A8.1 Flowcharts

Before you start

You should be able to:

- carry out simple calculations.

Why do this?

Flowcharts are used to help people or computers make complex calculations.

Objectives

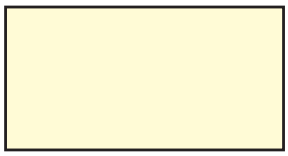
- You will be able to use a flowchart and produce outputs from the flowchart given inputs to the flowchart.
- You will be able to design a flowchart to solve a problem.

Get Ready

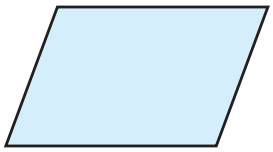
1 Jim earns £25 000 a year. He pays no tax on the first £6000 and tax at 20% on the remainder. Work out how much money he will have left after the tax has been taken off. Make sure each stage in your calculation would be clear to someone else.

Key Points

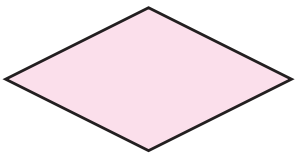
- There are four shapes that you need to understand:



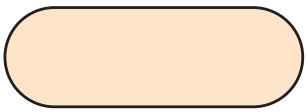
a calculation



an input or an output



a decision



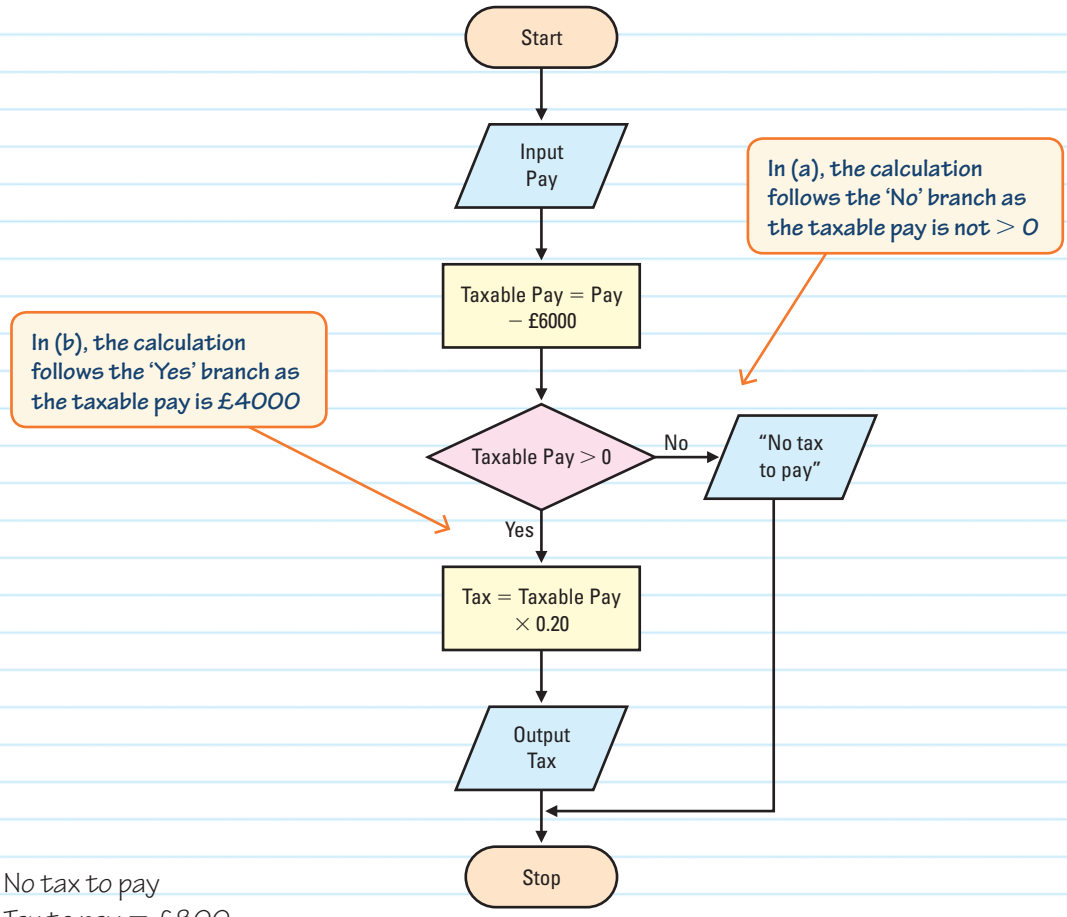
a start or a stop

- An arrow ⟶ shows the direction of the whole calculation.

Example 1

Jim wants to calculate the tax he has to pay at work.
He uses the flowchart shown to do it.
Use the flowchart to work out the tax to be paid on:

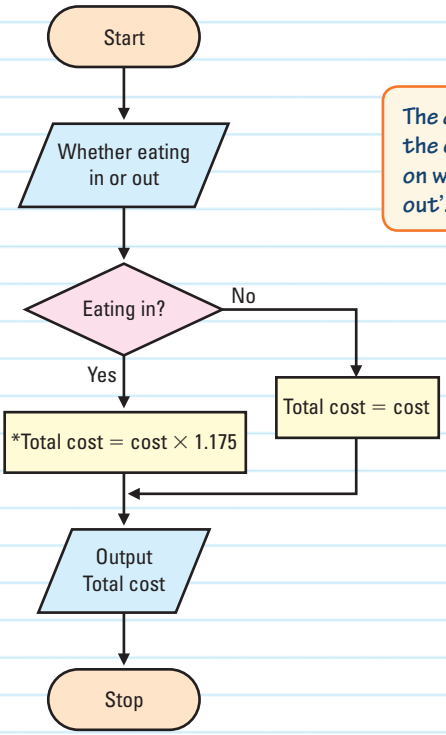
a £5000 **b** £10 000



a No tax to pay
b Tax to pay = £800

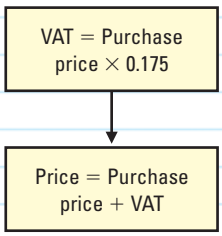
Example 2

Jim runs a fish and chip cafe. If people eat in the cafe then he has to add on VAT at 17.5% of the purchase price of the food. If they eat out then they do not have to pay VAT.
Construct a flowchart that Jim could use to work out the total cost.
Here is one possible response.



The decision box has 'eating in' as the calculation changes depending on whether 'eating in' or 'eating out'.

A second correct response would have been to have two boxes in place of the box *.

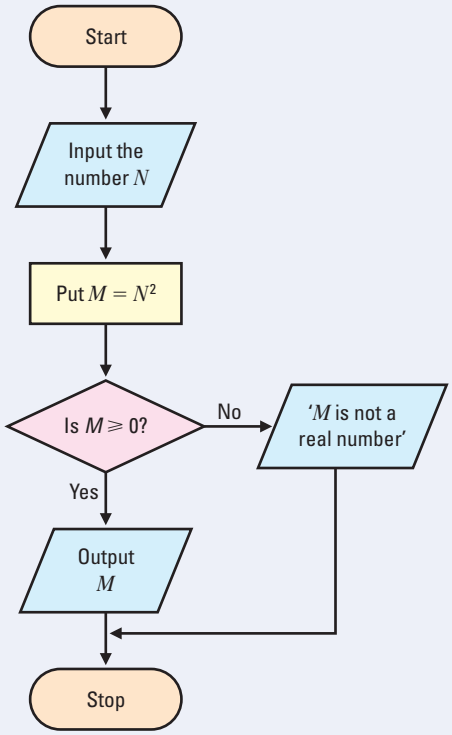


Exercise 8A

C

1 Use the following flowcharts and work out the outputs for the given inputs **i**, **ii**, and **iii**

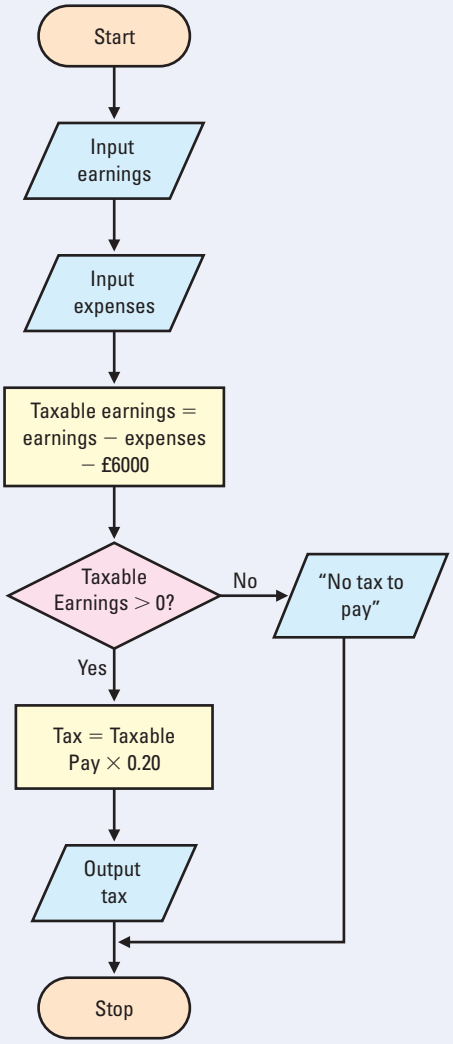
a



i $N = 3$ **ii** $N = 0$ **iii** $N = -4$

C

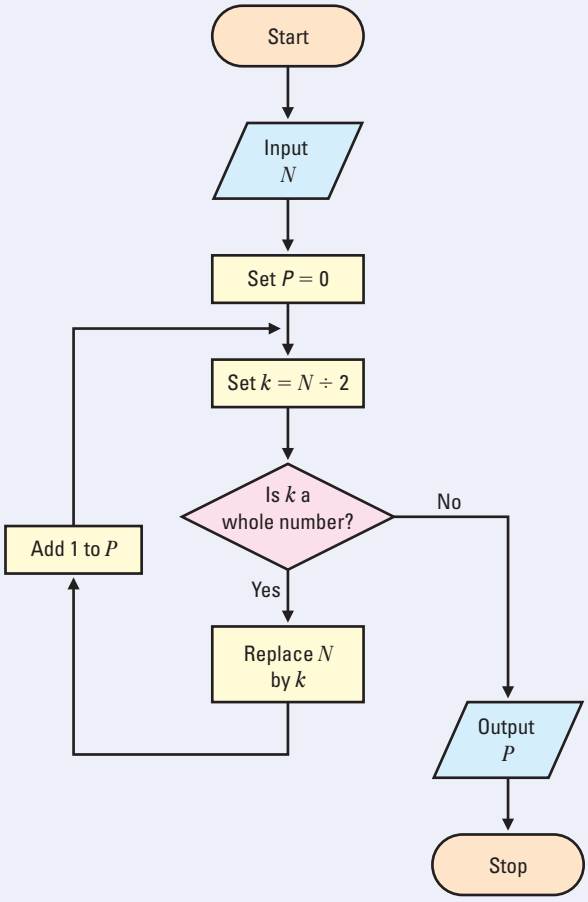
b A flowchart to work out tax given earnings and expenses:



i Earnings = £6000, Expenses = £2000
ii Earnings = £10 000, Expenses = £2000
iii Earnings = £34 000, Expenses = £4000

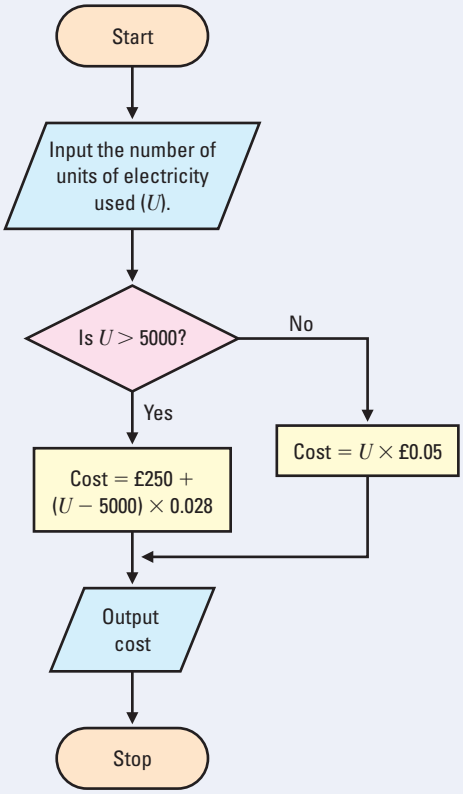
C

c A flowchart to work out the biggest power of 2 that divides a given number exactly:



i 10 **ii** 12 **iii** 16

d A flowchart to calculate the cost of electricity used:



i number of units used = 4800

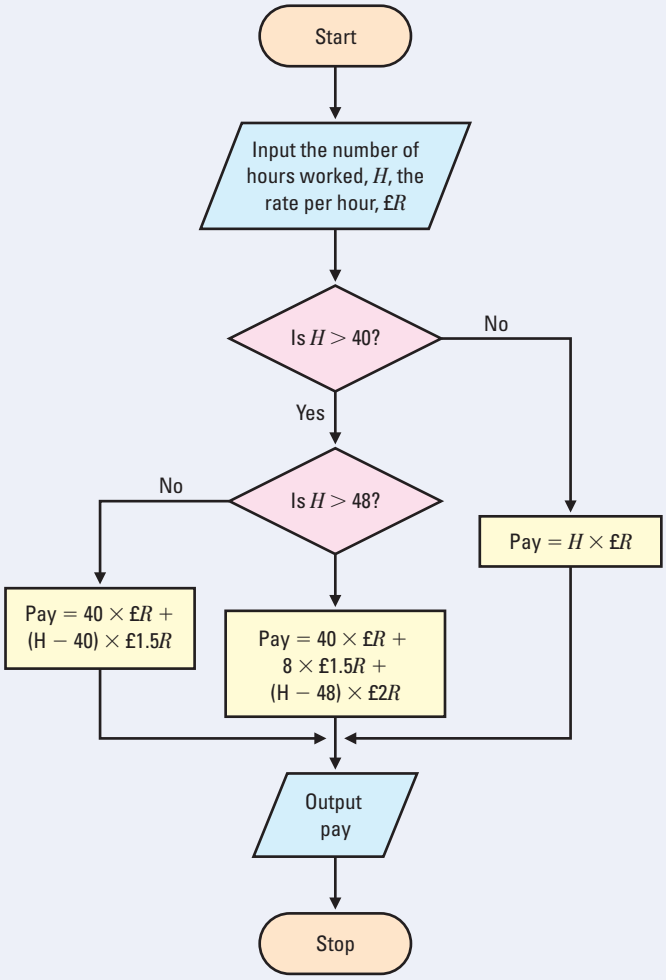
ii number of units used = 7500

iii number of units used = 5000

C

C

e A flowchart to work out the total pay, given the number of hours worked and the rate per hour:



i $H = 28, R = 6.50$ **ii** $H = 45, R = 8$ **iii** $H = 54, R = 9$

B

2 In each case design a flowchart which could be used to solve the problem.

a A shop has to change the VAT on its goods from 17.5% to 20%. This involves dividing the old price by 117.5 and then multiplying the answer by 120. The shop decides to make no changes to prices which are £50 or below.

b Meg wants to work out her electricity bill. She does this by first subtracting her old electricity reading from her new electricity reading to get the units used. If the units used is 4000 or less she multiplies by 12.25p and then changes to £, finally adding on 5% to get the total bill. If the units used is more than 4000 she multiplies the units used less 4000 by 8.5p, changes to £, adds £490 and then adds 5% to get the total bill.

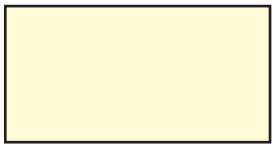
c A company pays 40p per mile expenses for the first 200 miles driven. For any further miles driven the rate is 28p per mile. Karen wants to work out her driving expenses.

d Find the highest power of 3 which will divide exactly into a given number N.

e Angus invests £P at 5% per annum compound interest. He wants to know how many years he will have to keep the account before its value has increased by 50%.

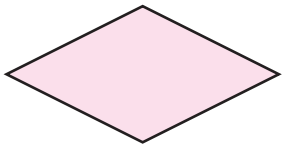
Review

- There are 4 shapes that you need to understand:

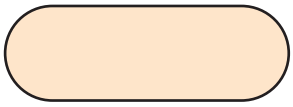


a calculation

an input or an output



a decision



a start or a stop

- An arrow ⟶ shows the direction of the whole calculation.

Answers

A8.1 Get Ready answers

1 Step 1 Work out the amount to pay tax on:
£25 000 − £6000 = £19 000

Step 2 Calculate the tax at 20% on £19 000:
£19 000 × 0.2 = £3800

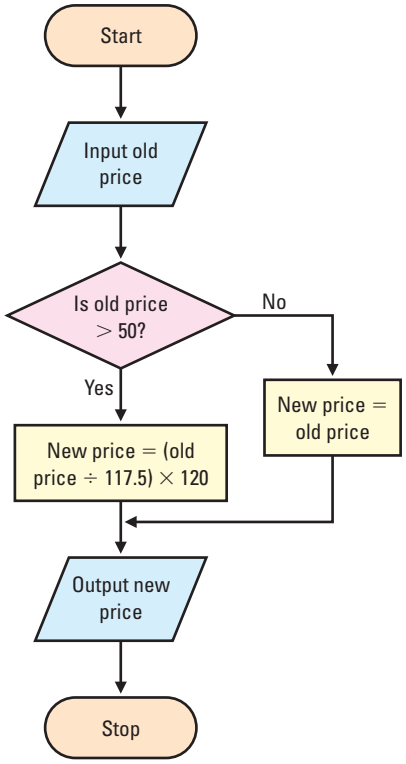
Step 3 Subtract the tax from the original earnings:
£25 000 − £3800 = £21 200

Step 4 Write down the answer:
Money left after tax = £21 200

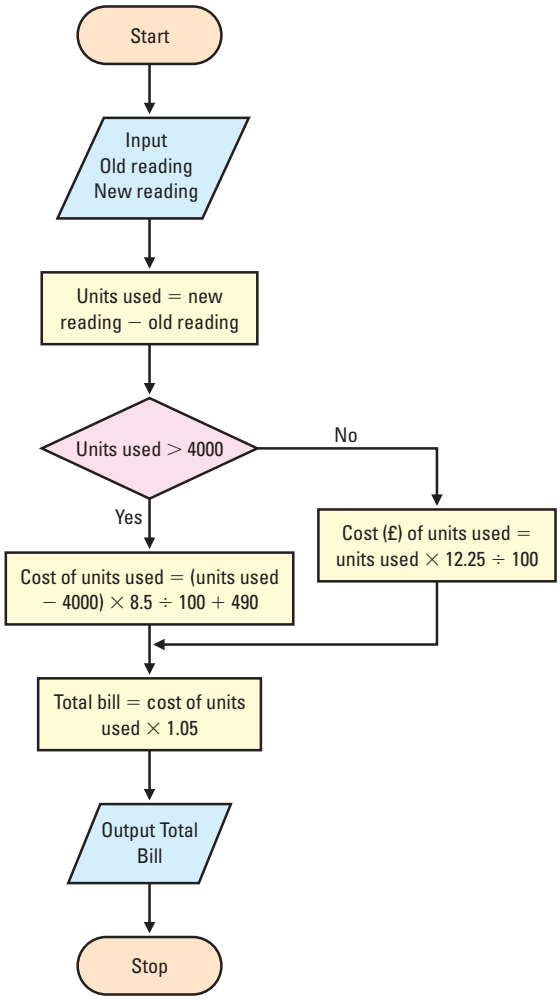
Exercise 8A

1 **a** **i** 9 **ii** 0 **iii** 16
b **i** No tax to pay **ii** £400 **iii** £4800
c **i** 1 **ii** 2 **iii** 4
d **i** £240 **ii** £320 **iii** £250
e **i** £182 **ii** £380 **iii** £576

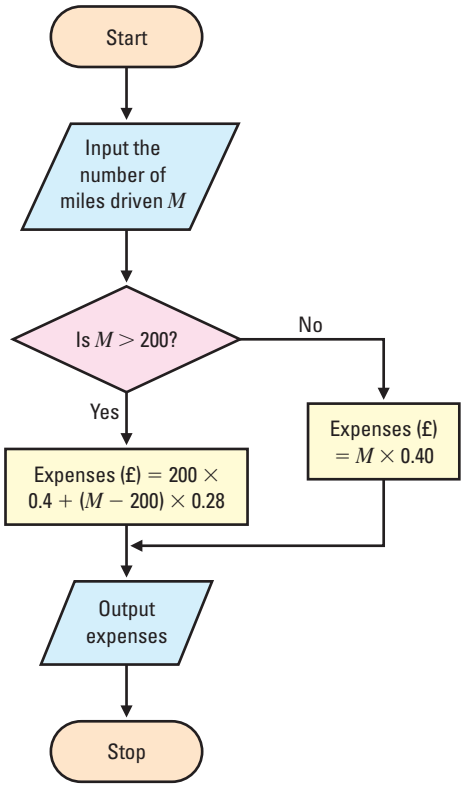
2 **a**



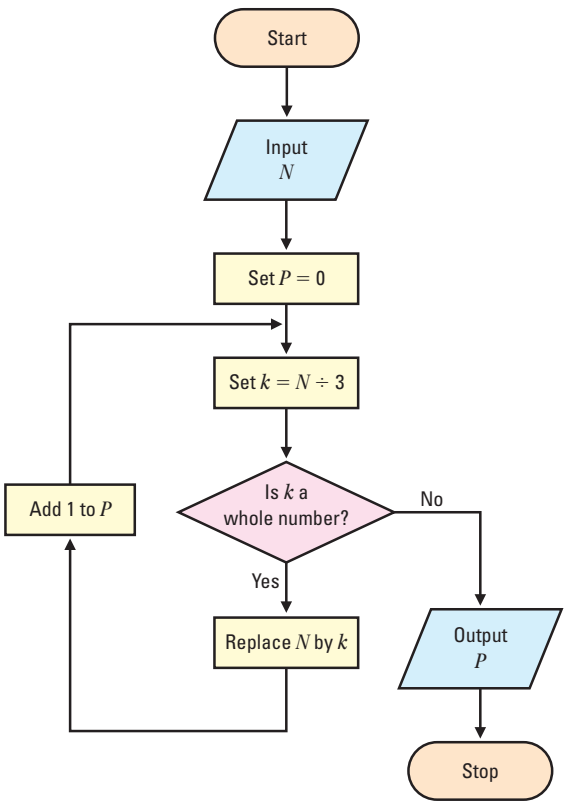
b



c



d



e