Exercise 2A

1 During the year 2026–27, Femi is employed on an annual salary of £24 150.

He has a personal tax-free allowance of £11 200.

What income tax does he pay that year?

Tax rates for 2026–27 (used throughout this worksheet)

Basic rate: 20%	on the first £33 500 of taxable income
Higher rate: 40%	on taxable income from £33 501 to £155 000
Additional rate: 45%	on taxable income over £155 000

Personal allowance for 2026–27: £11 200

2 During the year 2026–27, Tolu is employed on an annual salary of £58 150.

She has a personal tax-free allowance of £11 200.

What income tax does she pay that year?

Exercise 2B

National Insurance rates for 2026–27 (non-contracted out, used throughout)

	Weekly income	Monthly income
Nil/0% band	up to £160	up to £700
12% band	£160.01 – £855	£700.01 – £3700
2% band	above £855	above £3700

Contracted out rate: 10.6% (replaces the 12% band; upper limit £805 weekly / £3500 monthly)

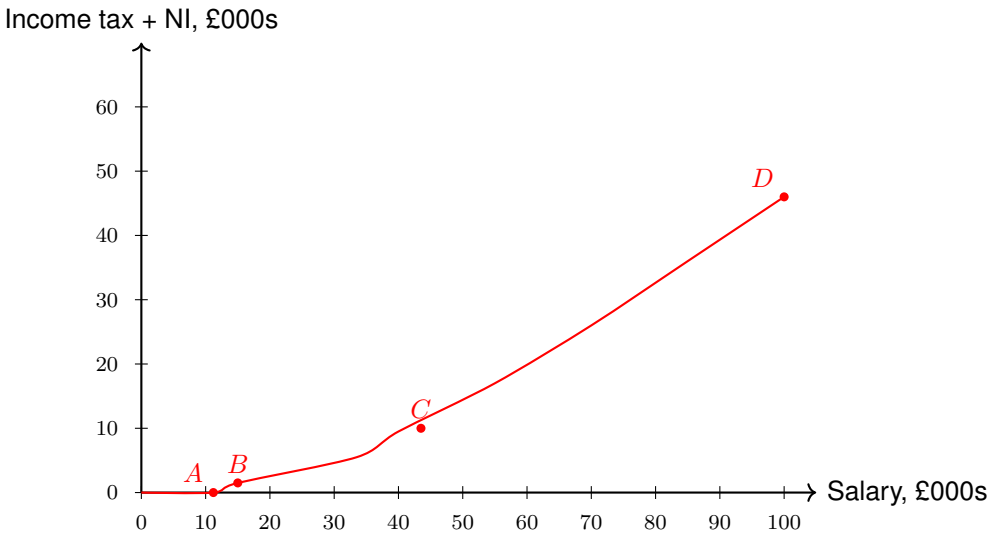
Student loan repayments for 2026–27: 9% of gross earnings in excess of £18 500.

1 Tunde earns £4500 per month and has a tax-free allowance of £9500. Calculate

a) his taxable income

b) the amount of income tax that Tunde pays in the year.

2 For someone with a personal allowance of £11 200, the graph of their income tax and NI contributions for 2026–27 has this shape.



a) Describe the significance of each of the points A, B and C in terms of income tax and NI thresholds.

b) For each of the points A, B, C and D, estimate what percentage of a person's salary is taken in income tax and NI.

3 During the year 2026–27, Bethan earned £980 per week. She paid NI at the non-contracted out rate. Calculate the amount of NI she paid each week.

4 Daniyar earns £460 per week. He is contracted out for National Insurance contributions. Calculate the amount Daniyar pays weekly in NI contributions.

5 During the year 2026–27, Priya was employed on a salary of £24 150. She had a personal tax allowance of £11 200 and paid NI at the non-contracted out rate. Throughout, give answers to the nearest penny.

a) Calculate Priya's monthly NI payments.

b) Calculate the monthly income tax that she pays.

c) Calculate the monthly repayments of Priya's student loan.

d) Find Priya's monthly take home income after she has paid National Insurance, income tax, pension of £50 per month and student loan repayments.

e) Copy and complete this payslip for Priya.

Employee No.	**Employee**	**Date**	**National Insurance No.**
04567	Priya	31/09/2026	CD789012E

Payments	**Units**	**Rate**	**Amount**	**Deductions**	**Amount**
Salary	1	_____	_____	PAYE Tax	_____
				PAYE NI	_____
				Personal pension	50.00
				Student loan	_____
				Total deductions	_____

Tax period 6	**Total gross pay** _____	**Totals year to date**
		Total gross pay TD _____
		Tax paid TD _____
		NI TD _____
		Pension TD _____
		Student loan TD _____
Tax code 1120L	**Payment method: BACS**	**Net Pay** _____

6 Marcus was expecting to be paid £85 000 in the 2026–27 tax year. However, he was given a pay rise of 10% at the start of the tax year. He had a personal tax allowance of £11 200.

The questions below relate only to the extra charges levied as a result of this 10% pay rise.

Give all answers to the nearest penny.

a) Calculate the additional non-contracted out National Insurance that Marcus pays.

b) Calculate the additional annual income tax that he pays.

c) Marcus has not yet paid off his student loan. How much extra annual pay did he receive from his 10% pay rise after the deductions due to National Insurance, income tax and student loan repayments?

(Based on AQA Use of Mathematics, 2013)

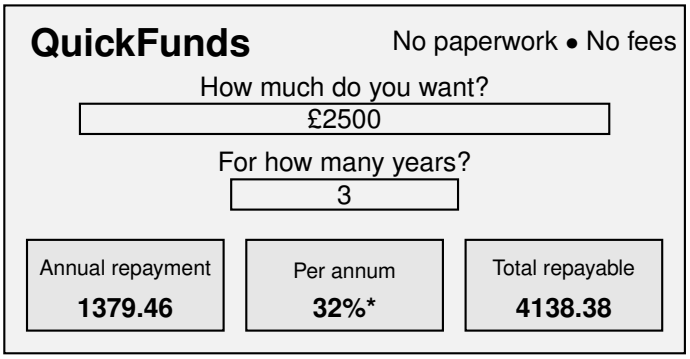
Exercise 2C

1

a) If a loan at APR 18% is repaid in three equal annual instalments of £500, state the values in the APR formula of m, A_1, A_2, A_3, $1+i$, t_1, t_2 and t_3.

b) Find the amount of the loan.

2



*Rates between 4.1% and 1180% APR

Check that the rate 'per annum' in this advertisement is actually the APR.

The * indicates that you should read the small print. In this case the rate is clearly just an illustration and is not guaranteed.

3 When buying a camera costing £800, Reuben is offered two different repayment methods.

Method A: paying back a single lump sum of £1100 at the end of 2 years.

Method B: paying back £480 after 1 year and a further £480 after another year.

a) Calculate the APR for repayment method A.

b) Repayment method B advertises an APR of 13.1%.
Show calculations to confirm that this is a good approximation.

(Based on AQA Use of Mathematics, 2008)

4 Naomi considers borrowing £1800 from a lender offering loans at an APR of 24%. She would have to pay back the loan in two equal repayments, the first at the end of 1 year and the second at the end of 2 years.

a) Find the amount of each repayment.

b) A different lender offers the loan for a single payment of £2400 at the end of two years. What is the APR in this case?

5 Kofi wants to borrow £1800. He wants to pay this back in two equal instalments, the first instalment at the end of 1 year and the second at the end of 2 years.

a) One lender offered the loan on the basis that Kofi paid back £1200 for each of the two instalments. Show calculations that confirm that the APR in this case is approximately 21.5%.

b) A different lender offered an APR of 20%. In this case, how much would Kofi pay back in each instalment?

(Based on AQA Use of Mathematics, 2009)

Exercise 2D

Worked recurrence relation (for reference)

A mortgage of $£A_0 = £160\,000$ has gross annual interest of 4.5% and annual repayments totalling $£13\,200$ ($£1100$ per month).

$A_{n+1} = A_n \times 1.045 - 13\,200$

n	0	1	2	3
A_n	160 000.00	154 000.00	147 730.00	141 177.85

1

a) Set up a spreadsheet to carry out the calculations above for a large number of years.

b) After how many years will this mortgage loan be repaid?

2 Suppose that monthly repayments of £1500 are made instead of £1100.

When will the mortgage be paid off now?

3 In questions 1 and 2, roughly what are the totals of all the repayments in each case?

4 Femi takes a mortgage for £135 000. He repays £1050 per month for the life of the mortgage. The mortgage has an interest rate of 0.55% per month which is fixed for the first 4 years.

The amount of the mortgage at the end of the nth month, $£A_n$, is given by

$$A_n = 1.0055A_{n-1} - 1050$$

where the amount at the start is $£A_0$ which is £135 000.

a) Explain the significance of the number 1.0055 in the recurrence relation.

b) Use the recurrence relation $A_n = 1.0055A_{n-1} - 1050$ to give the amount of the mortgage debt outstanding at the end of each of the first six months.

You should give your values correct to the nearest penny.

c) Hence find the amount Femi will have paid off his mortgage in the first six months.

(Based on AQA Use of Mathematics, 2013)

Exercise 2E

1 Daniel deposits £4200 in an account for 12 months. It earns compound interest at the rate of 1.35%, paid every 6 months. Interest is rounded to the nearest penny.

a) Find the missing values A and B in the table.

b) Calculate the AER on this investment.

	Starting value (£)	**Interest (£)**	**Final value (£)**
First 6 months	4200.00	56.70	4256.70
Second 6 months	4256.70	A	B

2 Yusra deposits £900 in a Best Saver account for 9 months. It earns compound interest every 3 months. The nominal rate is 2.4% per annum.

a) What is the interest rate for each 3 month period?

b) Find the missing values A to E in the table below.

c) Calculate the AER for this account.

	Starting value (£)	**Interest (£)**	**Final value (£)**
First 3 months	900	5.40	905.40
Second 3 months	905.40	A	B
Third 3 months	C	D	E

3 Olamide deposits £4500 in an account for 18 months. It earns 2.05% interest paid every 6 months.

a) How much money does Olamide have in the account at the end of 18 months?

b) Find the nominal rate and AER for this account.

Exercise 2F

Worked example (for reference)

In 2026, the number of tickets sold for a festival was 153 000. This was a decrease of 15% on the number sold in 2025. How many tickets were sold in 2025?

A decrease of 15% means that the number sold in 2026 was 85% of the number sold in 2025.

$$\frac{153\,000}{0.85} = 180\,000$$

1 A men's clothing store buys in ready-made suits from overseas and sells them with a mark-up of 60% for £312. What is the profit on each suit?

2 If you make a loss of 40% when you sell a car for £1380, how much did you pay for the car?

3 An antique dealer prices a table to give a profit of 140%. In a sale, the price of the table is reduced by 25%.

a) What is the dealer's percentage profit on the table?

b) The table was sold in the sale for £2160. What had the dealer paid for the table?

4 The price of a dining table was £1054.00, including VAT at $17\frac{1}{2}\%$.
Later, VAT was increased to 21%. A notice was displayed in the showroom.

NOTICE

VAT has been increased by $3\frac{1}{2}\%$.
The price of the table has been increased by

£1054.00 $\times \frac{3\frac{1}{2}}{100}$ = £36.89

and will now cost £1090.89

Was the notice correct? Fully justify your answer.

Exercise 2G

1 In the USA the price of a wireless speaker is $215.

The exchange rate is $1.42 to £1.

Calculate the cost of the speaker in pounds.

2 £600 is converted into euros using the exchange rate of £1 = €1.18

The euros are then converted into dollars at the rate of €1 = $1.15

How many dollars are obtained?

3 £350 is converted into euros using the exchange rate of £1 = €1.32

An additional £12 commission is charged.

a) How many euros are obtained and what is the total cost of these euros?

b) What commission-free exchange rate would match this deal?

4 Given that the mid-market price for £1 is $1.34 and 168.50 Japanese Yen, find the mid-market price for $1 in Yen.

5 A driver wanted to rent a car for one week in Portugal. At the time, the cost was 310 euros and the exchange rate was €1 = 75 pence.

a) The driver opted to pay in euros using her credit card, which charged a 2.75% fee. Calculate the cost of renting the car in pounds giving your answer to the nearest penny.

b) The cost of renting this car if the driver had opted to use Dynamic Currency Conversion would have been £254.10. What exchange rate has been used to do this conversion?

(Based on AQA Use of Mathematics, 2009)

Dynamic Currency Conversion is a method used with cards where foreign currency prices are automatically converted into pounds. You have the advantage of knowing exactly what you will be charged but the exchange rates for this service tend to be poor and can add up to 4% extra onto the cost.

Consolidation Exercise 2

1 Tariq earns £3950 per month and has a tax-free allowance of £9800. Calculate his taxable income.

2 When water freezes its volume increases by 4%.

What volume of water will make 1000 cm^3 of ice?

3 It is usually true that if you borrow a larger amount of money, then the APR you are charged will be smaller. In the past, the standard rates for bank loans were much higher than today.

In March 2017, if you borrowed £5200 from a typical high-street bank and repaid the loan over 5 years you would pay £128.40 per month.

If you borrowed £5250 from the same bank and repaid the loan over 5 years you would pay £105.50 per month.

a) Calculate the total interest you would be charged over the 5 years for the £5200 loan.

b) Calculate the total interest you would be charged over the 5 years for the £5250 loan.

c) What should you do?

(Based on AQA Use of Mathematics, 2008)

4 Funds in the Sapphire account earn interest at 2.5% per annum.

a) If you invested £550 in the Sapphire account and left it for 4 years without making deposits or withdrawals, how much would be in the account after 4 years? You can assume that the interest rate remains unchanged throughout the 4 year period.

b) Find the nominal interest rate for the Sapphire account if the interest is compounded monthly.

5 A shopkeeper normally sells coats at a price which includes a mark-up of 100% for profit. In a sale she wants to make a profit of at least 25% on each coat. By what percentage can she reduce the price of the coat in the sale?

6 The exchange rate spread can be very large for holiday currencies that are not as much in demand as euros and dollars. In this situation, getting the best exchange rate can often be better than looking for commission-free deals.

Compare the following two possible sources of South African rand.

A

Commission-free foreign currency		
	We sell	**We buy**
South African rand	22.5	25.8

B

Great exchange rates			
	We sell	**We buy**	**Commission**
South African rand	23.1	24.9	£6

a) What amounts of South African rand do you get with each company if you spend a total of £350? Which is the better deal?

b) Use trial and improvement, perhaps with a spreadsheet, or solve the equation

$$A \times 22.5 = (A - 6) \times 23.1$$

to find the number of pounds at which the two deals are equally good.

7

a) Suppose you invest $£S$ at a fixed rate of 0.15% per month. Then, after n years, the amount in the account will be $£P$ where

$$P = S \times 1.0015^{12n}.$$

i. What is the amount in the account after 1 year if you invest £600?

ii. Hence find the AER for this investment.

b) What is the formula for calculating the amount in an account after n years if you invest $£S$ and the interest rate is 1.9% every 6 months?

8 The annual rate R, expressed as a decimal, at which an amount $£P$ would increase to an amount $£A$ after n years is given by the formula

$$R = \sqrt[n]{\frac{A}{P}} - 1.$$

An investment of £4500 has grown to £5800 after 7 years.

Find the rate of interest on this investment, expressed as a percentage.

$\sqrt[7]{\ }$ stands for the 7th root. Make sure you know how to use your calculator to find roots like these.

9 The table shows some average food prices, in pence, for a country for 2016–2025.

	2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Eggs (6)	28	30	30	31	30	31	33	36	41	43
Onions (kg)	58	65	68	70	75	71	69	74	88	102
Rice (kg)	48	50	53	58	61	63	65	70	79	88
Pasta (500g)	45	44	48	51	56	62	70	79	102	108

a) Estimate how many boxes of eggs, kilograms of onions and rice, and packets of pasta a 'typical' household might buy in a week.

b) Hence calculate the weekly cost of your 'basket' of goods in each of the years 2016–2025.

c) Find the annual inflation rates that are given by your index.

Think about what the percentage increase is between years.

10 Aisha has a mortgage for £95 000. The annual interest rate is 4.5%.

To pay off the mortgage quickly, she makes monthly payments of £1750.

a) Show clearly that, at the end of the first year, Aisha owes £78 275.

b) Let $£A_n$ be the amount she owes after n years.

Aisha uses the recurrence relation

$$£A_{n+1} = 1.045A_n - 1750$$

to find the amount owed at the end of each year.

What mistake has she made? Correct her recurrence relation.

c) A spreadsheet is set up as shown.

	A	**B**
1	n	A_n
2	0	95 000
3	1	78 275
4	2	60 797.38
5	3	42 533.26
6		

i. What formula can be used for cell B6?

ii. Copy and complete the spreadsheet. When does Aisha pay off the mortgage?

11 The table shows the cost of a well-known burger in three countries in July 2026.

Australia	6.85 Australian dollars
UK	£3.15
USA	$5.25

The exchange rates at the time were:

$$£0.58 = \$1 = 1.46 \text{ Australian dollars}$$

In which country was the burger most expensive? Show your working fully.

12 To pay for a skiing holiday, Naledi considers borrowing £700 from two different lenders.

a) The first lender requires Naledi to pay a single lump sum of £1150 at the end of 2 years. Calculate the APR charged on this loan.

b) The second lender charges an APR of 32% and requires two equal repayments, the first repayment at the end of the first year and the second repayment at the end of the second year. Calculate the amount of each repayment.

c) Although the two lenders charge similar APRs, the two total repayments are very different. Why is that?

13 The interest on a loan of £6000 is 2.1% per month. A formula which converts a monthly interest rate of r into an APR of R is

$$R = (1 + r)^{12} - 1$$

where both r and R are expressed as decimals.

a) Use this formula to find the APR, expressing this as a percentage.

b) Explain why the APR is greater than $12 \times 2.1 = 25.2\%$.

14 £1750 is invested in an account earning 0.95% interest every 6 months.

a) Copy and complete the table.

	Start value	**Interest**	**Final value**
First 6 months	1750	16.62	1766.62
Second 6 months			
Third 6 months			

b) What is the nominal interest rate on this account?

c) Find the AER.

Review

After working through this chapter you should:

- be able to calculate the income tax, National Insurance and student loan repayments that will be deducted from your pay each month

- know how to compare loans using APR
- know how to compare savings rates using AER
- appreciate the effects of inflation on your savings
- be able to use spreadsheets and recurrence relations to find solutions to problems in financial contexts.