Draw a Winged Cross: Symmetry and Feather Placement

Original tasks 1, 2, 3 / complete keys

Task 1

A cross has a vertical bar 2 units wide and a horizontal bar 2 units wide on a 12 by 16 grid. The vertical bar starts 2 units below the top margin. The horizontal bar crosses at the horizontal center line, 6 units down from the top of the vertical bar. How many units from the top margin is the horizontal bar?

Answer: 8 units from the top margin.

Reason: The vertical bar starts 2 units below the top margin. The crossing is 6 units down the vertical bar. Add 2 plus 6 to get 8 units from the top margin, which matches the horizontal center line of the 16-unit grid. As a second check, the vertical bar ends 2 units above the bottom margin, so it is 12 units tall; the crossing is 6 units from the top and 6 units from the bottom of the bar, confirming it is the bar midpoint.

Check: Measure the distance from the top margin to the horizontal bar on your grid and compare it to 8 units, half of the 16-unit height. Also measure from the crossing point to the top and bottom ends of the vertical bar; both should be 6 units.

Task 2

Each wing extends 5 units from the cross. The left wing tip is measured 5.2 cm from the center line. The right wing tip is measured 4.9 cm from the center line. Using a hypothetical tolerance of 0.5 cm, do the wing tips pass the symmetry check?

Answer: Yes, they pass.

Reason: The difference is 5.2 minus 4.9 equals 0.3 cm. The tolerance is 0.5 cm. Since 0.3 is less than 0.5, the tips pass.

Check: Subtract the smaller distance from the larger distance and compare the result to 0.5 cm.

Task 3

A wing uses 4 inner feathers, 5 middle feathers, and 3 outer feathers. The other wing uses 4 inner, 4 middle, and 3 outer feathers. What is the total feather count difference between the wings?

Answer: 1 feather difference.

Reason: First wing total is 4 plus 5 plus 3 equals 12. Second wing total is 4 plus 4 plus 3 equals 11. The difference is 12 minus 11 equals 1.

Check: Count each layer on both wings and add the counts. Compare the two totals.

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Original tasks 4 / complete keys

Task 4

On a 12 by 16 grid, a wing root is 1 unit from the center line and the wing tip is 5 units from the center line. The wing rises 4 units above the horizontal bar. If you move the wing tip 1 unit farther out, what is the new distance from the center line, and does the wing span increase or decrease?

Answer: The new distance is 6 units, and the wing span increases.

Reason: The original tip distance is 5 units. Moving it 1 unit farther out gives 5 plus 1 equals 6 units. A larger distance from the center line means a longer wing span.

Check: Mark the new tip on the grid and measure from the center line. Confirm the distance is 6 units and compare it to the original 5 units.

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Source rubric / reflection

- [ ] Cross proportions: vertical and horizontal bars have consistent widths and paired arm lengths.
- [ ] Wing symmetry: left and right wing roots, mid-points, and tips are mirror images across the vertical center line.
- [ ] Feather placement: three layers are visible and ordered from root to tip.
- [ ] Feather counts: left and right wings have equal counts in each layer.
- [ ] Convention: any alternative feather direction is stated and applied consistently.
- [ ] Line clarity: cross outline is distinguishable from feather lines.
- [ ] Self-check: measurements and counts are recorded and within the chosen tolerance.

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