Investing and borrowing - Extended applications

10 questions | 60 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 quoted price of AUD 165 includes a supplied 10% sales tax. The seller's tax-exclusive cost was AUD 120. [6 marks]

(a) Recover the tax-exclusive selling price and tax amount. [3 marks]

$\frac{165}{1.10} = 150.$

$165 - 150 = 15.$

Answer: AUD 150 before tax; AUD 15 tax

(b) Find the seller's profit percentage on the tax-exclusive cost. [3 marks]

$\text{Profit} = 150 - 120 = 30.$

$\frac{30}{120} \times 100 = 25\%.$

Answer: 25%

2. Compare two accounts over 2 months with AUD 4000 initially. A grows 0.3% each month, then charges AUD 2. B grows 0.25% each month with no fee. [6 marks]

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

$A_1 = 4000 \times 1.003 - 2 = 4010.$

$A_2 = 4010 \times 1.003 - 2 = 4020.03.$

$B_2 = 4000(1.0025)^2 = 4020.025.$

Answer: A: AUD 4,020.03; B: AUD 4,020.03

(b) Explain why reporting only rounded balances can hide which unrounded model is larger. [3 marks]

Account rounding rules can affect the actual cent outcome;the supplied model retains full precision.

Answer: Both round to AUD 4020.03, but A exceeds B by AUD 0.005 before rounding.

3. A single AUD 5000 investment becomes AUD 5618 in 2 years, with monthly compounding and no fees. [6 marks]

(a) Find the monthly rate to 4 decimal places as a percentage. [3 marks]

$(1+i)^{24} = \frac{5618}{5000}$.

$i = (\frac{5618}{5000})^{\frac{1}{24}} - 1$.

Answer: 0.4868%

(b) Find the corresponding effective annual rate to 3 decimal places. [3 marks]

$\text{Annual factor} = (\frac{5618}{5000})^{\frac{1}{2}}$.

Subtract 1.

Answer: 6.000%

4. An investor has AUD 6000 available. Option A deducts a AUD 60 fee immediately, then earns 5% annually for 3 years. Option B invests all 6000 at 4.8%, subtracting an AUD 15 fee at each year end. [6 marks]

(a) Find Option A's final value. [3 marks]

$\text{Amount invested} = 6000 - 60 = 5940$.

$A = 5940(1.05)^3$.

Answer: AUD 6,876.29

(b) Calculate Option B using a recurrence and compare. [3 marks]

$B_{\text{next}} = 1.048B - 15$.

Evaluate three annual steps;compare with A.

Answer: $B = \text{AUD } 6{,}858.94$; $A = \text{AUD } 6{,}876.29$. Option A finishes higher by AUD 17.35.

5. A shareholder owns 200 shares. A dividend of AUD 0.45 per share is paid. The holder uses it to buy whole shares at AUD 8 each, with no reinvestment fee. [6 marks]

(a) Find the dividend, number of new shares and cash left over. [3 marks]

$200 \times 0.45 = 90.$

$\lfloor \frac{90}{8} \rfloor = 11.$

$90 - 88 = 2.$

Answer: AUD 90 dividend;11 new shares; AUD 2 cash

(b) A later dividend is AUD 0.40 per share on all 211 shares. Find this dividend and total cash held if the AUD 2 remains. [3 marks]

$211 \times 0.40 = 84.40.$

$84.40 + 2 = 86.40.$

Answer: AUD 84.40 dividend; AUD 86.40 cash

6. A purchase costs AUD 10000 today. Its price is predicted to rise 3% annually for 3 years. Savings earn 6% annually, with 25% of each year’s interest deducted as tax. [6 marks]

(a) Find the annual after-tax savings factor and future price. [3 marks]

$\text{Retainedrate} = 0.06 \times 0.75 = 0.045.$

$\text{Price} = 10000(1.03)^3.$

Answer: 1.045; AUD 10,927.27

(b) Find the minimum initial savings deposit to meet the future price. [3 marks]

$\text{PV} = \frac{10000(1.03)^3}{(1.045)^3}.$

Round upward to cents.

Answer: AUD 9,575.53

7. An AUD 1000 loan charges 1% monthly. Payments of AUD 300 are made at month end until a smaller final payment clears it. [6 marks]

(a) Find the balance immediately after the third 300 payment. [3 marks]

$B_1 = 710.$

$B_2 = 417.10.$

$B_3 = 121.271.$

Answer: AUD 121.27

(b) Find the final payment one month later and total paid, assuming final cent settlement. [3 marks]

$\text{Last payment} = 121.271 \times 1.01 = 122.48371.$

Pay 122.48 under nearest-cent settlement;$\text{total} = 1022.48.$

Answer: AUD 122.48 final; AUD 1,022.48 total

8. A cash-price AUD 3600 purchase has two credit options. X takes a AUD 600 deposit plus 24 payments of AUD 145. Y takes 36 payments of AUD 112 and an AUD 40 fee. [6 marks]

(a) Find total outlay and extra cost for each. [3 marks]

$X = 600 + 24 \times 145 = 4080.$

$Y = 36 \times 112 + 40 = 4072.$

Answer: X: AUD 4080 total/AUD 480 extra;Y: AUD 4072 total/AUD 472 extra

(b) Explain why the AUD 8 total difference does not show whether the repayment schedules are equally affordable. [3 marks]

The timing and size of payments differ even though totals are close.

Answer: X requires a deposit and higher payments but ends earlier.

9. A hypothetical club policy requires all money to be available after exactly one year. A pays 4.5% for one year. B pays 6% simple interest for 18 months but cannot be withdrawn early without a fee that is not supplied. [6 marks]

(a) Find A's final balance from AUD 8000. [3 marks]

$8000 \times 1.045 = 8360.$

Answer: AUD 8,360.00

(b) Can B be declared the better option for this club from the stated information? Explain. [3 marks]

A higher quoted rate is not enough to satisfy the given constraint.

Answer: No. Its 18 month term does not meet the one-year access requirement, and the early-withdrawal outcome is unspecified.

10. A learner models a AUD 5000 deposit at 4.8% nominal annual interest, compounded monthly, for 18 months. Their formula is $5000(1.048)^{1.5}$, followed by subtraction of 18 monthly fees of AUD 1. [6 marks]

(a) Correct the growth expression. Find the net balance if fees are all charged only at the end. [3 marks]

$\text{Monthlyrate} = \frac{0.048}{12} = 0.004; \quad \text{periods} = 18.$

End-onlyfees are subtracted after growth.

Answer: $5000(1.004)^{18} - 18 = \text{AUD } 5{,}354.51$

(b) If fees are actually deducted each month, state the correct recurrence and explain the direction of the difference. [3 marks]

Earlier fees remove money that would otherwise earn later interest.

Answer: $B_{n+1} = 1.004B_n - 1$; the final balance is slightly smaller.