

Exercise walk-through

3.1.99

Independent transfer: Foundation then Higher

AQA · GCSE · Mathematics

43. Length, area and volume scale factors · Foundation

Length, area and volume scale factors · Foundation

For similar shapes with corresponding length factor k , area factor is k^2 and volume factor is k^3 . Name the direction of the comparison: model to real or real to model. Recover k from an area ratio by a square root and from a volume ratio by a cube root. A change in only one dimension does not create similar solids. Higher links corresponding sides to equal trigonometric ratios.

56. Simple interest, compound growth and decay · Foundation

Simple interest, compound growth and decay · Foundation

At 10% per year, 1000 yuan earns simple interest 100 per year: after two years interest is 200 and balance is 1200. Compound balances are 1100 after year one and 1210 after year two. A machine worth 800 yuan losing 20% each year becomes 640 then 512, not 480: the second loss is 20% of 640. An 800-yuan sale price after a 20% reduction corresponds to original price $800/0.8=1000$. Growth from 50 to 65 is $(65-50)/50 \times 100 = 30\%$; 65 is 130% of 50. If a compound balance must first exceed 1300 at 10%, year two gives 1210 and year three 1331, so three whole years are needed.

62. Iterative processes with repeated deposits · Higher

Iterative processes with repeated deposits · Higher

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.

Exercises 2.1·3.1

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.

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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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.

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 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.

3.1 Interest then deposit gives $B_{n+1} = 1.05B_n + 100$, with $B_0 = 1000$. Thus $B_1 = 1150$ and $B_2 = 1307.50$ CNY. Deposit first gives $C_{n+1} = 1.05(C_n + 100)$, so $C_1 = 1155$ and $C_2 = 1317.75$ 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.