

Program Flowchart

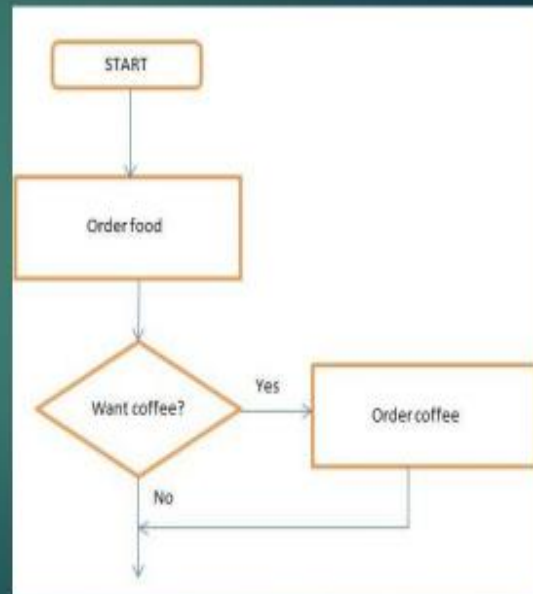
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What is a Program Flowchart.

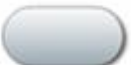




- ▶ A flowchart is a diagram which shows the breakdown of an algorithm into all of the necessary steps and is an alternative to pseudo code
- ▶ A flow chart makes use of some standard shapes joined together by lines.
- ▶ Each step is represented by a symbol and connecting lines show the step-by-step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

What is a Program Flowchart

- ▶ Have a look at the diagram below. It shows the process of ordering a food and drink.
- ▶ There is a clear start, a series of steps, a clear direction of flow and a clear end or finish point.
- ▶ This is a very simple flowchart.
For some tasks or systems, the flowchart can be very complex and detailed.



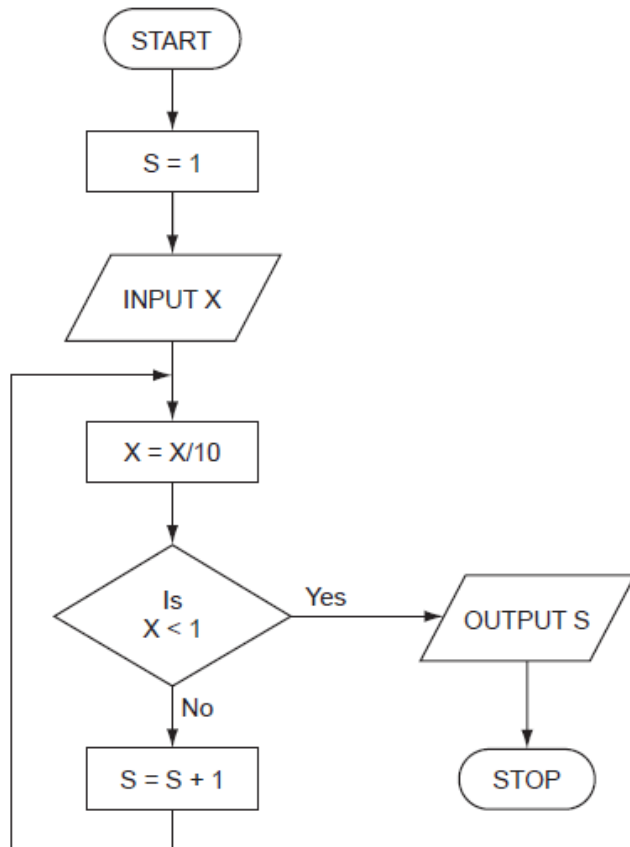
Program Flowchart Symbols

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.

Trace Table

A tabular method of recording the expected values of variables as test data are processed by a program.

Example 1:



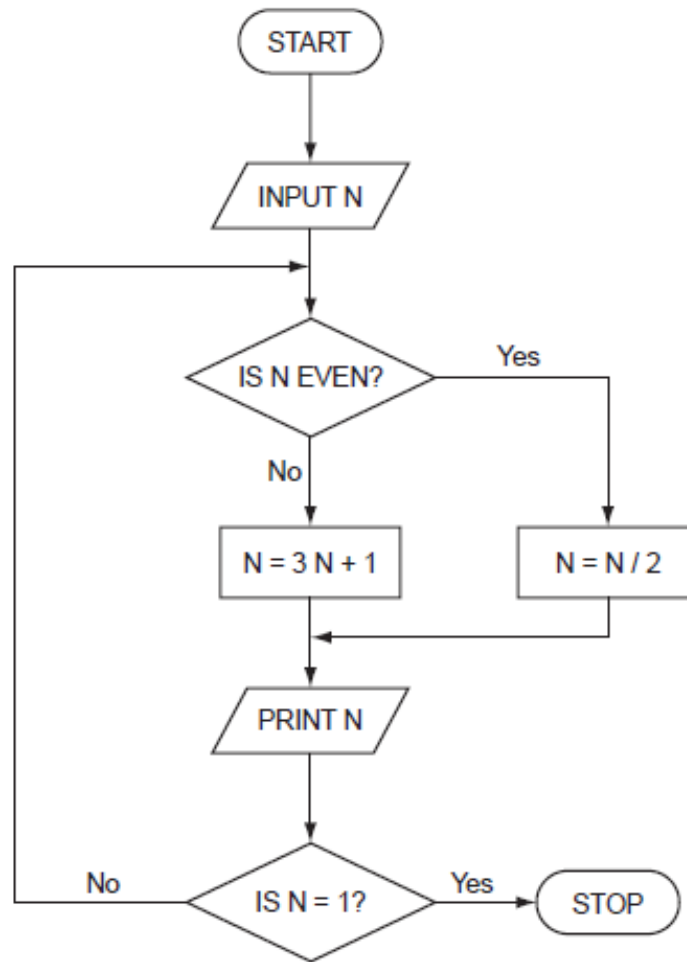
Complete the following table showing the expected output from the flowchart for the **three** sets of input data:

INPUT X	OUTPUT S
48	
9170	
-800	

Solution (Example 1):

2
4
1

Example 2:



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

.....

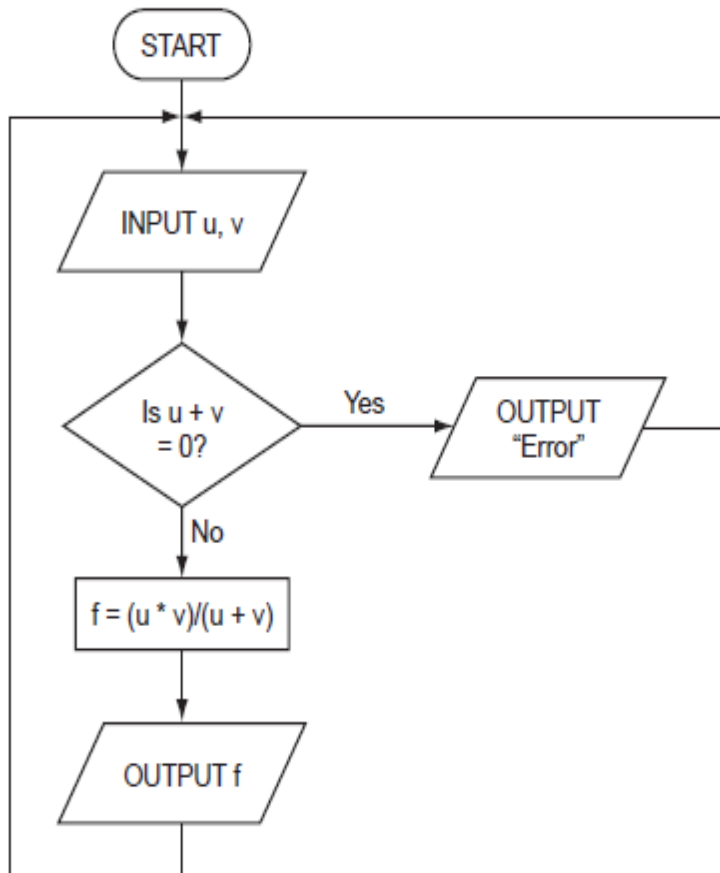
(a) 1

(b) $\leftarrow 10, 5, \rightarrow$
one mark

$\leftarrow 16, 8, 4, 2, 1 \rightarrow$
one mark

Example 3:

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	

Solution (Example 3)

2.5

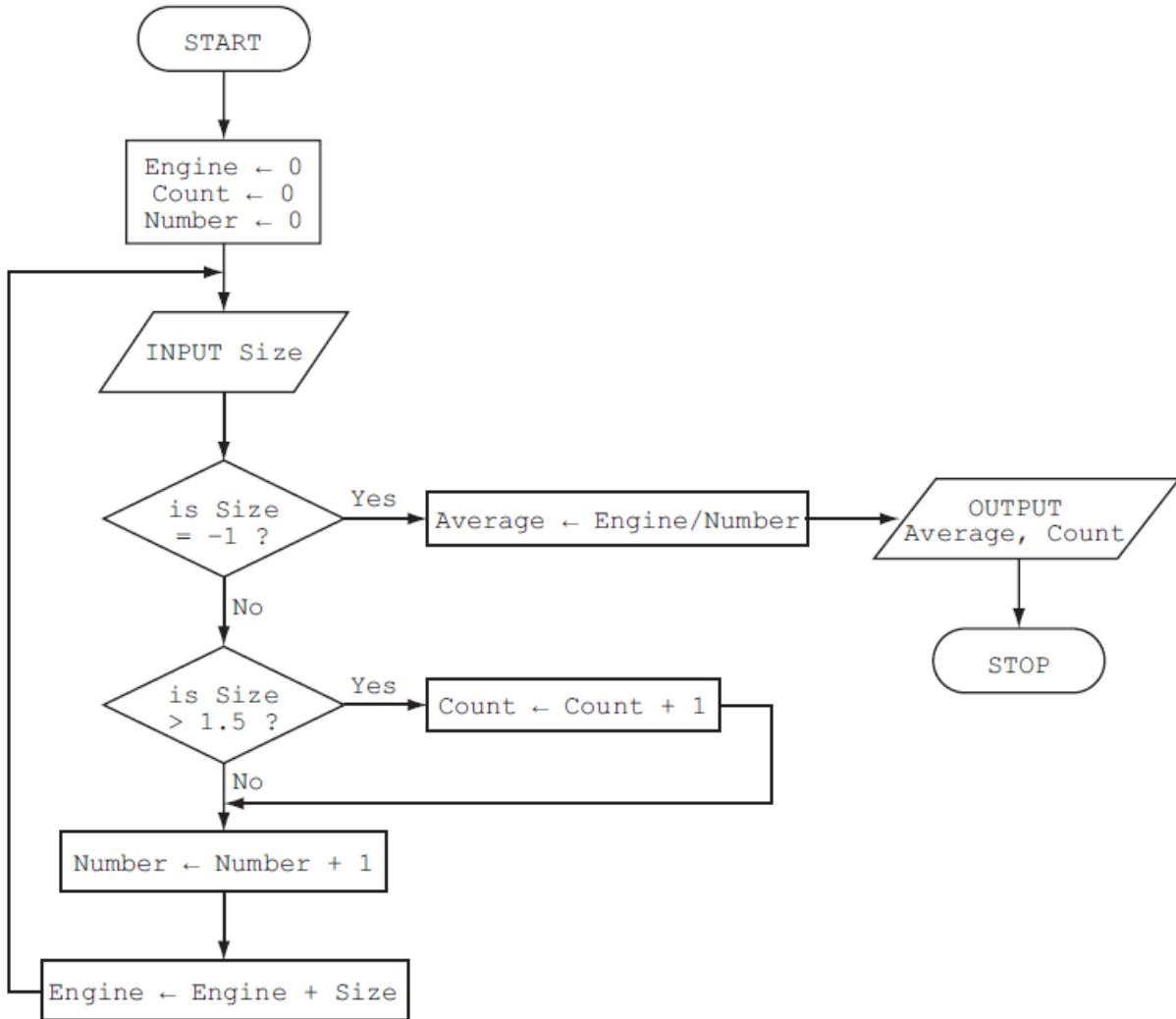
Error

3

Example 4:

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*

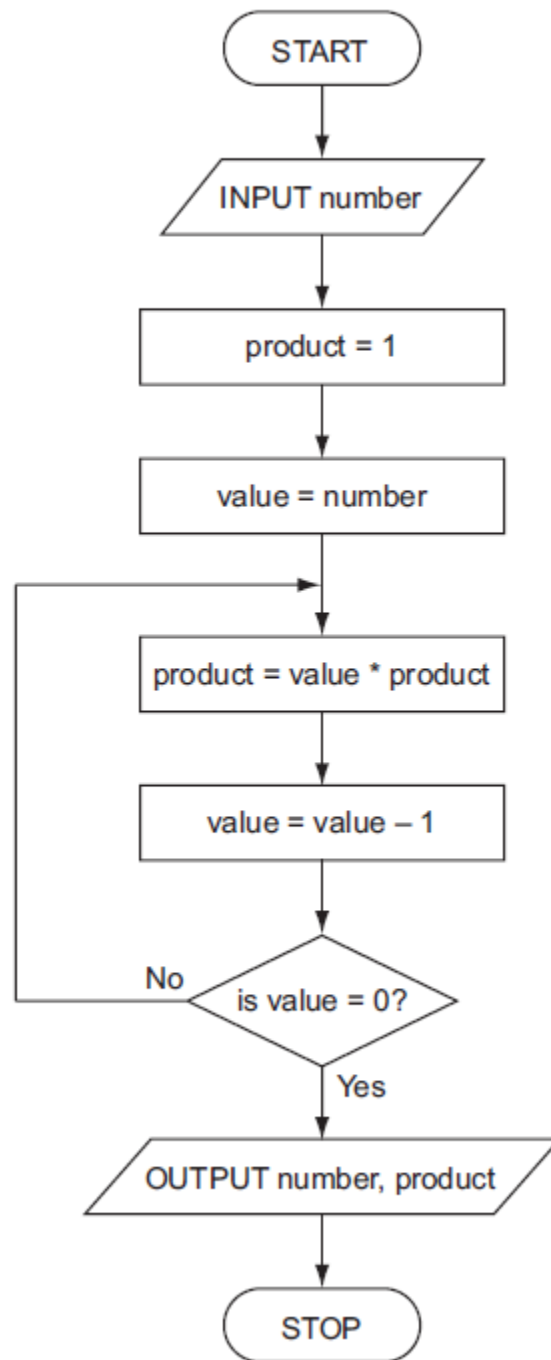


Solution (Example 4)

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

Example 5:

Study the following flowchart very carefully.



Complete the trace table for the input value of 5:

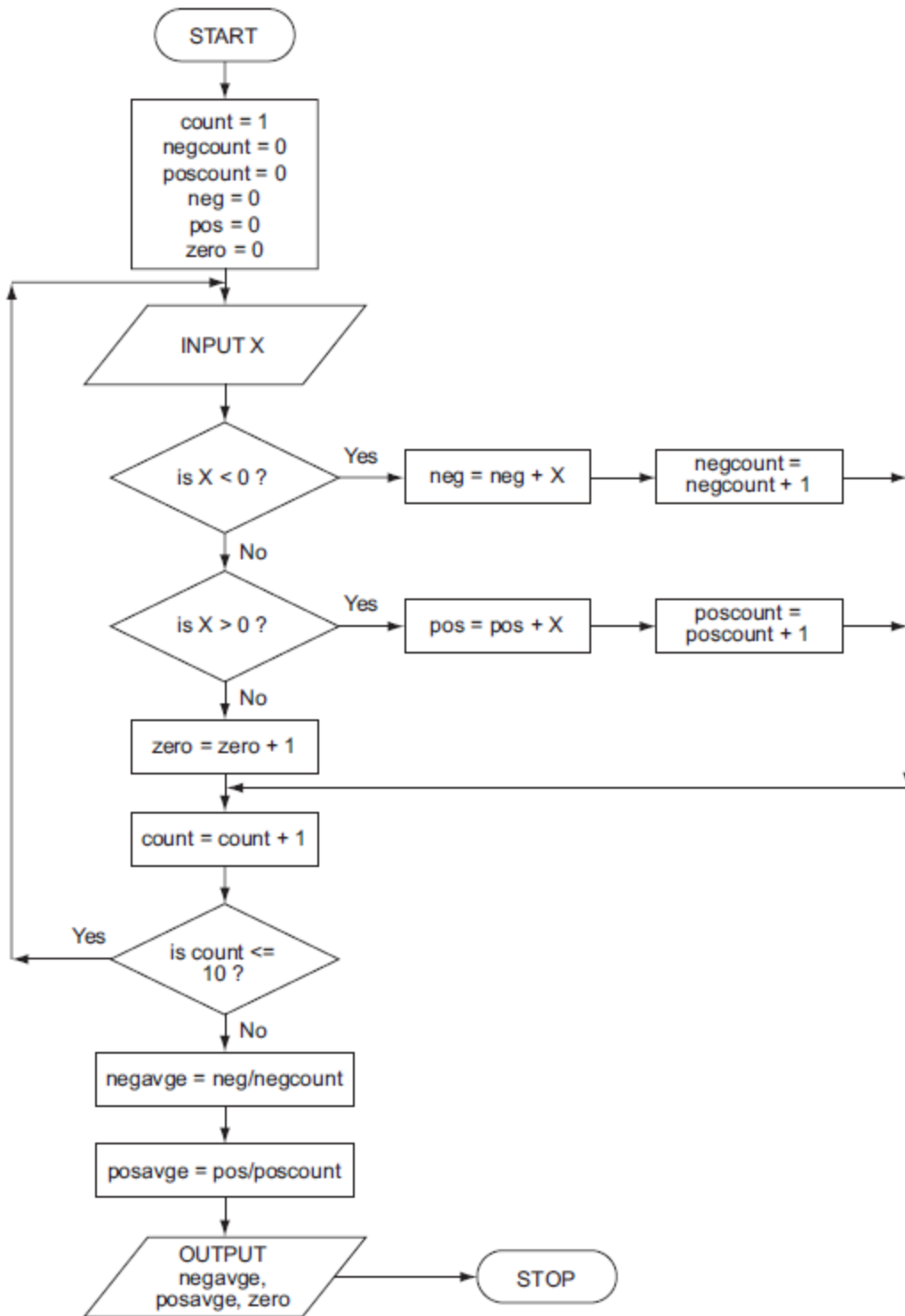
number	product	value	OUTPUT

Solution (Example 5)

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

Example 6:

Study the following flowchart.



(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]