

## 3.1.99 Independent transfer: Foundation then Higher

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Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**KEY WORDS** scale • recurrence relation

<!-- Session 2 independent transfer -->

### Objective

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Apply this topic to unfamiliar Foundation and Higher problems; keep the two scopes distinct. Original questions and local marking guidance.

### 1 Key knowledge and worked examples

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A map scale compares like units. Convert real distance and time before dividing for speed. Repeated interest uses a recurrence, and the position of each deposit in the recurrence records when it earns interest. Check a recurrence by writing the first two years explicitly.

At 1:25,000, 4 cm represents 100,000 cm=1000 m=1 km. A real 1.5 km path is 150,000 cm, so it measures  $150,000/25,000=6$  cm on the map. A room 6 m by 4 m drawn at 1:100 becomes 6 cm by 4 cm because each metre is 100 cm. Its drawing diagonal is  $\sqrt{(6^2+4^2)}\approx 7.21$  cm and the real diagonal is about 7.21 m. Enlarging the printed map changes its numerical scale: doubling drawing lengths halves the scale denominator. A scale bar printed with the map enlarges with it.

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.

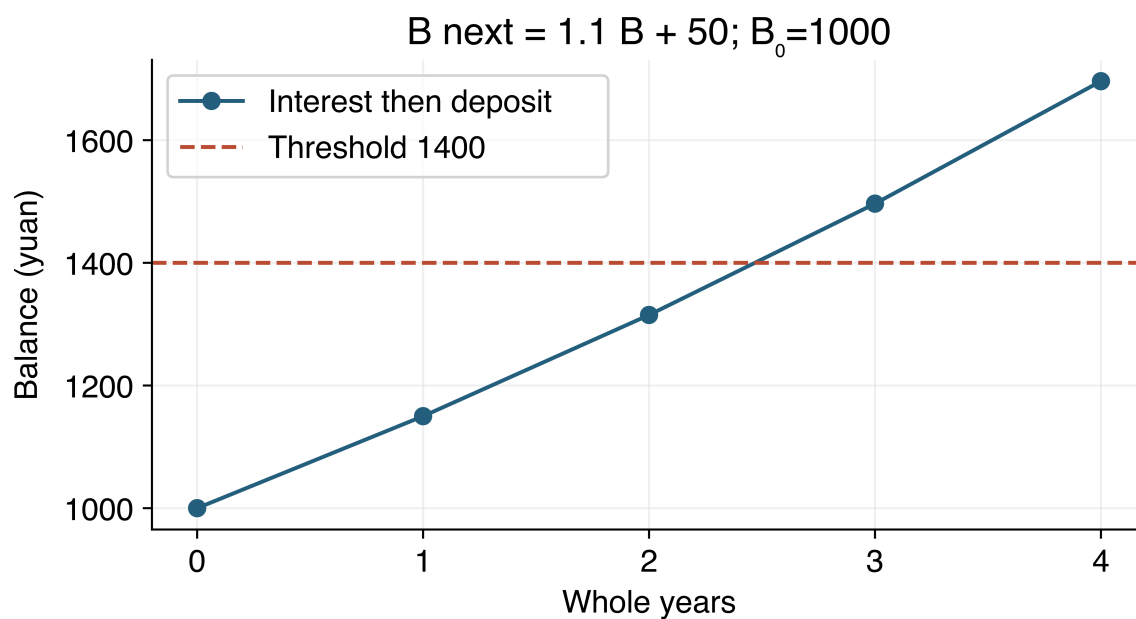
Match units before applying the scale

4 cm on map



1 km on ground at 1:25,000

*Prerequisite example; use the transfer task's own data.*



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## 2 Practice

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**2.1** Foundation: A 1:25000 map shows a road as 6.4 cm. Find its real length in kilometres. A cyclist travels it in eight minutes. Find average speed in kilometres per hour, showing the unit conversion.

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## 3 Exam-style questions

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**3.1** Higher: A savings account starts at 1000 CNY. Each year it receives 5% interest, then a 100 CNY deposit. Write a recurrence and find the balance after two years. Compare with depositing before interest each year, explaining the difference.

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## Solutions

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**2.1** Real length  $L = kl = 25000(6.4 \text{ cm}) = 160000 \text{ cm} = 1.6 \text{ km}$ . Time  $t = 8/60 \text{ h} = 2/15 \text{ h}$ . Average speed  $v = L/t = (1.6 \text{ km})/(2/15 \text{ h}) = 12 \text{ km/h}$ . The map ratio compares like units before conversion. The average does not assert constant instantaneous speed.

**3.1** Interest then deposit gives  $B_{n+1} = 1.05B_n + 100$ , with  $B_0 = 1000$ . Thus  $B_1 = 1150$  and  $B_2 = 1307.50 \text{ CNY}$ . Deposit first gives  $C_{n+1} = 1.05(C_n + 100)$ , so  $C_1 = 1155$  and  $C_2 = 1317.75 \text{ CNY}$ . The difference is 10.25 CNY: the first early deposit earns five CNY an extra year and that advantage earns 5% in year two, while the second early deposit adds another five CNY. Operation order is part of the model.

Local guidance: select and explain the relationship; calculate every requested result; check units, scope, conditions and completeness. These are authored classroom criteria.