Read the Half-Life Model

Grade 11 | Science | Visual learning | 40 minutes

Learning target

Use an exponential decay model and distinguish deterministic predictions from random simulation outcomes.

Prerequisites and materials

Powers and fractions; interpret graphs. 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

7 min: Read the data and vocabulary.

8 min: Trace the diagram or organizer with a partner.

15 min: Complete the four application questions.

7 min: Compare calculations and justify conclusions.

3 min: Identify one limit of the model.

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

Use logarithms, if known, to solve N(t) = 30; otherwise estimate between table values.

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



Lesson reference

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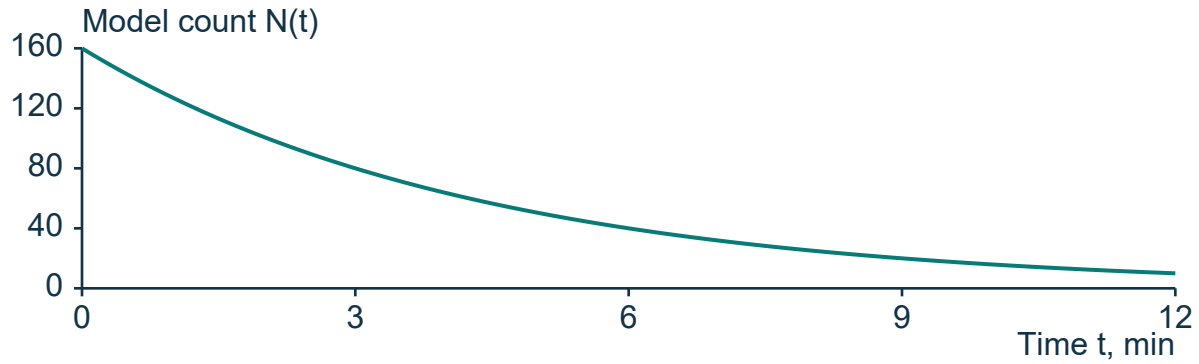
A fictional 160-counter simulation uses N(t) = 160(1/2)^(t/3), with t in minutes. No radioactive material is used.

Vocabulary	Meaning
half-life	The time interval over which a modeled quantity halves.
exponential decay	Decrease by a constant fraction over equal intervals.
expected value	The model's average prediction, not a guarantee for one trial.

Reference data

Time t (min)	0	3	6	9	12
Model N(t)	160	80	40	20	10

Use the visual model



Rules and assumptions

The model halves every 3 minutes. A random version removes each counter independently with probability 1/2 per round; each round represents 3 minutes. One run need not match the expected curve.



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