Investing and borrowing - Applications test

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 school enterprise buys an item for AUD 80 and marks it up 25%. It later discounts the marked price 10%. [5 marks]

(a) Find the marked and final sale prices. [2 marks]

$80 \times 1.25 = 100.$

$100 \times 0.90 = 90.$

Answer: AUD 100 marked; AUD 90 sale

(b) Find profit as a percentage of cost. [3 marks]

$\text{Profit} = 90 - 80 = 10.$

$\frac{10}{80} \times 100 = 12.5\%.$

Answer: 12.5%

2. A club savings account opens at AUD 1000. At each quarter end it earns 1% interest, receives AUD 200 and pays a AUD 5 fee, in that order. [6 marks]

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

$B_1 = 1000 \times 1.01 + 200 - 5 = 1205.$

$B_2 = 1205 \times 1.01 + 195 = 1412.05.$

Answer: AUD 1205.00; AUD 1412.05

(b) Write a recurrence and explain why $1000(1.01)^4$ cannot give its full year-end balance. [3 marks]

The balance changes through additional cash flows every quarter.

Answer: $B_{n+1} = 1.01B_n + 195$; the one-sum model omits the deposits and fees.

3. A single fund earns AUD 540 simple interest from AUD 6000 over 18 months. [6 marks]

(a) Find its annual simple interest rate. [3 marks]

$r = \frac{540}{(6000 \times 1.5)} = 0.06.$

Answer: 6% p.a.

(b) At that rate, how long would AUD 6000 take to reach AUD 6900 under simple interest? [3 marks]

$\text{Interest target} = 900.$

$t = \frac{900}{(6000 \times 0.06)} = 2.5.$

Answer: 2.5 years

4. A club deposits AUD 4000 at 5% compounded annually. It needs at least AUD 5000. [6 marks]

(a) Compare its balances after 4 and 5 years. [3 marks]

Evaluate $4000(1.05)^4$ and $4000(1.05)^5$.

Answer: AUD 4,862.03 and AUD 5,105.13

(b) If withdrawals occur only at anniversaries, when is the first withdrawal meeting the target? [3 marks]

The 4 year value is below 5000;the 5 year value exceeds 5000.

Answer: After 5 years.

5. Equipment costs AUD 6000 now. Its price is modelled to increase 3% each year. A savings deposit earns 5% annually for 3 years. [6 marks]

(a) Find the predicted equipment price after 3 years. [3 marks]

$\text{Price} = 6000(1.03)^3$.

Answer: AUD 6,556.36

(b) Find the minimum single deposit now that meets that future price. [3 marks]

$\text{PV} = \frac{6000(1.03)^3}{(1.05)^3}$.

Round upward to cents.

Answer: AUD 5,663.64

6. AUD 10000 is invested for 2 years at 6% annually. Under a supplied rule,30% of each year's interest is deducted as tax at year end. [6 marks]

(a) Find the after-tax growth factor per year and final balance. [3 marks]

$\text{Retained rate} = 0.06 \times 0.70 = 0.042$.

$\text{Balance} = 10000(1.042)^2$.

Answer: 1.042; AUD 10,857.64

(b) Compare this with deducting 30% of all accumulated interest only at the end of Year 2. [3 marks]

End-only model lets all Year 1 interest earn interest during Year 2.

Answer: End-only deduction gives AUD 10,865.20, which is higher by AUD 7.56.

7. A club buys 100 shares at AUD 7 and another 100 at AUD 9. Each purchase incurs AUD 10 brokerage. It sells all 200 at AUD 9.50, incurs AUD 15 sale brokerage and receives AUD 0.20 per share dividend. [6 marks]

(a) Find total cost and net profit. [3 marks]

$$\text{Cost} = 700 + 10 + 900 + 10 = 1620.$$

$$\text{Receipts} = 1900 - 15 + 40 = 1925.$$

$$\text{Profit} = 305.$$

Answer: AUD 1620 cost; AUD 305 profit

(b) Calculate ROI to 2 decimal places and explain why the two purchase prices cannot be ignored. [3 marks]

$$\frac{305}{1620} \times 100 = 18.827\ldots\%.$$

Total cost depends on both purchases and both fees.

Answer: 18.83%

8. A machine costs AUD 4800 cash. A buyer pays 20% deposit and borrows the rest at 7% flat simple interest for 2 years, with an AUD 80 fee. [6 marks]

(a) Find the deposit, borrowed principal and interest. [3 marks]

$$\text{Deposit} = 0.20 \times 4800.$$

$$\text{Principal} = 3840.$$

$$\text{Interest} = 3840 \times 0.07 \times 2 = 537.60.$$

Answer: AUD 960 deposit; AUD 3840 borrowed; AUD 537.60 interest

(b) Find total outlay including deposit and 24 equal repayments. State the monthly repayment. [3 marks]

$$\text{Financed repayment total} = 3840 + 537.60 + 80 = 4457.60.$$

$$\text{Monthly} = \frac{4457.60}{24} = 185.733\ldots; \quad \text{total including deposit} = 5417.60.$$

If equal payments are rounded to cents, a final adjustment is needed.

Answer: AUD 5417.60 total; AUD 185.73 monthly to the nearest cent

9. A student models an AUD 2500 loan at 1% monthly with AUD 300 paid at month end. [6 marks]

(a) Calculate the balance after 3 months. [3 marks]

$B_1 = 2225.$

$B_2 = 1947.25.$

$B_3 = 1947.25 \times 1.01 - 300 = 1666.7225.$

Answer: AUD 1,666.72

(b) Give a spreadsheet formula for the next balance if the current balance is in B2 and explain why copying it works. [3 marks]

Each copied row applies one month’s interest and one repayment to the previous balance.

Answer: =B2*1.01-300

10. A comparison predicts account A finishes AUD 12 higher than B after one year. A has a fixed rate; B’s rate can change and its quoted rate applies only if a monthly condition is met. [6 marks]

(a) State two pieces of information needed to judge the prediction. [3 marks]

Without these, the quoted growth is not determined.

Answer: B’s rates over the full year; whether its monthly condition is met.

(b) If A has an omitted AUD 18 closing fee, revise the difference and conclusion. [3 marks]

A’s $12 \text{ advantage} - 18 \text{ fee} = -6.$

Answer: B finishes AUD 6 higher under the same remaining assumptions.