The Balanced Beam Code

Grade 11 | Engineering | Escape room | 40 minutes

Learning target

Apply force and torque equilibrium to a simplified supported beam.

Prerequisites and materials

Linear equations; multiply force by distance. Provide pages 2-3, pencil, and a calculator if needed. These are paper-based analyses of fictional data; no physical experiment is required.

Teaching sequence

5 min: Introduce the mission and source data.

5 min: Model a similar calculation using different values.

20 min: Teams solve the locks; each learner records work.

7 min: Complete the transfer question independently.

3 min: Compare the code and discuss model limits.

Assessment and access

12 points: 3 per response. Keep calculations, units, and reasoning visible. Allow oral rehearsal, annotate variables, and supply a calculator or worked example with different values during practice. For assessment, clarify directions without giving answers.

Extension

Include a 16 N beam weight acting at its midpoint and recalculate the original reactions.

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PREVIEW - first two pages only. Full package includes responses and answer key.

Lesson reference

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Analyze a fictional weightless horizontal beam of length 4 m with vertical supports at x = 0 and x = 4 m. A downward 60 N load acts at x = 1 m and a downward 20 N load at x = 3 m. This is a paper model, not a load rating for a real structure.

Vocabulary	Meaning
reaction	A support force acting on a structure.
torque	Force times perpendicular lever arm in this model.
equilibrium	Zero net force and zero net torque.

Reference data

Quantity	Equation / value
Vertical balance	R_left + R_right = 80 N
Torque about left	4 R_right = 60(1) + 20(3) N m
Assumptions	Static loads; weightless beam; vertical forces only.

Rules and assumptions

Lock 1: total downward load 80 N = digit 2; 40 N = digit 8. Lock 2: right reaction 30 N = digit 5; 50 N = digit 1. Lock 3: left reaction 50 N = digit 9; 30 N = digit 4.



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