, not the trunk axis.

Check: Recompute 2/4 = 0.5; 6/0.5 = 12; add one. Check that each line curves around the branch and does not depict bark or leaves.

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Original tasks 4 / complete keys

Task 4

A trunk is 9 cm long with a diameter of 3 cm. A branch is 3 cm long with a diameter of 1 cm. Use a trunk spacing of 1 cm. Compute all spacings, intervals, and lines. Then list two mistakes to avoid and how to fix them.

Answer: Branch spacing is 1 cm times 1/3, which equals about 0.33 cm. Trunk intervals: 9 divided by 1 equals 9, so 10 lines. Branch intervals: 3 divided by 0.33 equals about 9, so about 10 lines. Mistakes to avoid: straight lines without curvature, fixed by curving lines around the form; adding bark texture, fixed by erasing texture and keeping only cross-contour lines.

Reason: The branch spacing uses the diameter ratio 1/3. Rounding to 0.33 cm is acceptable if stated. The mistakes list matches the boundary and convention.

Check: Recompute 1/3 ≈ 0.33; 9/1 = 9; 3/0.33 ≈ 9; add one. Confirm the two mistakes are from the provided list and the fixes address the boundary.

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Source rubric / reflection

- [ ] Wrapping direction: lines curve around the trunk and branch surfaces (0-2 points).
- [ ] Spacing logic: spacing is stated in centimeters and scaled to diameter (0-2 points).
- [ ] Boundary compliance: no bark texture, leaf detail, or shading (0-2 points).
- [ ] Line closure: each cross-contour closes or meets the outer contour cleanly (0-2 points).
- [ ] Arithmetic check: line counts match the stated spacing rule (0-2 points).
- [ ] Valid alternative allowance: variation is explained and does not violate the convention (0-2 points).

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