Swords on Graph Paper: Grid Silhouette and Shading

Original tasks 1 / complete keys

Task 1

Plot a sword with total length 12 squares, blade length 8 squares, blade width 2 squares, guard width 6 squares, guard thickness 1 square, grip length 3 squares, and tip length 1 square. The given numbers do not sum to the stated total; identify the mismatch, choose one corrected dimension, and plot the corrected sword. Then check the arithmetic and guard symmetry.

Answer: Given zones: blade 8, guard 1, grip 3, tip 1. Sum = 8 + 1 + 3 + 1 = 13 squares, which exceeds the stated total of 12 by 1 square. Corrected plot: reduce the grip to 2 squares. Then blade 8 by 2 squares; guard 6 wide by 1 thick centered on the blade; grip 2 long by 1 wide; tip triangle base 2 height 1. Total check: 8 + 1 + 2 + 1 = 12 squares. Guard symmetry: 3 squares left and 3 squares right of the centerline. Shading with upper-left light: upper-left blade column light, lower-right blade column mid, lower-right guard half dark, upper-left guard half light, grip lower-right cell mid, tip cell light.

Reason: The zones must sum to the stated total length. The original numbers sum to 13, so one zone must change by 1 square; reducing the grip from 3 to 2 squares gives a consistent total of 12. Symmetry is checked by counting squares on each side of the blade centerline.

Check: Re-add blade, guard, grip, and tip in squares and confirm the sum is 12. Count guard squares left and right of the centerline and confirm both are 3. Count light, mid, and dark cells and confirm they match the stated shading.

Swords on Graph Paper: Grid Silhouette and Shading

Original tasks 2 / complete keys

Task 2

A drawing has blade width 3 squares and guard width 8 squares. State the ratio. Plot a symmetric guard by placing the blade centerline on a grid line so the guard extends 4 squares on each side; count squares to verify symmetry. Then shade a blade of length 6 squares and width 3 squares with upper-left light and count tones.

Answer: Guard width is 8 squares and blade width is 3 squares, so the guard is 8 ÷ 3 ≈ 2.67 times the blade width; state the ratio as 8:3. Place the blade centerline on a grid line. The blade is 3 squares wide, so its edges lie 1.5 squares left and 1.5 squares right of the centerline, on clear half-square lines. The guard is 8 squares wide, so it extends 4 squares left and 4 squares right of the centerline, with ends on grid lines. All edges lie on grid lines or clear half-squares. Blade is 6 squares long by 3 squares wide, so it contains 18 cells. Shading rule for this task: upper-left edge cells stay light, lower-right edge cells are mid, and interior cells remain light. With a 3-square-wide blade, the upper-left edge is 6 cells, the lower-right edge is 6 cells, and the interior column is 6 cells. Tone counts: light 12 cells (upper-left edge plus interior), mid 6 cells (lower-right edge), dark 0 cells. Total 18 cells.

Reason: The ratio compares guard width to blade width as 8:3. An 8-square guard is even, so a grid-line centerline gives whole-square extensions of 4 squares on each side. The 3-square blade centered on the same grid line has edges on half-square lines, which the convention allows. Shading follows the stated upper-left light direction, with each cell assigned one tone.

Check: Confirm the ratio is 8:3 by comparing the two widths. Count squares from the centerline to each guard end; both should be 4. Count half-squares from the centerline to each blade edge; both should be 1.5. Count light and mid cells on the blade and confirm light 12 + mid 6 + dark 0 = 18 cells.

Swords on Graph Paper: Grid Silhouette and Shading

Original tasks 3, 4 / complete keys

Task 3

Plot a tapered blade of length 7 squares that narrows from 3 squares at the guard to 1 square at the tip, with the width decreasing by 1 square at counted positions: width 3 for the first 3 squares, width 2 for the next 3 squares, and width 1 for the final square. Use a guard 5 squares wide and 1 square thick, and a grip 2 squares long. The target total length is 10 squares. Check total length and describe shading.

Answer: Blade 7 squares long: width 3 for squares 1–3, width 2 for squares 4–6, and width 1 for square 7. Guard 5 wide by 1 thick centered on the blade centerline. Place the centerline on a half-square line so the 5-square guard extends 2.5 squares to either side and ends on grid lines. For a 3-square blade centered there, the blade edges land on grid lines; mark those as such. Grip 2 long. Total length: 7 + 1 + 2 = 10 squares, matching the target (tip included in blade taper). Shading: upper-left taper edge light, lower-right taper edge mid, lower-right guard dark.

Reason: A tapered blade still occupies counted squares; the taper is described by width changes at counted positions. Total length sums blade, guard, and grip when the tip is part of the blade taper, and the sum is compared with the stated target of 10 squares.

Check: Count blade length squares and verify widths are 3, 3, 3, 2, 2, 2, 1 across the 7 squares. Count guard squares from the half-square centerline: 2.5 left and 2.5 right, confirming symmetry and grid-line ends. Add blade 7 + guard 1 + grip 2 and confirm the total is 10 squares, matching the target. Count tone cells and confirm lower-right surfaces are mid or dark.

Task 4

A sword drawing has 10 light cells, 5 mid cells, and 3 dark cells. The stated light direction is upper left. Propose one correction if the lower-right guard edge is light, and state the new tone counts after changing 2 cells to dark.

Answer: The lower-right guard edge should be dark under the upper-left light convention, so change 2 light cells on that edge to dark. New counts: light 8, mid 5, dark 5. Total cells remain 18.

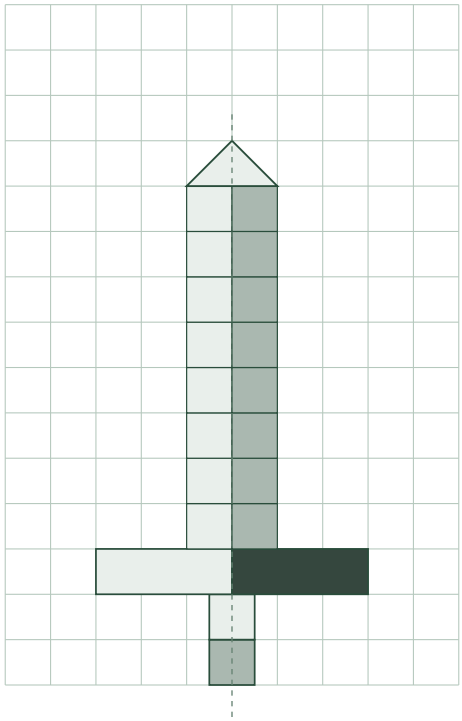
Reason: The convention assigns lower-right surfaces to mid or dark. Changing 2 cells from light to dark preserves total cell count and corrects the inconsistency.

Check: Re-count light, mid, and dark cells; confirm total equals 18; confirm lower-right guard edge is dark.

Swords on Graph Paper: Grid Silhouette and Shading

Task 1 / answers

Counted sword schematics / chosen unit = 6 mm / upper-left light convention

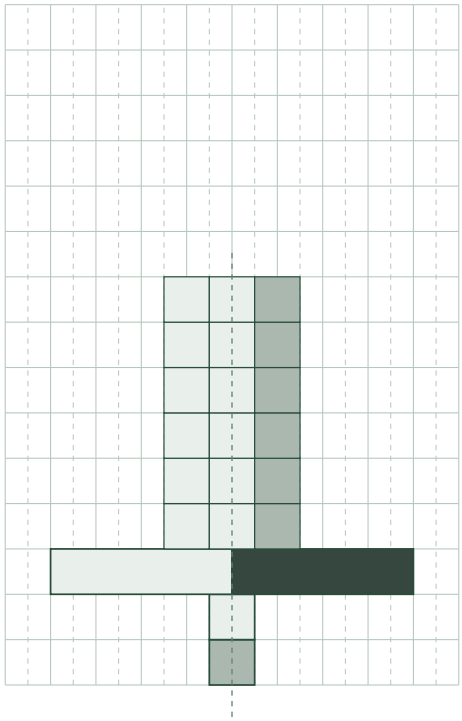


Blade rows: 2, 2, 2, 2, 2, 2, 2, 2. Guard 6 wide, 3 to each side. Axial length 8 + 1 + 2 + 1 = 12. Grip corrected from 3 to 2; original given sum was 13.

Swords on Graph Paper: Grid Silhouette and Shading

Task 2 / answers

Counted sword schematics / chosen unit = 6 mm / upper-left light convention

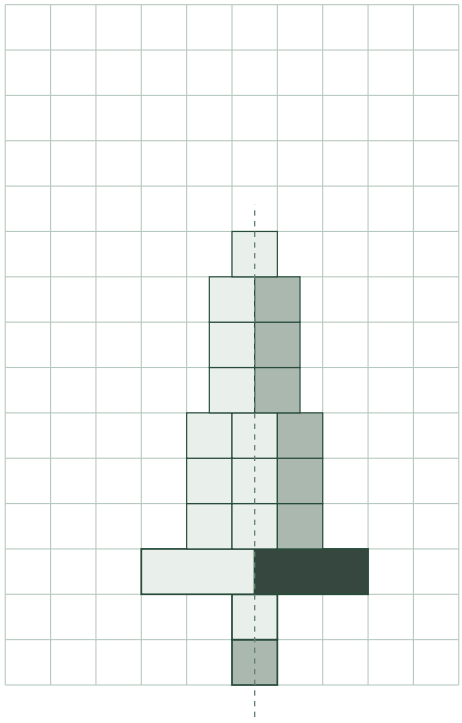


Blade rows: 3, 3, 3, 3, 3, 3. Guard 8 wide, 4 to each side. Axial length 6 + 1 + 2 + 0 = 9. Task 2 blade-only tones: 12 light, 6 mid, 0 dark.

Swords on Graph Paper: Grid Silhouette and Shading

Task 3 / answers

Counted sword schematics / chosen unit = 6 mm / upper-left light convention

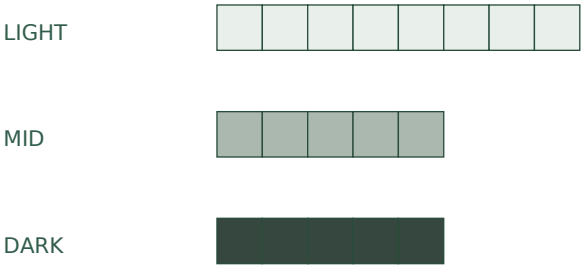


Blade rows: 3, 3, 3, 2, 2, 2, 1. Guard 5 wide, 2.5 to each side. Axial length 7 + 1 + 2 + 0 = 10.

Swords on Graph Paper: Grid Silhouette and Shading

Task 4 / answers

Counted sword schematics / chosen unit = 6 mm / upper-left light convention



Tone inventory after moving 2 light cells to dark: 8 + 5 + 5 = 18. This is an inventory chart, not a new complete sword.

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Source rubric / reflection

- [ ] Silhouette edges lie on grid lines or clear half-squares and coordinates are recorded.
- [ ] Axial length is counted as tip (if separate) + blade + guard thickness + grip; crosswise guard width is not added.
- [ ] Guard width is a whole number of squares and symmetric about the blade centerline.
- [ ] Tip base equals blade width in squares.
- [ ] Shading uses one stated light direction with light, mid, and dark cells counted.
- [ ] Style is stated in one sentence and the drawing is consistent with that statement.
- [ ] Valid alternatives such as tapered blades or rounded guards are accepted if countability and shading convention hold.

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