Financial mathematics - practice test 5

Name: _____ Date: _____

10 questions | 60 marks | 75 minutes

Use multi-stage savings, retirement and loan models with full supplied assumptions.

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

1. A future amount of AUD 25,000 is needed in 7 years. An account earns 0.45% monthly. [6 marks]

(a) State the number of compounding periods. [3 marks]

(b) Find the single deposit required now. [3 marks]

2. AUD 8,000 grows for 3 years at 4% effective annually, then 2 years at 5% effective annually. [6 marks]

(a) Find the final balance. [3 marks]

(b) Find the constant annual effective rate that gives the same five-year result. [3 marks]

3. A saver deposits AUD 500 at each year end for 5 years, then AUD 800 at each year end for another 5 years. The account earns 4% annually. [6 marks]

(a) Find the balance immediately after year 5. [3 marks]

(b) Find the balance at time 10. [3 marks]

4. An initial AUD 1,500 plus monthly end deposits of AUD 200 earns 0.3% monthly. The target is AUD 10,000. [6 marks]

(a) Find the first whole month reaching the target. [3 marks]

(b) Calculate the interest earned by that month. [3 marks]

5. In this model, salary starts at AUD 50,000 and grows 3% each year. Gross contributions are 12% of that year's salary, with a 15% deduction. A fund starts at AUD 10,000 and earns 4% annually. Contributions occur at each of the next 3 year ends; the first salary is AUD 50,000. [6 marks]

(a) Find the three net contributions. [3 marks]

(b) Find the balance after year 3. [3 marks]

6. A retirement account must pay AUD 10,000 at the end of year 1, AUD 10,300 at year 2 and AUD 10,609 at year 3. It earns 5% annually. [6 marks]

(a) Find the present value of these unequal withdrawals. [3 marks]

(b) Verify that the calculated starting balance is exhausted after the third withdrawal. [3 marks]

7. Two fee plans apply to a single AUD 10,000 deposit for 10 years at 5% before fees. Plan A charges AUD 80 at each year end. B charges 1% of the post-interest balance each year. [6 marks]

(a) Find each final balance. [3 marks]

(b) Choose the higher model balance and explain why subtracting 1 percentage point from 5% is not exact for B. [3 marks]

8. Equipment costing AUD 40,000 today must be replaced after 5 years. Its replacement price rises 2% annually. A sinking fund earns 3.5% annually with equal year-end deposits. [6 marks]

(a) Find the replacement target. [3 marks]

(b) Find the annual sinking-fund deposit. [3 marks]

9. AUD 15,000 is owed at 0.5% monthly. No repayments are made for the next 3 months, and interest is capitalised. The resulting debt is then cleared over 36 equal month-end repayments at the same rate. [6 marks]

(a) Find the debt after the holiday. [3 marks]

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

10. Compare one-year saving schedules with zero initial balance and a fixed effective annual rate of 6%. A deposits AUD 100 at each month end; B deposits AUD 1,200 at year end. Use the exactly equivalent monthly rate for A. [6 marks]

(a) Find both balances at year end. [3 marks]

(b) Explain why the result is not caused by a different annual interest rate. [3 marks]