Financial mathematics - practice test 6

Name: _____ Date: _____

10 questions | 60 marks | 75 minutes

A harder synthesis paper: reverse models, changing conditions, cash-flow cost rates and refinancing.

Use a graphics calculator or appropriate digital tool for labelled tasks.

1. AUD 7,500 grows to AUD 9,000 in 5 years under a constant annual compound model. [6 marks]

(a) Find the effective annual rate. [3 marks]

(b) Find the monthly rate equivalent to this annual growth. [3 marks]

2. Two accounts accept AUD 12,000 for one year. A quotes 6% nominal compounded quarterly with an AUD 40 fee at year end. B quotes 5.8% nominal compounded monthly with no fee. [6 marks]

(a) Find both net ending balances. [3 marks]

(b) Find the starting balance at which the two one-year ending balances are equal. [3 marks]

3. A target has today’s purchasing power AUD 30,000. It is required in 8 years; inflation is 2.5% annually and the savings account earns 4.5% annually. [6 marks]

(a) Find the future-dollar goal. [3 marks]

(b) Find the equal year-end deposit from zero that meets it. [3 marks]

4. AUD 5,000 is available now, and 10 equal deposits will be made at the beginnings of years 1 through 10-that is, times 0 through 9. The balance at time 10 must be AUD 25,000. Interest is 4% annually. [6 marks]

(a) Calculate the required deposit R. [3 marks]

(b) Explain why the first deposit is not included in the AUD 5,000 initial balance in this model. [3 marks]

5. A fund starts at AUD 30,000. Its supplied annual returns are 5%, −2% and 6%. Gross year-end contributions are AUD 4,000 each year, with a stated 15% deduction. Fixed year-end fees are AUD 100, AUD 120 and AUD 140 respectively. [6 marks]

Fund scenario

Year	Return	Gross contribution (AUD)	Fixed fee (AUD)
1	5%	4000	100
2	−2%	4000	120
3	6%	4000	140

(a) Find the net contribution and year 1 closing balance. [3 marks]

(b) Find the final balance and explain why a single average-rate annuity calculation is not the stated model. [3 marks]

6. An account starts with AUD 18,000 and pays AUD 500 at the end of each of 12 months at zero interest. It then earns 0.4% monthly for another 12 months while keeping the same withdrawals. [6 marks]

(a) Find the balance after the zero-interest stage. [3 marks]

(b) Find the balance after all 24 withdrawals. [3 marks]

7. A balance earns −4% during a year, then a fee of 1% of the remaining balance is deducted. Prices fall 1% during the same year. [6 marks]

(a) Find the net nominal return. [3 marks]

(b) Find the real return and explain whether falling prices entirely offset the loss. [3 marks]

8. A business has an interest-only debt of AUD 50,000 at 6% annually due in 5 years. It already holds AUD 10,000 in a sinking fund earning 4% annually and will add equal year-end deposits. [6 marks]

(a) Find the required sinking deposit. [3 marks]

(b) Find annual combined cash outflow, then separate total loan interest from total new fund deposits. [3 marks]

9. A loan currently owes AUD 20,000 and has 24 months remaining. Keeping it costs 24 month-end repayments of AUD 900. Refinancing finances an AUD 300 fee into the new debt; the new nominal rate is 6% annually, compounded monthly, over 24 months. There are no other costs. [6 marks]

(a) Find the new monthly repayment. [3 marks]

(b) Compare the total future cash outflows and state a relevant model limitation. [3 marks]

10. A loan starts at AUD 12,000 with 0.5% monthly interest and AUD 500 month-end payments. Model A has a constant AUD 2,000 offset. Model B instead uses that AUD 2,000 to reduce principal immediately and has no offset. Use no negative interest and unrounded balances. [6 marks]

(a) Find both loan balances after 6 payments. [3 marks]

(b) Compare net debt after allowing for A’s offset asset, and explain why the displayed loan balances differ. [3 marks]