# Draw an Antique Balance Scale with Beam Symmetry and Pan Suspension

Original tasks 1, 2, 3 / complete keys

Task 1

A student draws a beam with a left half-length of 6 cm and a right half-length of 5.5 cm. The drop lines are both 4 cm. Identify the symmetry error and state the corrected right half-length.

Answer: The beam is asymmetric because the right half-length is 0.5 cm shorter than the left. The corrected right half-length is 6 cm.

Reason: Beam symmetry requires equal half-lengths from the beam centre point. Since the left is 6 cm, the right must also be 6 cm. The drop lines are already equal, so only the beam needs correction.

Check: Measure from the beam centre to each suspension point; both should read 6 cm within 1 mm.

Task 2

A drawing has pan half-widths of 2.5 cm on the left and 2.5 cm on the right, but the left pan centre is 1 cm farther from the central axis than the right pan centre. Describe how to check and correct the pan placement.

Answer: Measure the horizontal distance from the central axis to each pan centre. The left distance is 1 cm too large. Move the left pan centre 1 cm toward the axis so both distances match, then redraw the pan symmetrically about its new centre line.

Reason: Pan symmetry includes both pan shape and pan placement relative to the central axis. Equal half-widths alone do not guarantee equal placement. The correction restores equal horizontal distances.

Check: Measure from the central axis to each pan centre; the two distances should be equal within 1 mm.

Task 3

A base is drawn with a left half-width of 4 cm and a right half-width of 4.5 cm. The central column is on the axis. State the base symmetry error and give a corrected right half-width.

Answer: The base is asymmetric because the right half-width is 0.5 cm larger than the left. A corrected right half-width is 4 cm.

Reason: Base symmetry requires equal half-widths from the central axis. Since the left is 4 cm, the right should also be 4 cm. The column placement is already correct.

Check: Measure from the central axis to each base edge; both should read 4 cm within 1 mm.

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Original tasks 4 / complete keys

Task 4

A student uses a beam half-length of 7 cm, drop lines of 5 cm, pan half-width of 4 cm, and base half-width of 5 cm. All left and right measurements match. Describe the construction steps and the final symmetry check.

Answer: Draw the frame and central axis. Mark the beam axis and beam centre. Mark 7 cm left and right for suspension points. Draw 5 cm drop lines and hooks. Draw pans with 4 cm half-widths, symmetric about their own centre lines. Draw the central column on the axis and a base with 5 cm half-widths. Check that all left and right measurements are equal: beam 7 cm, drop 5 cm, pan 4 cm, base 5 cm. Differences are 0 cm, so the drawing is symmetric.

Reason: The construction follows the same order: axis, beam, suspension, drop lines, pans, column, base. The check compares each paired measurement. Equal values confirm symmetry.

Check: Record each left and right measurement in centimetres and subtract; each difference should be 0 cm or within 1 mm.

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Source rubric / reflection

- [ ] Beam is centred on the vertical axis and left and right half-lengths are equal within 1 mm.
- [ ] Suspension points are marked at equal distances from the beam centre.
- [ ] Drop lines are equal in length and pans hang at the same level.
- [ ] Each pan is symmetric about its own vertical centre line.
- [ ] Central column is centred on the vertical axis.
- [ ] Base is symmetric with equal left and right half-widths within 1 mm.
- [ ] Construction lines are light and final outlines are clear.
- [ ] Chosen numerical values are recorded and used consistently in centimetres.

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