End of Topic Test – Chapter 2: Personal finance

Answer all questions in the spaces provided.

1. **Budgeting and current account**

   A student keeps track of their money using a current account. Part of the statement for September is shown below.

Date	Payment details	Paid out (£)	Paid in (£)	Balance (£)
31 Aug	Brought forward			125.40
01 Sep	DD Mobile phone	28.00		97.40
01 Sep	ATM Cash	60.00		37.40
02 Sep	Card Supermarket	42.50		*OD* 5.10
02 Sep	Unauthorised OD fee	20.00		*OD* 25.10
03 Sep	Employer salary		980.00	954.90
10 Sep	DD Gym membership	25.00		929.90
18 Sep	Card Online shopping	85.60		844.30
25 Sep	CHQ Rent	520.00		324.30
30 Sep	DD Gas/Electric	63.40		260.90

   (a) (2 points) Explain what "*OD*" means on the statement and why an "Unauthorised OD fee" was charged.

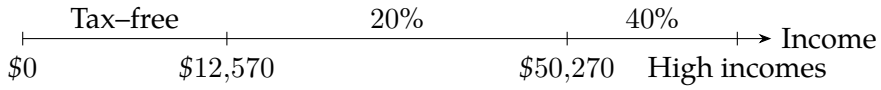
   (b) (3 points) Calculate the student's total income and total expenditure for September, using the statement.

   (c) (3 points) The student wants to avoid overdraft charges in future. Suggest two realistic changes they could make to their budgeting, and explain how each would help.

2. **Income tax bands**

   For a particular tax year, the income tax rules are:

   - Personal allowance (tax–free): $\$12\,570$
   - Basic rate: 20% on taxable income from $\$12\,571$ to $\$50\,270$
   - Higher rate: 40% on taxable income above $\$50\,270$



(a) (3 points) A worker has a gross annual income of $\$39\,500$. Calculate their income tax for the year.

(b) (4 points) Another worker has a gross annual income of $\$62\,000$. Calculate their income tax for the year, clearly showing the tax paid in each band.

(c) (2 points) For the worker in part (b), find their average (overall) tax rate as a percentage of their gross income.

3. **Payslip and deductions**

A worker is paid monthly. Part of their payslip is shown below.

PAYSLIP – March	
Employee name	Alex Green
Employee number	04721
Gross pay	\$2 450.00
Income tax	\$310.40
National Insurance	\$165.20
Student loan	\$72.00
Pension contribution	\$122.50
Net pay	\$1 780.–

(a) (2 points) Explain the difference between *gross pay* and *net pay*.

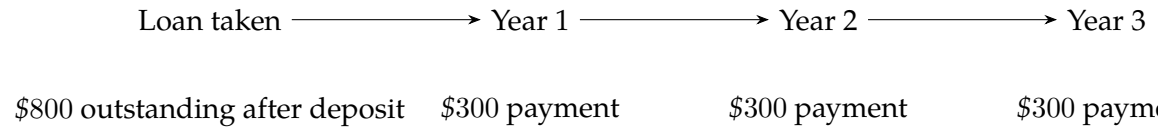
(b) (3 points) Calculate Alex's net pay for March, showing your working.

(c) (3 points) The student loan deduction is 9% of any monthly income above \$2 274. Show that the student loan deduction on the payslip is consistent with this rule.

4. **Comparing loans using APR**

A furniture store offers the following credit deal on a sofa costing $\$900$:

- Deposit: $\$100$ now
- Then 3 equal annual payments of $\$300$ at the end of each year



Assume the annual percentage rate (APR) is i, expressed as a decimal. The present value of the repayments should equal the amount borrowed after the deposit.

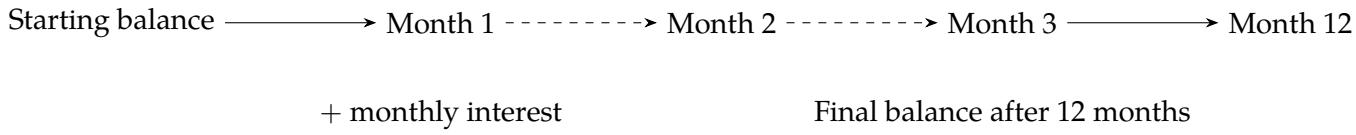
(a) (4 points) Write an equation in i for the APR of this loan, using the present value of the three payments.

(b) (3 points) Use trial and improvement (or a calculator) to find an approximate value of i as a percentage, correct to one decimal place.

(c) (2 points) The store advertises the deal as "$\$900$ sofa – only $\$300$ per year for 3 years, no interest!". Comment on whether this description is accurate, using your answer from part (b).

5. **Comparing savings using AER**

A bank offers a savings account with interest paid monthly. The nominal annual interest rate is 2.4%, with interest added at the end of each month.



(a) (3 points) A customer deposits $\$2\,000$ in this account. Find the monthly interest rate as a percentage.

(b) (4 points) Complete the following table for the first three months, rounding interest to the nearest penny.

	Starting value (£)	**Interest (£)**	**Final value (£)**
Month 1	2 000.00	_____	_____
Month 2	_____	_____	_____
Month 3	_____	_____	_____

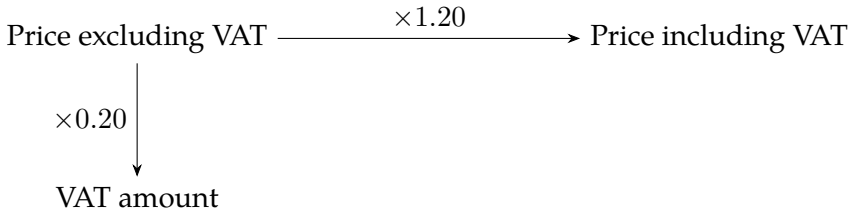
(c) (3 points) Using the general AER formula

$$\text{AER} = \left(1 + \frac{i}{n}\right)^n - 1,$$

where i is the nominal annual rate and n is the number of compounding periods per year, calculate the AER for this account as a percentage, correct to two decimal places.

6. **VAT and percentage multipliers**

Value Added Tax (VAT) is charged at 20% on many goods and services.



(a) (2 points) A jacket has a price excluding VAT of $\$75$. Find the VAT amount and the price including VAT.

(b) (3 points) A customer sees a price including VAT of $\$54$ on a pair of shoes. Find the price excluding VAT, using an appropriate multiplying factor.

(c) (3 points) A shop advertises "$\$60$ including VAT – now $\$51$ in our sale". Find the percentage reduction from the original price including VAT.

7. **Inflation and real value**

A house is currently worth $\$210\,000$. It is projected to increase in value by 3% per year for the next 6 years.

(a) (3 points) Write an expression for the projected value of the house after 6 years, and calculate this value.

(b) (3 points) Suppose inflation is also 3% per year over the same period. Explain briefly why the *real* value of the house (adjusted for inflation) has not changed.

(c) (3 points) If instead inflation averages 1.5% per year, calculate the real growth factor of the house value over 6 years, and express the real percentage increase.

8. **Mortgage and recurrence relations**

A borrower takes out a mortgage of $\$120\,000$ at an annual interest rate of 4%. They make fixed monthly payments of $\$900$.

Month	Outstanding balance ($)	Comment
0	120 000	Initial loan
1	_____	After interest and payment
2	_____	After interest and payment

Assume interest is added monthly at a rate of $\frac{0.04}{12}$.

(a) (3 points) Write a recurrence relation for the outstanding balance B_n after n months.

(b) (4 points) Use your recurrence relation to calculate the outstanding balance after 1 month and after 2 months, correct to the nearest pound.

(c) (3 points) Explain how a spreadsheet could be set up to model the mortgage over several years, stating clearly what would go in the first few rows and columns.