Investing and borrowing - Reasoning and model checks

10 questions | 59 marks | 70 minutes

An original mixed topic paper. Show calculations, label rates and periods, and explain conclusions using the supplied hypothetical financial rules. Round final monetary answers to cents unless a minimum deposit is requested.

Equivalent correct methods earn the corresponding marks.

1. A supplier raises a price by 20% and later discounts it 20%. The original price is AUD 350. [5 marks]

(a) Find the final price. [2 marks]

$350 \times 1.20 \times 0.80 = 336.$

Answer: AUD 336.00

(b) A student says the changes cancel. Explain the different percentage bases. [3 marks]

The factors multiply to 0.96,not 1.

Answer: The increase uses 350;the decrease uses 420.

2. Two one-year accounts pay simple interest. A pays 4% without fees. B pays 4.8% but charges AUD 32 annually. [6 marks]

(a) Find the break-even principal. [3 marks]

$0.008P = 32.$

$P = 4000.$

Answer: AUD 4,000.00

(b) Without recalculating final balances, explain which account wins for AUD 1500 and for AUD 8000. [3 marks]

Below 4000 the additional interest is less than 32;above 4000 it exceeds 32.

Answer: A for 1500;B for 8000.

3. Two balance models start at AUD 2000. Their values are listed. [6 marks]

Year	X (AUD)	Y (AUD)
0	2000	2000
1	2080	2080
2	2160	2163.20
3	2240	2249.728

(a) Identify which is simple and which is compound interest, and state each annual rate. [3 marks]

X gains 80 each year.

Y multiplies by 1.04 each year.

Answer: X is 4% simple;Y is 4% annually compounded.

(b) Predict both balances at the end of Year 4. [3 marks]

$X = 2000 + 4 \times 80.$

$Y = 2000(1.04)^4.$

Answer: AUD 2,320.00 for X; AUD 2,339.72 for Y

4. A calculator entry for AUD 3000 at 6% nominal compounded monthly for 2 years is $3000(1.06)^{24}$. [6 marks]

(a) Explain both the correct and incorrect interpretations of this entry. [3 marks]

The annual rate was not divided by 12.

Answer: It models 6% per month, not 6% nominal per year. The 24 period count is correct.

(b) Write the correct expression and evaluate it. [3 marks]

$A = 3000(1 + \frac{0.06}{12})^{24}.$

Answer: AUD 3,381.48

5. A deposit is required to reach AUD 9000 in 4 years at 3% annually. [6 marks]

(a) Find the unrounded present value to 4 decimal places. [3 marks]

$\mathrm{PV} = \frac{9000}{(1.03)^4}.$

Answer: AUD 7996.3834

(b) A calculator rounds the result down to a cent. Explain why that can fail and state the minimum cent deposit. [3 marks]

A smaller initial deposit gives a smaller final value because the growth factor is positive.

Round upward, not simply to nearest, when a target must be met.

Answer: AUD 7,996.39

6. A student buys 50 shares at AUD 4 with AUD 12 brokerage. Later the price is AUD 4.30; selling incurs another AUD 12. There are no dividends. [6 marks]

(a) Find the net profit or loss. [3 marks]

$\mathrm{Cost} = 200 + 12 = 212.$

$\mathrm{Sale} = 215 - 12 = 203.$

$\mathrm{Profit} = 203 - 212 = -9.$

Answer: AUD -9.00

(b) Explain how a price rise can coexist with a negative ROI, and find ROI to 2 decimal places. [3 marks]

$\mathrm{Gross\ price\ gain} = 15; \quad \mathrm{brokerage\ total} = 24.$

$\frac{-9}{212} \times 100 = -4.245\ldots\%.$

Answer: Fees exceed the price gain; $\mathrm{ROI} = -4.25\%.$

7. A fund grows from AUD 5000 to AUD 6050 over 2 years with no other cash flows. [6 marks]

(a) Find the total and annualised percentage returns. [3 marks]

$\frac{6050}{5000} = 1.21.$

$\text{Annual factor} = \sqrt{1.21} = 1.1.$

Answer: 21% total;10% annualised

(b) Explain why dividing 21% by 2 does not give the exact annual compound rate. [3 marks]

The second year earns interest on first-year growth.

Answer: 10.5% per year would compound to more than 21% over 2 years.

8. An investment earns 8% after tax during a year in which prices rise 5%. [6 marks]

(a) Find the exact real return to 3 decimal places. [3 marks]

$\text{Real factor} = \frac{1.08}{1.05}.$

$\text{Real return} = \text{factor} - 1.$

Answer: 2.857%

(b) Compare with the 3% subtraction estimate and explain the difference. [3 marks]

The percentage real gain is measured relative to the increased price level.

Answer: Exact is about 2.857%, slightly below 3%.

9. An AUD 8000 loan charges 0.75% monthly interest, with repayments at month end. [6 marks]

(a) Show that an AUD 50 repayment increases the balance and find the next balance. [3 marks]

$$\text{Interest} = 8000 \times 0.0075 = 60.$$

$$\text{Balance} = 8000 + 60 - 50 = 8010.$$

Answer: AUD 8010;an increase of AUD 10

(b) Find the minimum repayment that reduces the balance by exactly AUD 100 in that month. [3 marks]

$$8000 + 60 - R = 7900.$$

$$R = 160.$$

Answer: AUD 160.00

10. An item costs AUD 3000 now. Borrowing requires 24 monthly payments of AUD 140 and an AUD 60 fee. Waiting one year is predicted to raise the cash price by 4%. [6 marks]

(a) Compare the total borrowing outlay with the predicted delayed cash price. [3 marks]

$$\text{Borrowing} = 24 \times 140 + 60 = 3420.$$

$$\text{Delayed price} = 3000 \times 1.04 = 3120.$$

Answer: AUD 3420 borrowing; AUD 3120 delayed cash; AUD 300 difference

(b) Give two assumptions that must be considered before interpreting the cheaper option. [3 marks]

A total-cost comparison does not value timing or affordability by itself.

Answer: The 4% price prediction must hold;the buyer must be able to save enough and accept delayed use.