The Density Archive

Grade 9 | Science | Escape room | 40 minutes

Learning target

Calculate density and use a proportional mass-volume model without overclaiming material identity.

Prerequisites and materials

Divide decimals; use a proportional relationship. 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

If mass were measured to the nearest gram, discuss why a calculated density should not be reported with unlimited precision.

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



Lesson reference

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Unlock three records for fictional uniform samples. Assume density stays constant when the amount changes; ignore measurement uncertainty for these calculations.

Vocabulary	Meaning
density	Mass per unit volume: density = mass / volume.
proportional	Changing by the same scale factor.
model	A simplified description with stated assumptions.

Reference data

Sample	Mass (g)	Volume (cm^3)
A	54	20
B	81	30
C	40	20

Rules and assumptions

Use density = mass / volume and mass = density x volume. Lock 1: A has density 2.7 = digit 4; density 2.0 = digit 8. Lock 2: equal-density pair A and B = digit 6; A and C = digit 2. Lock 3: mass of 40 cm^3 of A is 108 g = digit 3; 54 g = digit 9.



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