






Program Flowchart

- ▶ A flowchart is a diagram which shows the breakdown of an algorithm into all of the necessary steps and is an alternative to pseudo code
- ▶ A flow chart makes use of some standard shapes joined together by lines.
- ▶ Each step is represented by a symbol and connecting lines show the step-by-step progression through the task.

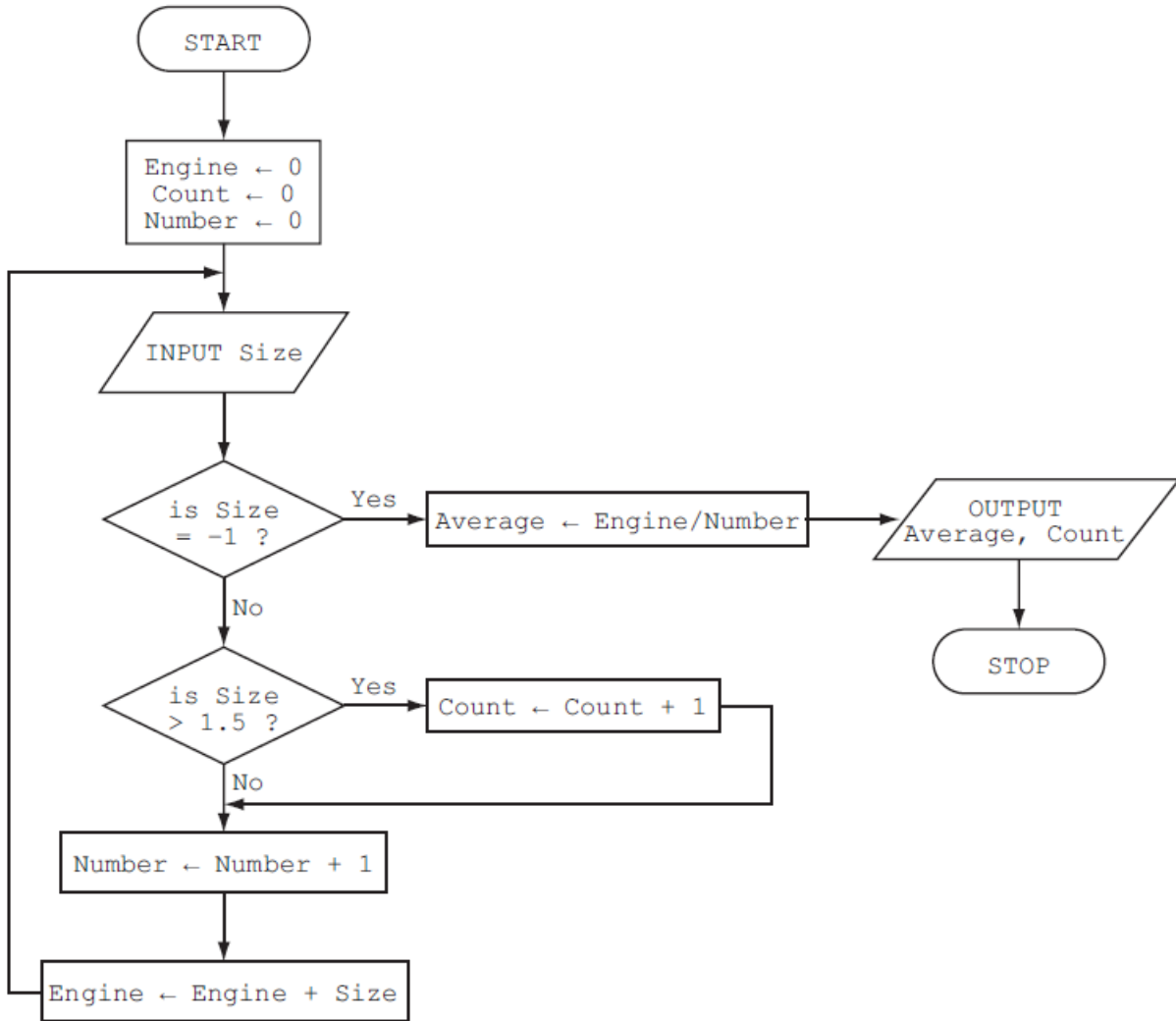
There are 5 symbols for constructing a program flowchart.

Symbol	Name	Function
	Start/end	An oval represents a start or end point.
	Arrows	A line is a connector that shows relationships between the representative shapes.
	Input/Output	A parallelogram represents input or output.
	Process	A rectangle represents a process.
	Decision	A diamond indicates a decision.

Question 1:

The flowchart inputs the size of a number of car engines; a value of -1 stops the input.

This information is output: *average engine size and number of engines with size > 1.5*

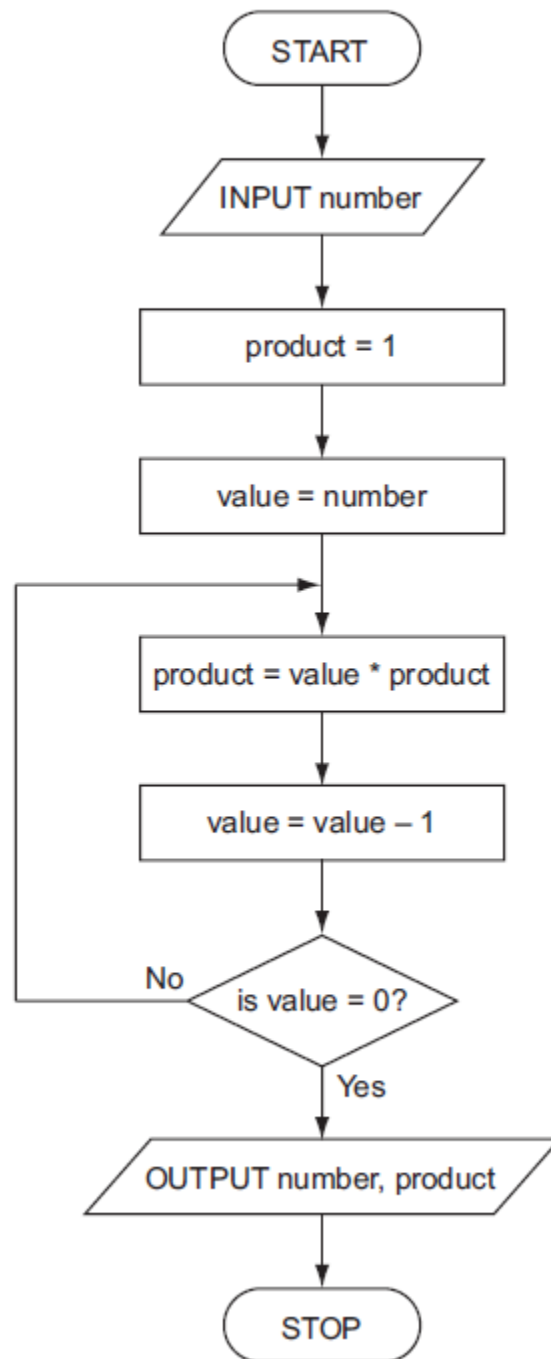


Question 1: Solution

Engine	Count	Number	Size	Average	OUTPUT
0	0	0	1.8		
1.8	1	1	2.0		
3.8	2	2	1.0		
4.8		3	1.3		
6.1		4	1.0		
7.1		5	2.5		
9.6	3	6	2.0		
11.6	4	7	1.3		
12.9		8	1.8		
14.7	5	9	1.3		
16.0		10	-1		
				1.6	
					1.6, 5

Question 02:

Study the following flowchart very carefully.



Complete the trace table for the input value of 5:

number	product	value	OUTPUT

Question 02: Solution

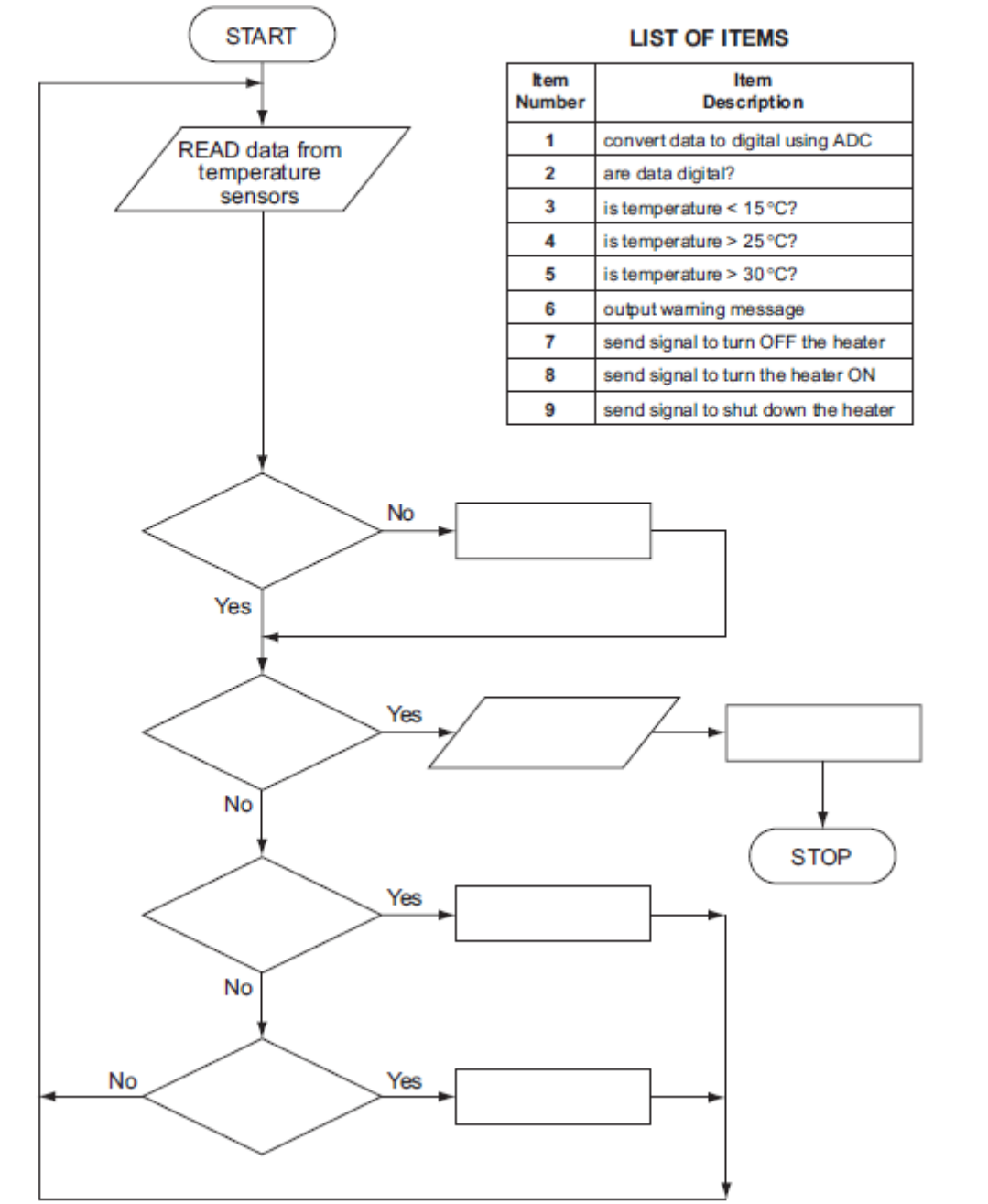
number	product	value	OUTPUT
5	1	5	
(5)	5	4	
(5)	20	3	
(5)	60	2	
(5)	120	1	
(5)	(120)	0	
			5, 120

Question 03:

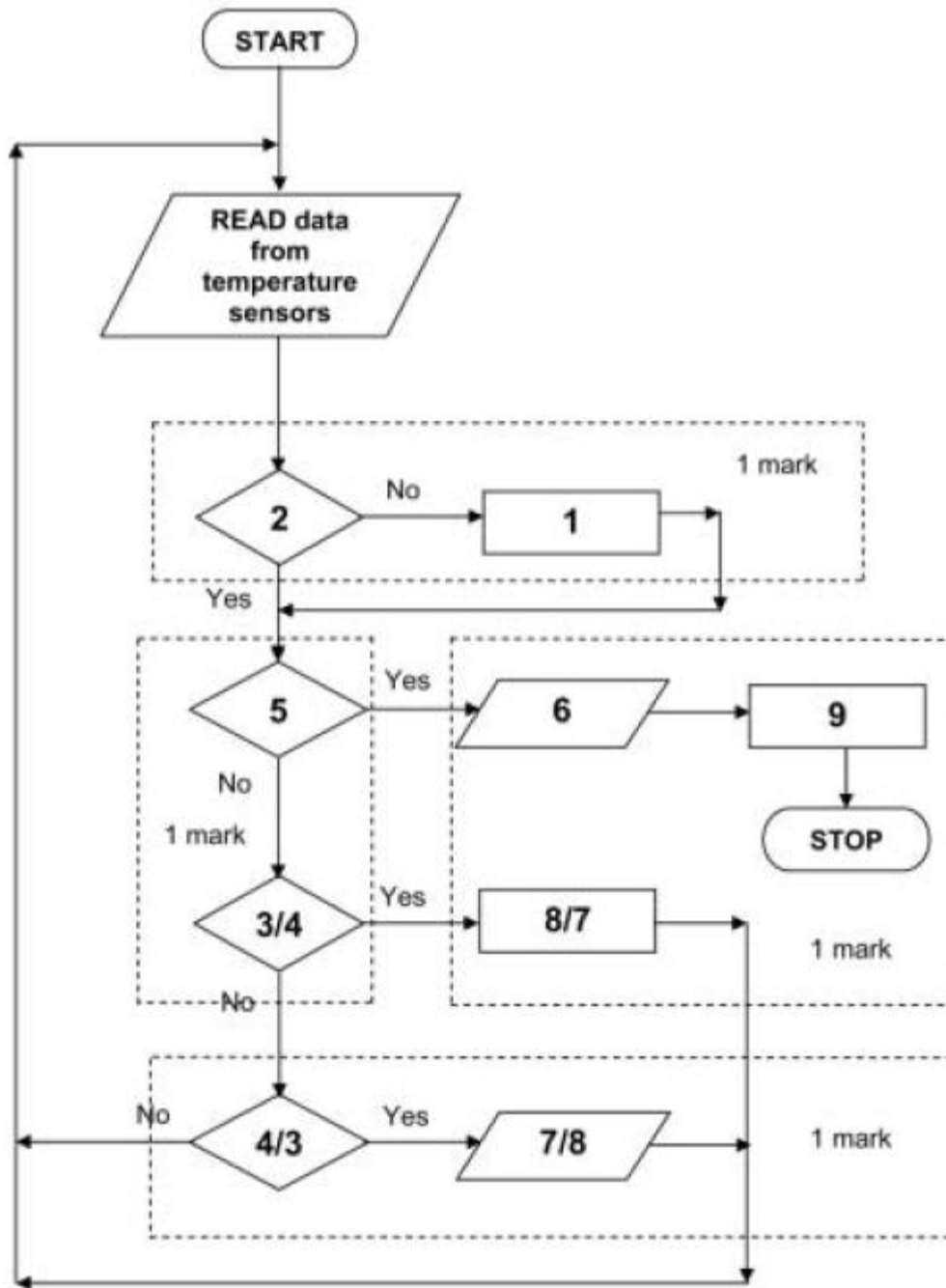
A heating system is being controlled by sensors and a computer. The temperature must be kept between 15°C and 25°C. If 30°C is exceeded a warning message is generated and the system shuts down.

A flowchart of the process is shown below. Some of the items are missing.

Complete the flowchart, using **item number only**, from the list of items given.



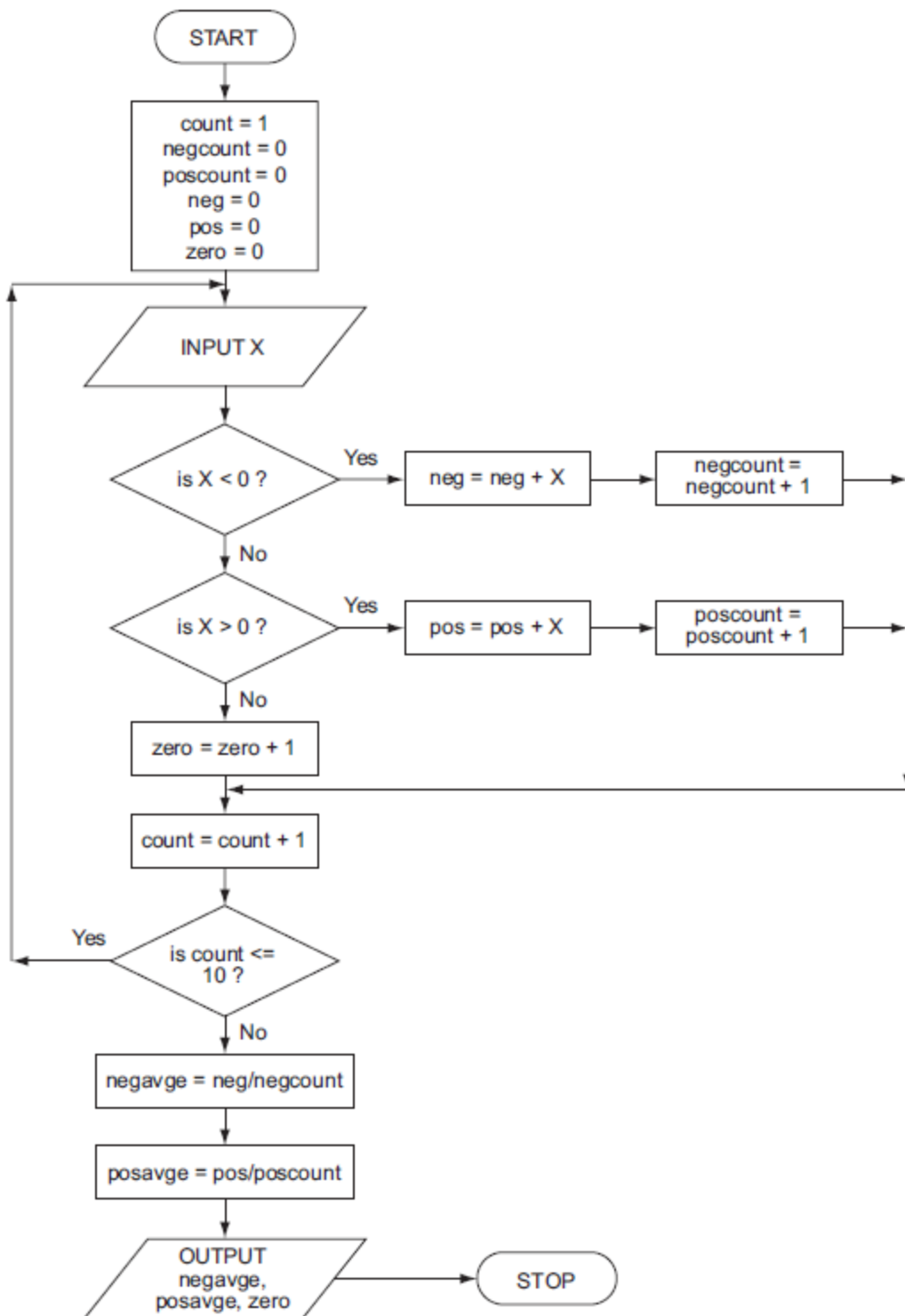
Question 03: Solution



(3 and 8 AND 4 and 7 MUST be marked in PAIRS)
(accept the phrases)

Question 04:

Study the following flowchart.



Question 04: Solution

(NOTES: Additional 0s in any column (UNLESS THEY ARE JUST THE REPEAT OF 0 VALUES) lose the mark for that column)

If columns 1 to 7 are wrong there can be one mark for initialisation (0 0 0 0 0 1) and a mark for the correct output (-3, 6).

negcount	poscount	neg	pos	zero	count	X	negavge	posavge
0	0	0	0	0	1			
				1	2	0		
	1		3		3	3		
	2		8		4	5		
	3		14		5	6		
1		-4			6	-4		
2		-5			7	-1		
				2	8	0		
				3	9	0		
3		-9			10	-4		
	4		24		11	10		
							-3	6

<----- 1 mark -----> 1 mark 1 mark 1 mark <----1 mark----> <----- 1 mark ----->

[6]

Question 05:

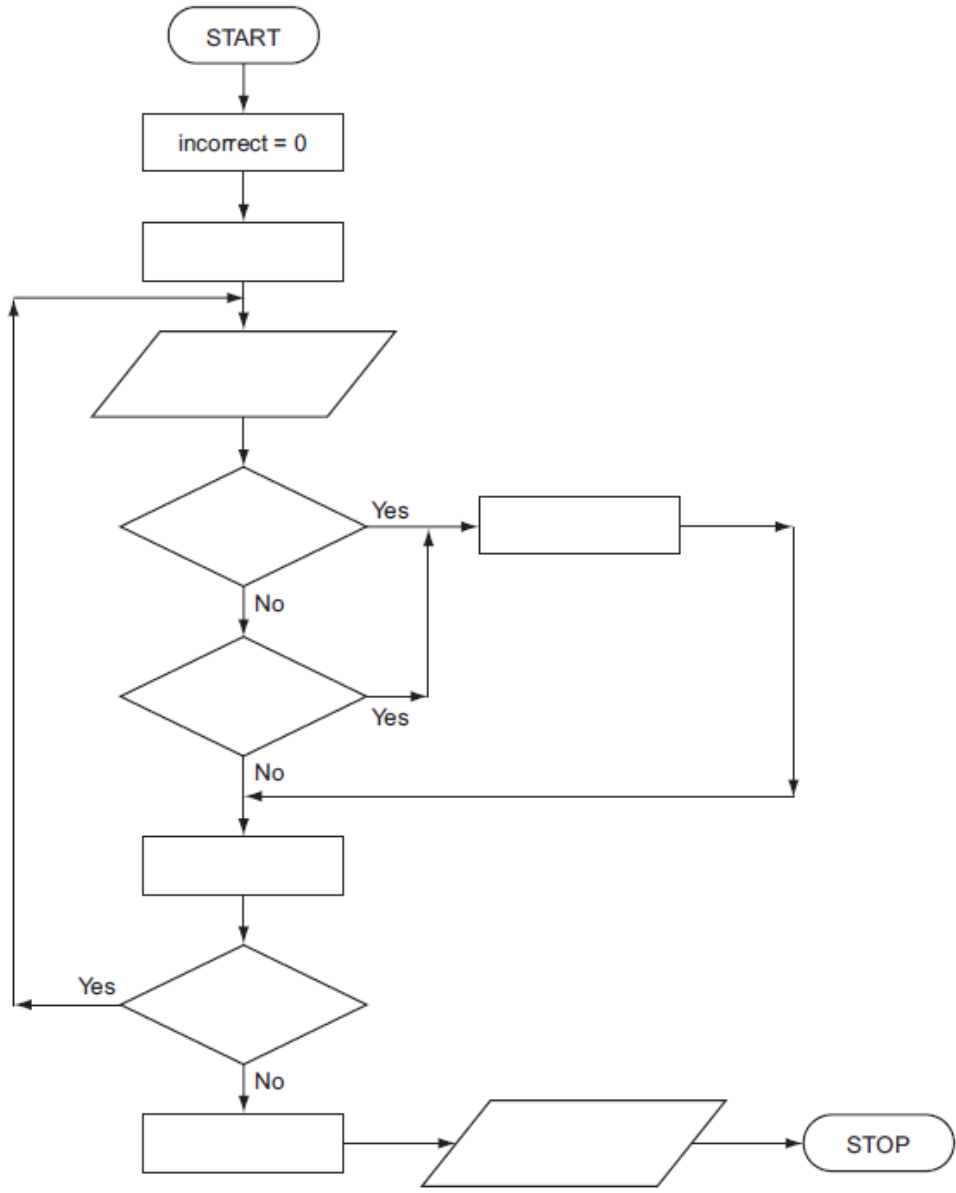
An algorithm has been written to check that code numbers are valid on input. They must be in the range 1000 to 9999.

Five hundred codes are being entered and the percentage of entered codes which are incorrect is output.

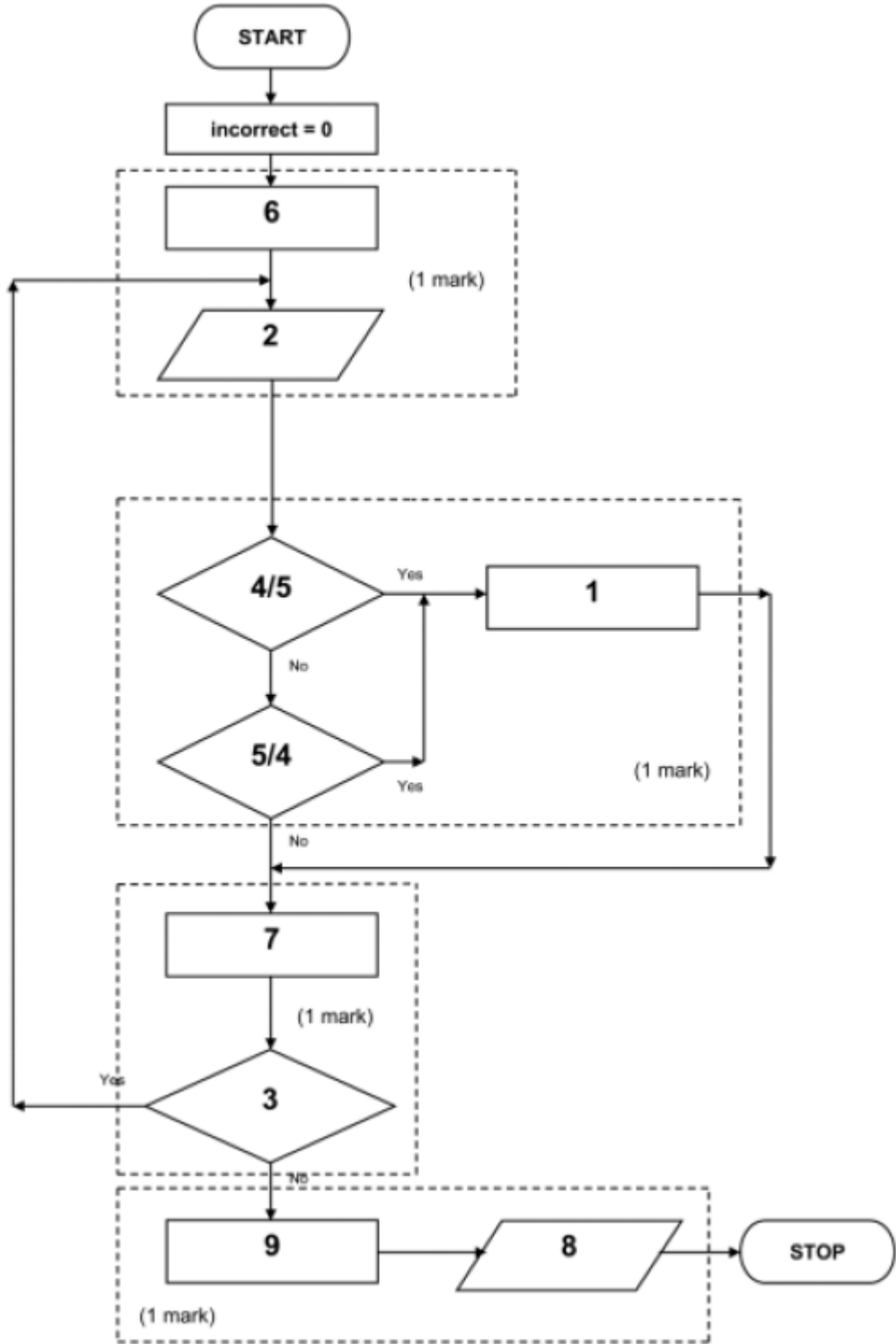
There is a flowchart on the opposite page. It has some statements missing.

Complete the flowchart. Use statement numbers only, chosen from the list below.

statement number	statement
1	Incorrect = Incorrect + 1
2	INPUT Code
3	is Number \leq 500 ?
4	is Code $<$ 1000 ?
5	is Code $>$ 9999 ?
6	Number = 1
7	Number = Number + 1
8	OUTPUT Percent
9	Percent = Incorrect / 5



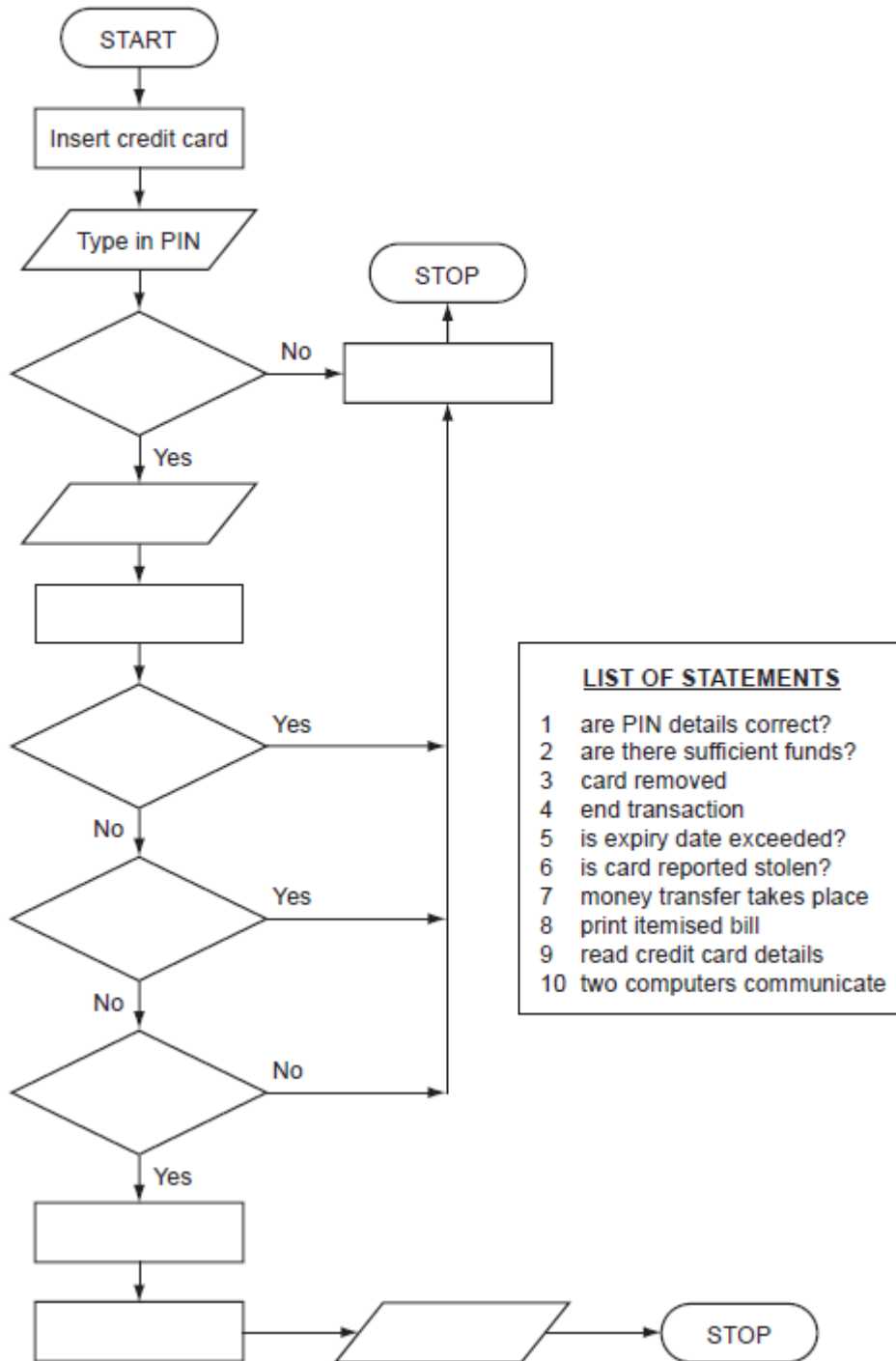
Question 05: Solution



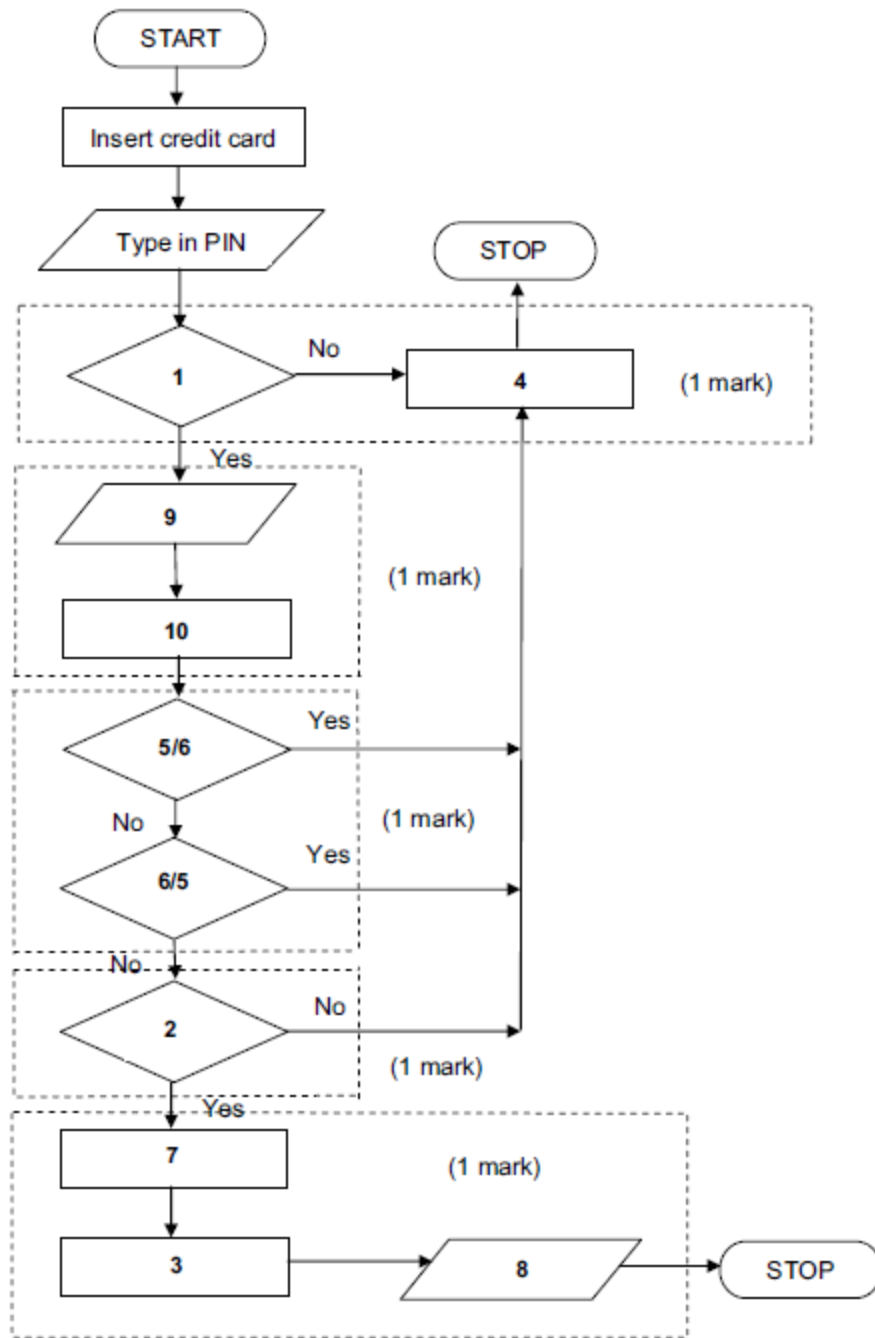
Question 6:

The following flowchart shows what happens when a customer uses a credit card to pay for goods at a supermarket. Ten of the boxes are blank.

Using the items from the list, insert the **ten** missing statements using the appropriate number only. Each statement may be used once only.

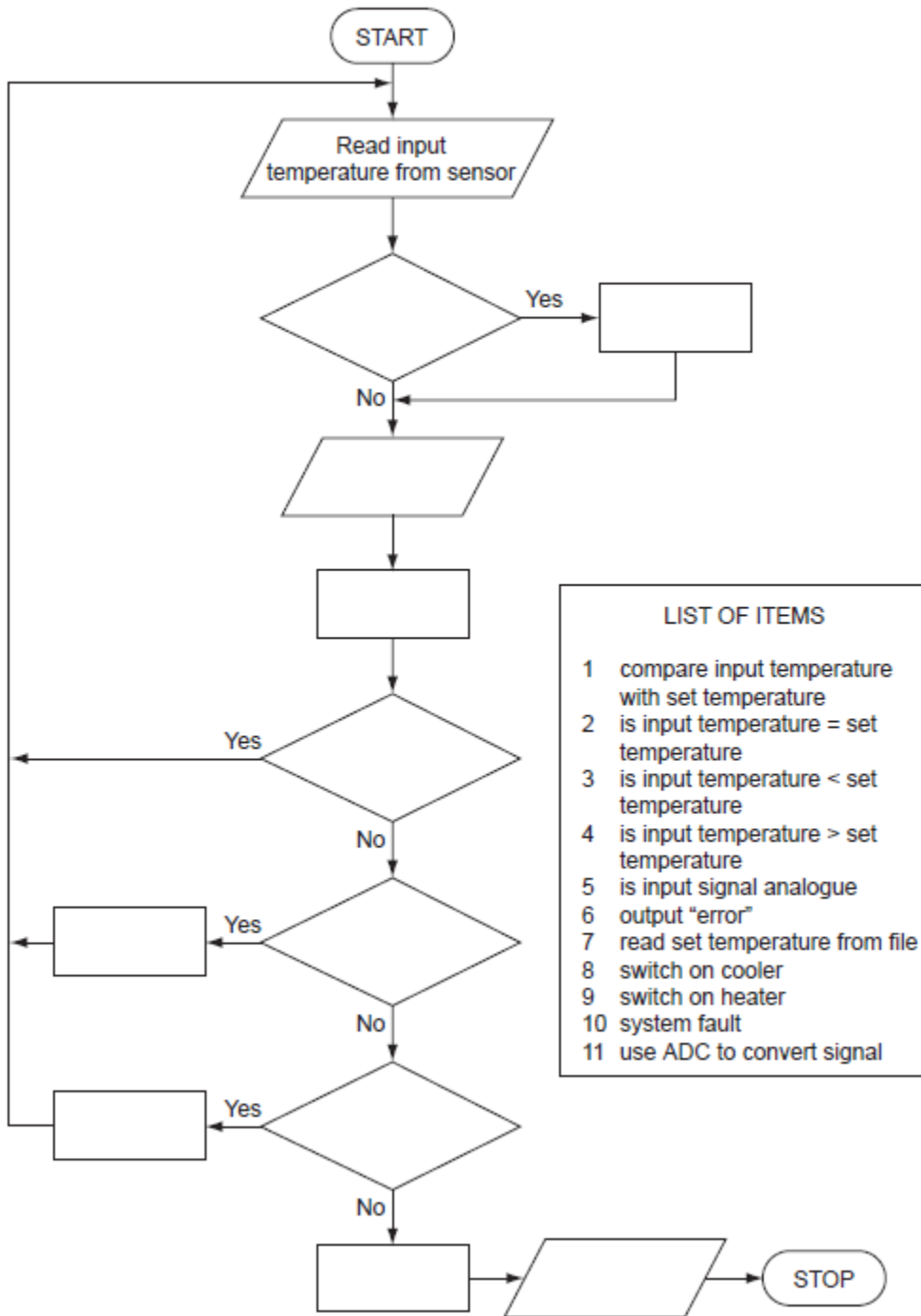


Question 06: Solution



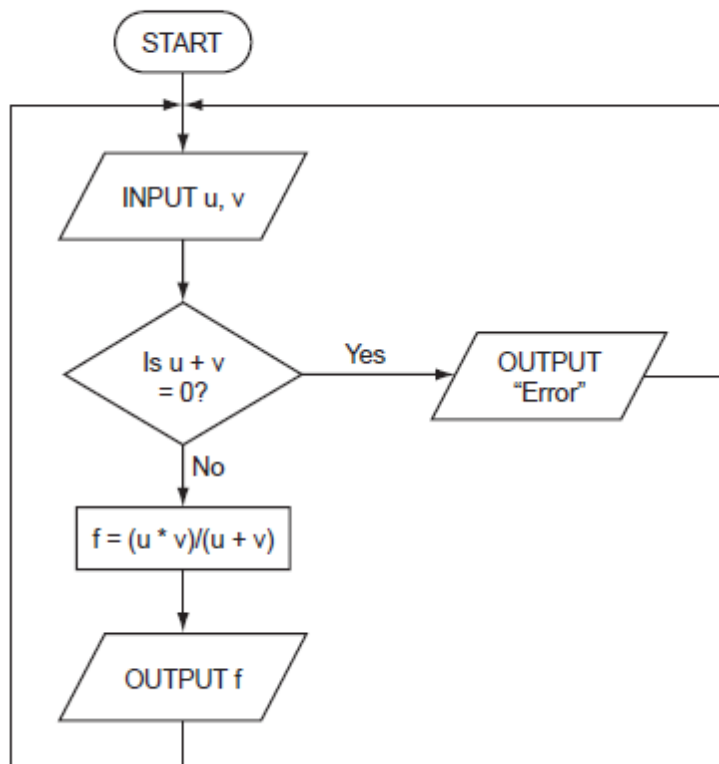
Question 07:

The following flowchart shows how sensors (which can be analogue or digital) and a computer are used to control the temperature of a greenhouse for plants. Complete the flowchart using the items from the list below.



Question 08:

The following flowchart inputs **two** numbers, carries out a calculation and then outputs the result.



Complete the following table for the **three** sets of input data.

INPUT		OUTPUT
u	v	
5	5	
6	-6	
12	4	

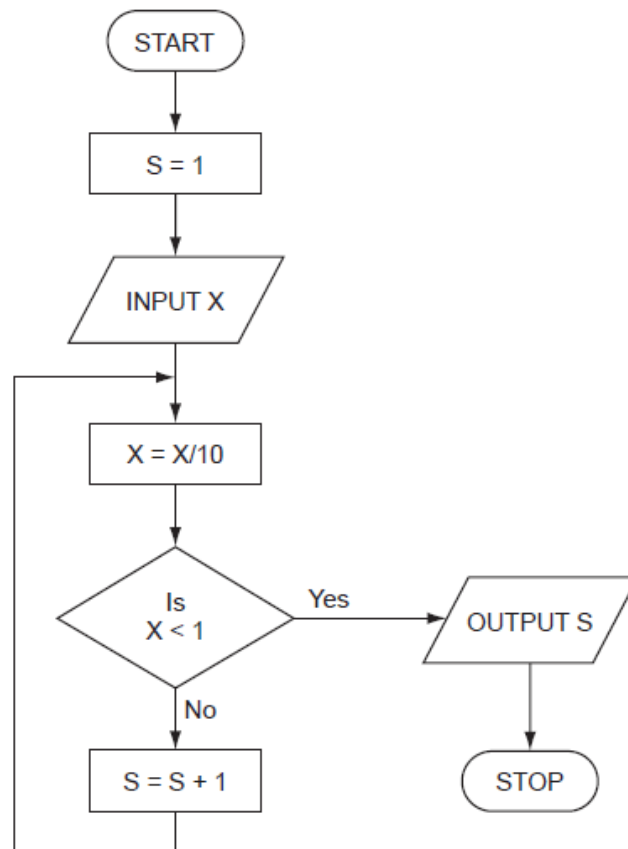
Question 08: Solution

2.5

Error

3

Question 09:



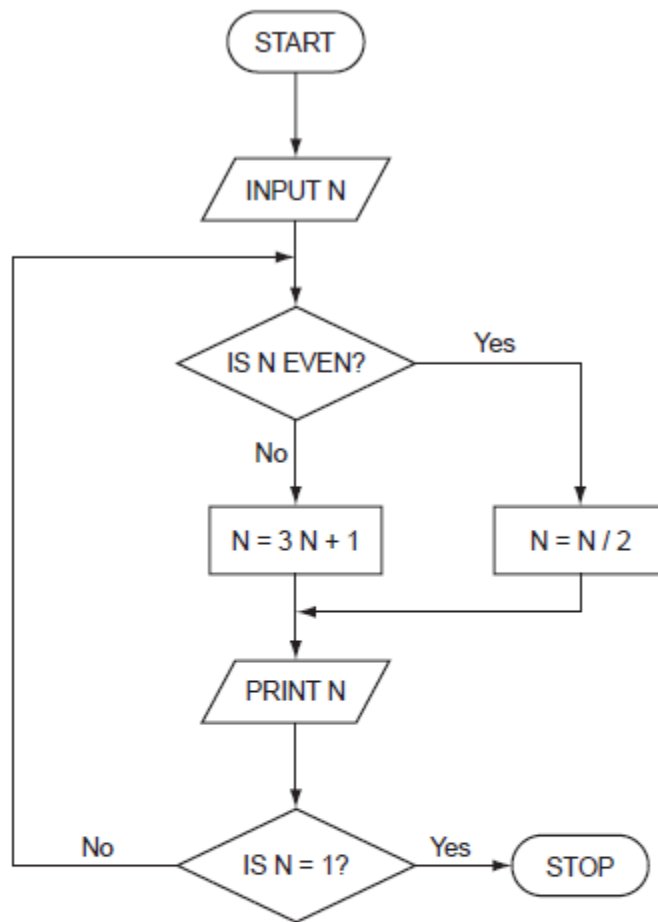
Complete the following table showing the expected output from the flowchart for the **three** sets of input data:

INPUT X	OUTPUT S
48	
9170	
-800	

Question 09: Solution

2
4
1

Question 10:



Trace the flow chart using the numbers 2 and 3. Write down each of the values of N in the order that they are printed out.

(a) 2

(b) 3

(a) 1

(b) $\overleftarrow{10, 5,}$
one mark

$\overleftarrow{16, 8, 4, 2, 1}$
one mark