Unlock the Parabolic Arch

Grade 10 | Mathematics | Escape room | 40 minutes

Learning target

Interpret a quadratic model's vertex, zeros, and symmetric heights within a physical domain.

Prerequisites and materials

Substitute into a quadratic; recognize a square. 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

Find the two x-values where the arch reaches 3.5 m.

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



Lesson reference

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A fictional display arch is modeled by h(x) = -0.5(x - 4)^2 + 8 metres for 0 <= x <= 8 metres. x is horizontal position from the left end; h is height. This is a drawing problem, not a construction specification.

Vocabulary	Meaning
vertex	The turning point of a parabola.
domain	The allowed input values for a model.
zero	An input at which the output equals zero.

Reference data

x (m)	0	2	4	6	8
h(x) (m)	0	6	8	6	0

Rules and assumptions

Lock 1: maximum height 8 m = digit 5; 4 m = digit 1. Lock 2: ground-level span 8 m = digit 2; 4 m = digit 9. Lock 3: positions at height 6 m are x = 2 and 6 = digit 7; x = 0 and 8 = digit 3.



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