2. Algebra

Comparing phone contracts and utility bills

Understanding how to substitute values into formulae is not only helpful for those all important maths exams, it is also a useful skill in day-to-day life. When comparing energy tariffs or phone contracts, you may find it useful to write a short formula to estimate your costs and pick the best deal.

Task one: Comparing phone contracts

Compare the five different iPhone 12 phone contracts on page 5 and answer the following questions:

1. What is the total cost of each contract? (Look out for the length of the contracts, as these may differ.) Upfront costs are one-off costs that are paid upon taking out the contract.

   1. Provider 1

   2. Provider 2

   3. Provider 3

   4. Provider 4

   5. Provider 5 (assume you keep this monthly contract for two years)

The cost of a phone contract has to cover both the cost of the phone as well as the services you are buying from the provider (which, in this case, is data).

2. Match the equation that shows the cost of the handset to the relevant provider and complete the table by providing the missing two formulae and calculating the cost of the handset for each provider.

D = price per GB per month   P = phone handset cost

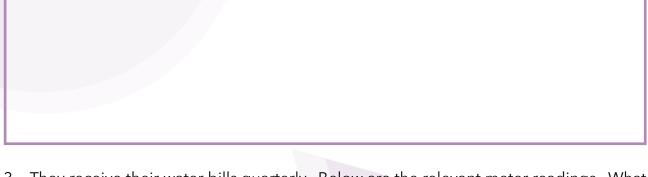| Provider	Formula	Phone handset cost Assume data costs £3 per GB per month
	$P = 50 + 36(30-4D)$	
	$P = 140 + 24(44-6D)$	
	$P - 100 = 24(53-8D)$	

Task two: Energy bills [Higher]

A young couple in a flat are charged for their utility (i.e. water, electricity and gas) bills at the following rates:

	Water	Electricity	Gas
Price per unit	138.18p per m³ 1m³ = 1,000L	13.978p per kWh	3.8p per kWh
Standing charge	£19.26 per year (charged as a quarterly fee in each bill)	£85.78 per year (charged as a daily fee in each bill)	158.41p per day (charged in each monthly bill)
Annual cost formula			

1. Express the annual utility charges as a formula in the above table.

2. In April they used 600 kWh (kilowatt hour) of gas. How much will their April bill cost?

3. They receive their water bills quarterly. Below are the relevant meter readings. What is the expected water bill for this quarter?

Reading date and time	Water
1 January 2022, 00:00	4,304 m³
31 March 2022, 23:59	4,368 m³

4. The following electricity meter readings have been recorded. The couple pays their electricity bill via direct debit each month. Complete the table below to calculate their account balance at the end of each month.

Reading date and time	Meter reading (kWh)	Electricity usage (kWh)	Actual cost	Payments made	Account balance
1 January 2022 00:00	4,600	-	-	-	£17.50 CR
31 January 2022 23:59	4,875			£35.00	
28 February 2022 23:59	5,050			£35.00	
31 March 2022 23:59	5,215			£35.00	

It's often best to pay bills via a direct debit so you don't miss or forget to pay them, some suppliers may even offer discounts for paying via a direct debit. A direct debit is an automatic monthly payment towards your bills that is based on an estimate of your usage. As they are based on estimates, your account may go through periods of being either in debit (DR) which means you owe the supplier more money or in credit (CR), meaning the supplier owes you money.

Phone contracts for an iPhone 12

Provider 1	
Contract length (months)	24
Upfront cost (£) :	140
Data (GB)	6
Monthly cost (£) :	44

Provider 2	
Contract length (months)	24
Upfront cost (£) :	100
Data (GB)	8
Monthly cost (£) :	53

Provider 3	
Contract length (months)	36
Upfront cost (£) :	50
Data (GB)	4
Monthly cost (£) :	30

Provider 4	
Contract length (months)	36
Upfront cost (£) :	0
Data (GB)	6
Monthly cost (£) :	38.50

Provider 5	
Contract length (months)	1
Upfront cost (£) :	679
Data (GB)	4
Monthly cost (£) :	12