Financial mathematics - practice test 1

10 questions | 60 marks | 75 minutes

A balanced first paper covering investment growth, saving, income, loan balances and stated borrowing costs.

Equivalent correct methods earn the corresponding marks.

1. A balance of AUD 4,500 earns 4.2% annually for 5 years, with no cash flows or fees. [6 marks]

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

Use $4500(1.042)^5$.

Answer: AUD 5,527.78

(b) Find the total interest and state one assumption of this model. [3 marks]

Subtract 4500 from the final balance.

The model assumes no rate changes or extra cash flows.

Answer: AUD 1,027.78; the rate remains constant.

2. A savings account quotes a nominal annual rate of 6.4% with quarterly compounding. [6 marks]

(a) Find the quarterly rate. [3 marks]

$0.064/4 = 0.016$.

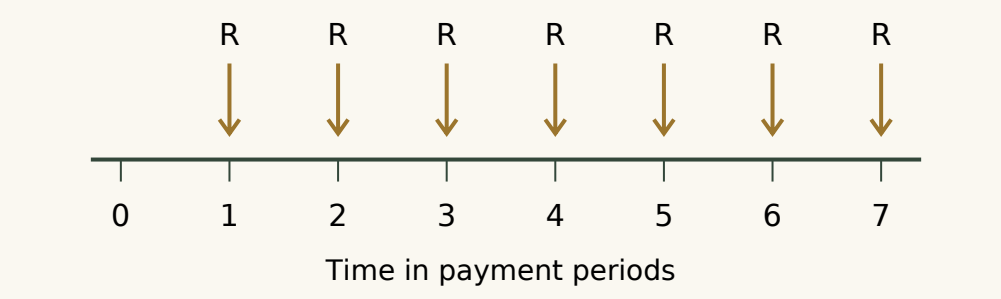
Answer: 1.6%

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

Use $(1.016)^4 - 1$.

Answer: 6.5552%

3. An account starts at zero and receives AUD 1,200 at each year end for 7 years. Interest is 4% annually. [6 marks]



(a) Calculate the accumulated balance. [3 marks]

Use $1200s_{7}(0.04)$.

Answer: AUD 9,477.95

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

Subtract 7×1200 from the balance.

Answer: AUD 1,077.95

4. A target is AUD 18,000 in 6 years. Interest is 3.5% annually and the initial balance is zero. [6 marks]

(a) Find the required equal year-end deposit. [3 marks]

Use $R = 18000/s_{6}(0.035)$.

Answer: AUD 2,748.03

(b) Find the equal beginning-of-year deposit for the same target. [3 marks]

Each deposit earns one extra year; divide the ordinary deposit by 1.035.

Answer: AUD 2,655.10

5. For this model, an annual gross contribution is 11% of an AUD 60,000 salary. A 15% deduction applies to contributions. The opening balance is AUD 25,000, the return is 5%, and a fixed AUD 120 fee is charged at year end. [6 marks]

(a) Find the net annual contribution. [3 marks]

Gross is $60000 \times 0.11 = 6600$.

Net is $6600 \times 0.85 = 5610$.

Answer: AUD 5,610.00

(b) Find the balance after one year, adding the contribution and deducting the fee after the return. [3 marks]

$25000 \times 1.05 + 5610 - 120 = 31740$.

Answer: AUD 31,740.00

6. An income account earns 4% annually and must pay AUD 8,000 at each year end for 10 years. [6 marks]

(a) Find the starting balance that exactly funds the payments. [3 marks]

Use $P = 8000a_{10}(0.04)$.

Answer: AUD 64,887.17

(b) Find the balance immediately after the fourth withdrawal. [3 marks]

Six future withdrawals remain; discount those to time 4.

Answer: AUD 41,937.09

7. AUD 10,000 earns 6%. A stated tax takes 20% of interest; a fixed AUD 50 fee is then charged. Prices rise 3% over the year. [6 marks]

(a) Find the ending nominal balance. [3 marks]

Interest 600, tax 120, fee 50:$10000 + 600 - 120 - 50 = 10430$.

Answer: AUD 10,430.00

(b) Find the purchasing-power return. [3 marks]

Use nominal factor 1.043 divided by price factor 1.03, then subtract 1.

Answer: 1.2621%

8. An interest-only loan of AUD 40,000 charges 5% annually. A separate sinking fund must repay the debt after 8 years and earns 3% annually. [6 marks]

(a) Find the annual loan-interest payment. [3 marks]

$40000 \times 0.05 = 2000$.

Answer: AUD 2,000.00

(b) Find the annual year-end sinking-fund deposit and combined annual outflow. [3 marks]

Deposit is $40000/s_{\overline{8}|0.03}$.

Add the interest payment and deposit.

Answer: AUD 4,498.26; combined AUD 6,498.26

9. A loan begins at AUD 12,000, has 0.6% monthly interest, and is repaid by AUD 450 at each month end. [6 marks]

(a) Find the first two closing balances. [3 marks]

$B_1 = 12000 \times 1.006 - 450 = 11622.$

$B_2 = 11622 \times 1.006 - 450 = 11241.732.$

Answer: AUD 11,622.00 and AUD 11,241.73

(b) Calculate the balance after 12 payments. [3 marks]

Use $12000(1.006)^{12} - 450s_{12}(0.006).$

Answer: AUD 7,311.28

10. Both offers provide AUD 15,000 for 36 months. Offer A:36 repayments of AUD 460 plus a separate AUD 150 upfront fee. Offer B:36 repayments of AUD 455 plus an AUD 8 monthly fee. [6 marks]

(a) Calculate each total cash outflow. [3 marks]

$A = 36 \times 460 + 150.$

$B = 36 \times 463.$

Answer: A:AUD 16,710.00; B:AUD 16,668.00.

(b) Choose the lower stated total and give one limitation of the comparison. [3 marks]

Subtract the totals.

A different repayment date or unlisted cost could change the comparison.

Answer: B is AUD 42.00 lower. It assumes the full 36-month term and only the listed fees.