

3.2.3 Iterative Growth

Name: _____ Class: _____ Date: _____

KEY WORDS recurrence relation

<!-- Session 2 native-skill companion -->

Objective

Practise iterative growth within the labelled native lessons. Public original tasks; locally authored answer guidance.

1 Key knowledge and worked examples

■ Iterative processes with repeated deposits · Higher

Write an update rule and an initial value. Apply the operations in their stated order, using the previous output as the next input. A recurrence $B_{\text{next}} = 1.1B + 50$ differs from $1.1(B + 50)$. Tables can locate a first whole-period threshold; verify both the preceding and crossing values. Iteration can model growth, decay or other repeated processes, not just solve equations.

$$B_{n+1} = 1.1B_n + 50, \quad B_0 = 1000$$

With $B_0 = 1000$ and $B_{n+1} = 1.1B_n + 50$, $B_1 = 1150$, $B_2 = 1315$ and $B_3 = 1496.5$. The balance first exceeds 1400 after three years because $1315 \leq 1400 < 1496.5$. If the deposit preceded interest, $B_1 = 1.1 \times 1050 = 1155$, five yuan greater. A decay-and-top-up rule $V_{\text{next}} = 0.8V + 20$, starting at 200, gives 180 then 164. A fixed point satisfies $V = 0.8V + 20$, hence $V = 100$; values above 100 decrease toward it. A fixed point is a value preserved by the update, not a claim that every finite step reaches it exactly.

Preserve operation order and use the updated value each time. Do not round early or confuse the initial value with the first updated value. A continuous fractional-period estimate does not answer a whole-period question by itself.

AQA R16 Higher extends growth/decay to general iterative processes. State the model assumptions, initial value, recurrence and threshold interpretation. Use substitution to check a proposed fixed point without calculus.



Original native-lesson illustration; labels belong to its worked example.

2 Practice

2.1 (Higher) Find B_1 for $B_0 = 1000$ and $B_{\text{next}} = 1.1B + 50$.

2.2 (Higher) Find B_2 using the same update.

2.3 (Higher) Find the fixed point of $V_{\text{next}} = 0.8V + 20$.

3 Exam-style questions

3.1 Decide whether this claim is true. Justify with a concrete calculation or counterexample: Depositing before interest always gives the same result as depositing after interest.

Solutions

2.1 $1.1 \times 1000 + 50 = 1150$.

2.2 $1.1 \times 1150 + 50 = 1315$.

2.3 Solve $V = 0.8V + 20$: $0.2V = 20$.

3.1 False. Starting at 1000 with 10% interest and a deposit of 50, deposit first gives $1.1 \times 1050 = 1155$. Interest first gives $1.1 \times 1000 + 50 = 1150$.

Local review guidance: show the chosen method; give the checked result; explain the condition or failed shortcut. This is authored classroom guidance.