Balancing moments: a metre rule

Student activity • investigation and reasoning

YEAR 10 / LESSON 11 / PHYSICS ONLY

The question

Do clockwise and anticlockwise moments agree when a loaded rule balances?

Use a supported metre rule and small secured loads to test the principle of moments.

Equipment

- Metre rule with secure hooks, low blunt pivot and padded tray
- Small masses, balance and booklet

Keep rules and loads low above padded trays. Do not balance on sharp blades or overload hooks. Add and remove masses while supporting the rule; keep hands clear of the pivot and never launch a mass.

Course coverage: Physics only: 1.30P, 1.32P. Quantitative moments and equilibrium.

Plan, model or apparatus sketch

Draw a labelled setup or force diagram; include the measured quantities.

Method and reasoning

Read the whole sequence before starting

YEAR 10 / LESSON 11 / PHYSICS ONLY

1. Find the unloaded rule's balance point on a low, blunt pivot. Mark that position; do not assume that it is exactly the 50 cm mark.

2. Place the rule on the pivot over a padded tray. Attach one small staff-approved mass at a measured distance on one side, including the hook or hanger in its mass.

3. Attach a known mass on the other side and adjust its position until the rule is horizontal without being held. Keep the loads low above the tray.

4. Record both forces and perpendicular distances from the pivot. Repeat for four different balanced arrangements within the approved load range.

5. Calculate each moment using force × distance. Compare the clockwise and anticlockwise totals, showing units and the precision of your readings.

6. Predict a new balancing position, test it, and explain differences using pivot friction, load placement and measurement uncertainty.

Cleanup

- Support the rule, remove all loads and count masses before returning apparatus.

Record your evidence

Blank spaces are for your own work

YEAR 10 / LESSON 11 / PHYSICS ONLY

Reference and task data

Use g = 9.8 N kg^{-1}. If the pivot is at the unloaded centre of gravity, the rule's weight has negligible moment about it. Example calculation, not a measurement: 0.98 N at 0.20 m balances 1.96 N at 0.10 m. Include the hanger or clip in each total load.

Left force / N	Left distance / m	Right force / N	Right distance / m

Show your calculations, labelled model or correction here.

Explain and evaluate

Use evidence and show calculation steps where relevant

YEAR 10 / LESSON 11 / PHYSICS ONLY

1. Why locate the unloaded balance point?

2. What moment is produced by 0.98 N at 0.20 m?

3. Where should 1.96 N act to balance it?

4. Why include hooks in the load?

5. Does a balanced rule necessarily have zero force acting on it?

6. What causes uncertainty in the balance position?