Draw a Beam Balance Scale: Beam, Pans and Pointer

Original tasks 1, 2, 3 / complete keys

Task 1

Draw a level beam balance with a beam length of 100 mm and suspension points 40 mm from the pivot on each side. Use two chains per pan and a pointer 30 mm long.

Answer: A centered pivot, horizontal beam 100 mm long, hooks at 40 mm left and right, two matching pans with two chains each, and a 30 mm pointer through the pivot.

Reason: Each half of the beam is 50 mm, so 40 mm hooks leave 10 mm to each end and keep the arms equal. The pointer length is shorter than the post but still visible.

Check: Measure both arms from the pivot center; both should be 40 mm. Confirm the beam total is 100 mm and the pointer starts at the pivot center.

Task 2

Draw the same scale tilted so the left side is lower. Keep the beam length 100 mm and the hooks 40 mm from the pivot. Describe how the pans and pointer change.

Answer: The beam rotates about the pivot; the left hook lowers and the right hook rises. The left pan hangs lower and the right pan higher. The pointer tilts away from the middle scale mark.

Reason: A tilt rotates the beam about the fixed pivot. Equal arms mean the hooks move in opposite vertical directions. The pointer, attached at the pivot, shows the tilt against the fixed scale.

Check: Check that both hooks are still 40 mm from the pivot along the beam. Confirm the pointer still passes through the pivot center and no longer aligns with the middle mark.

Task 3

Draw a beam balance with a beam length of 140 mm and hooks 60 mm from the pivot. Add a three-mark scale behind the pointer. State the distance from each hook to the nearest beam end.

Answer: Each half of the beam is 70 mm. With hooks at 60 mm from the pivot, each hook is 10 mm from its nearest beam end. The scale has three marks with the middle mark on the centerline.

Reason: Subtract the hook distance from the half-beam length: 70 mm minus 60 mm equals 10 mm. The scale marks are placed behind the pointer tip, with the middle mark aligned to the centerline.

Check: Measure each arm from the pivot center; both should be 60 mm. Measure from each hook to the beam end; both should be 10 mm.

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Original tasks 4 / complete keys

Task 4

Draw a beam balance with a beam length of 80 mm and hooks 30 mm from the pivot. Use three chains per pan. Check whether the arms are equal and whether the hooks fit inside the beam ends.

Answer: Each half of the beam is 40 mm. Hooks at 30 mm from the pivot leave 10 mm to each beam end, so the arms are equal and the hooks fit inside the beam.

Reason: Half the beam is 40 mm. The hook distance of 30 mm is less than 40 mm, so each hook sits inside the beam end with 10 mm remaining. Three chains per pan are acceptable if both pans use three.

Check: Measure both arms from the pivot center; both should be 30 mm. Confirm each hook is 10 mm from its beam end and that both pans have three chains.

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Source rubric / reflection

- [ ] Centerline and pivot are aligned vertically.
- [ ] Beam arms are equal within 2 mm when measured from the pivot center.
- [ ] Two pans are present and similar in size.
- [ ] Chains attach to the suspension hooks and are short and similar.
- [ ] Pointer passes through the pivot center and aligns with the middle scale mark when the beam is level.
- [ ] Line quality is clear and consistent; alternative pan shapes are accepted if both pans match.

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