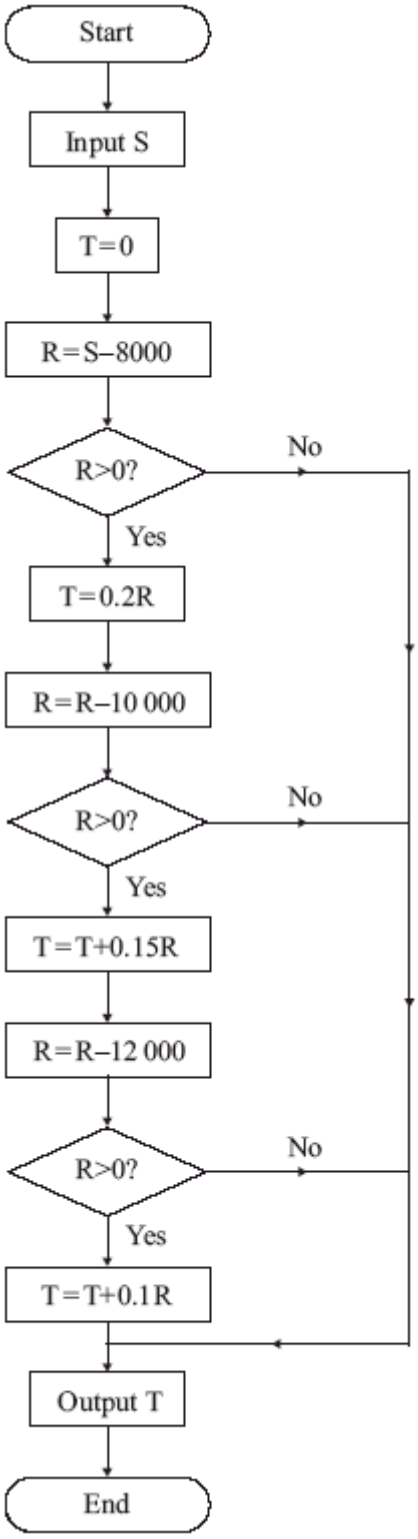
1.



An algorithm is described by the flowchart shown in the diagram above.

(a) Given that S = 25 000, complete the table in the answer book to show the results obtained at each step when the algorithm is applied.

You may not need to use all the lines in this table

S	T	R	R>0?	Output

(5)

This algorithm is designed to model a possible system of income tax, T, on an annual salary, £S.

(b) Write down the amount of income tax paid by a person with an annual salary of £ 25 000.

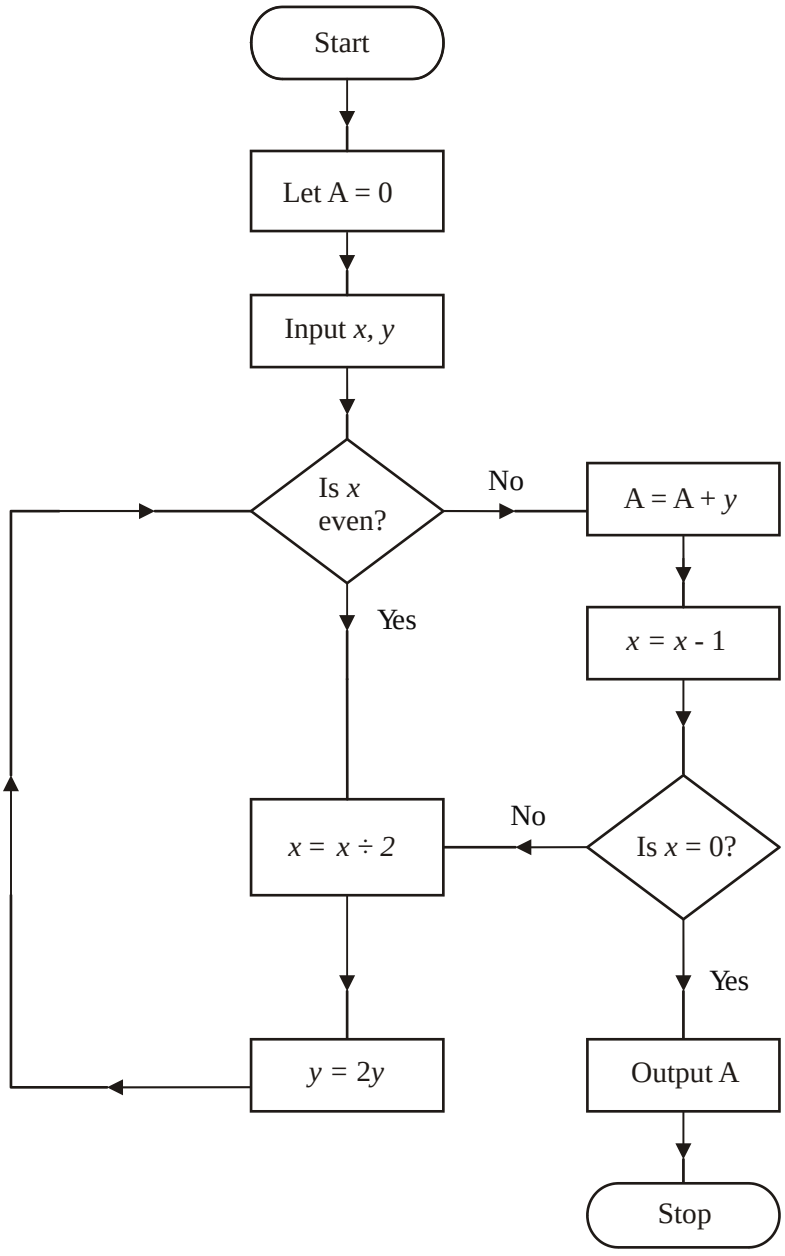
(1)

(c) Find the maximum annual salary of a person who pays no tax.

(1)

(Total 7 marks)

2.



An algorithm is described by the flow chart shown above.

(a) Given that $x = 54$ and $y = 63$, complete the table below to show the results obtained at each step when the algorithm is applied.

You may not need to use all of these rows.
It may not be necessary to complete all boxes in each row.

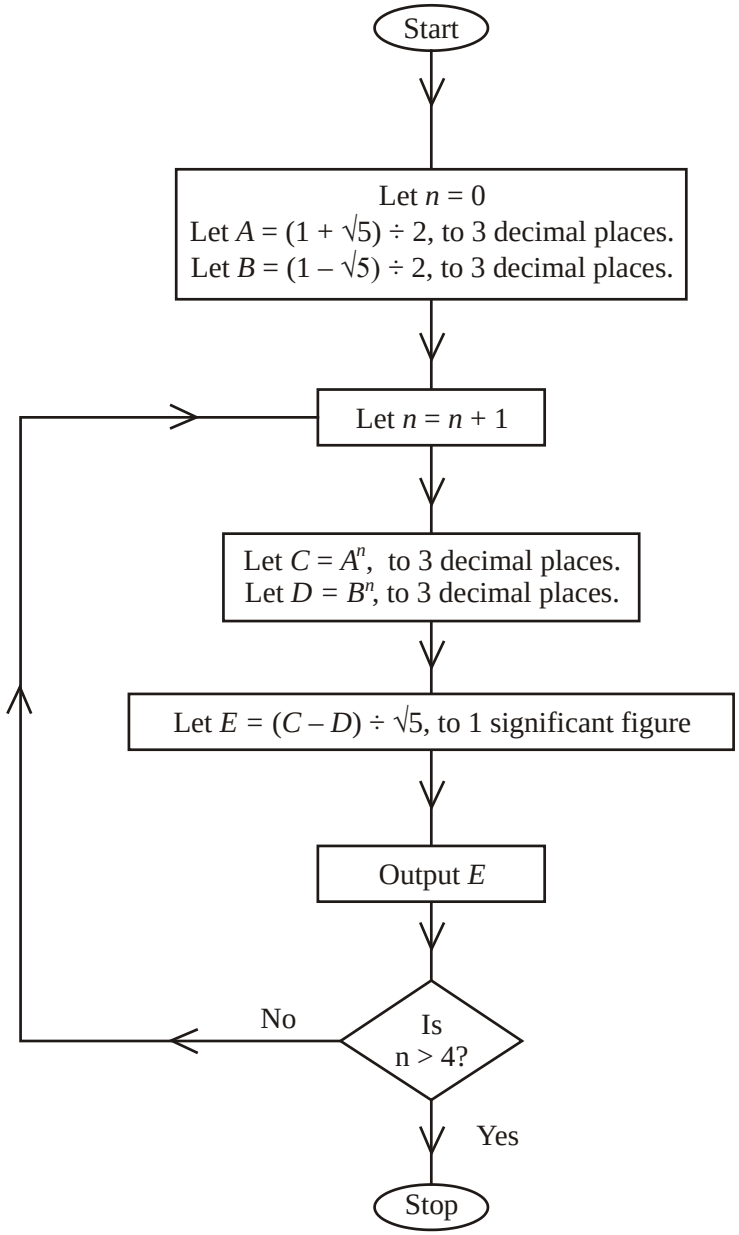
A	x	y	x even?	$x = 0$?

(7)

(b) State what the algorithm achieves.

(2)
(Total 9 marks)

3.



An algorithm is described by the flow chart shown in the figure above.

(a) Complete the table below recording the results of each step as the algorithm is applied. (Notice that values of *A, B, C* and *D* are to be given to 3 decimal places, and the values of *E* to 1 significant figure.)

You may not need to use all the rows in this table.

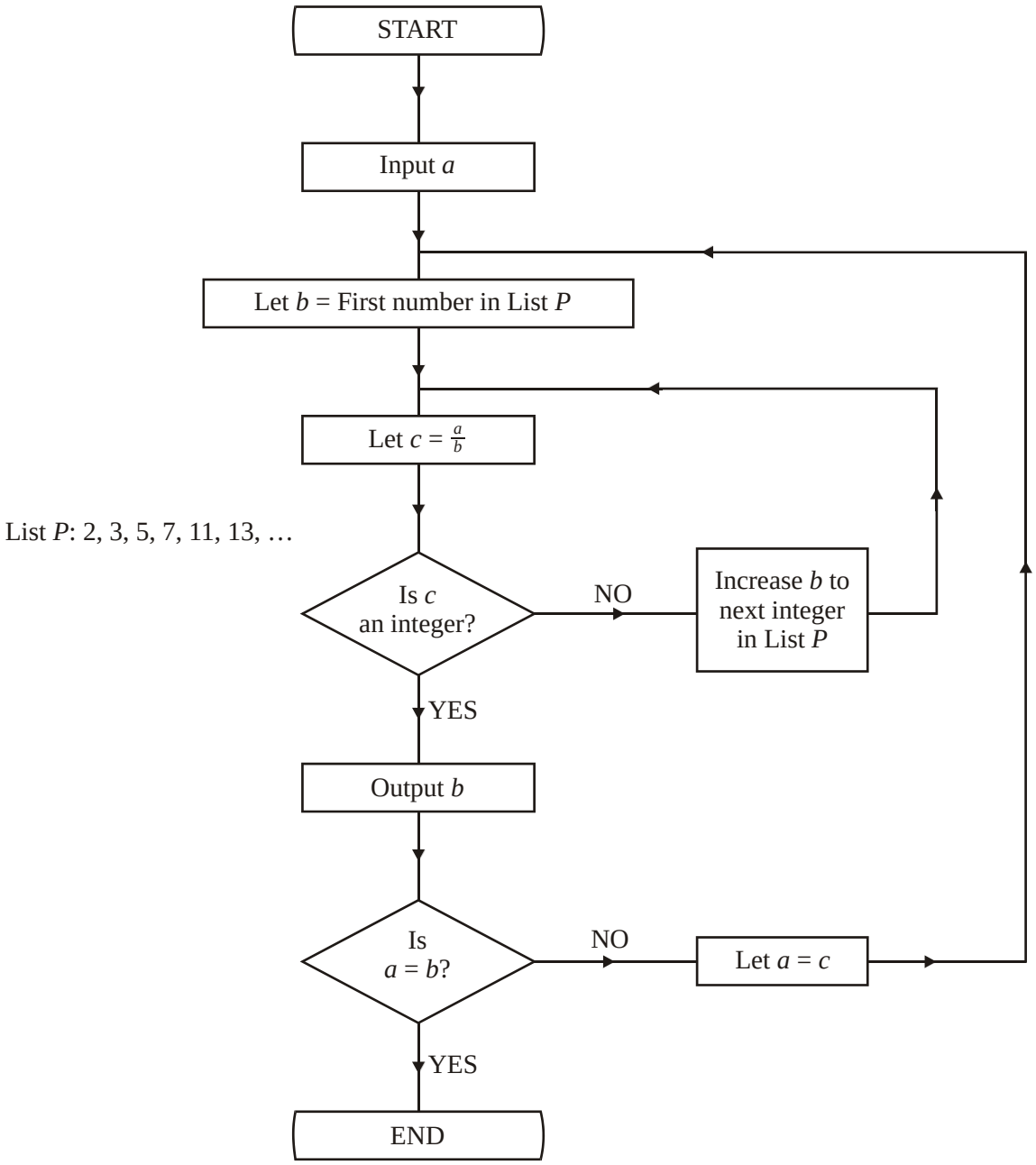
A	*B*	*n*	*C*	*D*	*E*

(8)

(b) Write down the output from the algorithm.

(1)
(Total 9 marks)

4.



The diagram above describes an algorithm in the form of a flow chart, where a is a positive integer.

List P, which is referred to in the flow chart, comprises the prime numbers 2, 3, 5, 7, 11, 13, 17, ...

(a) Starting with $a = 90$, implement this algorithm. Show your working in the table below.

You may not need to use all the rows in this table.

a	b	c	Integer?	Output List	$a = b$?

(7)

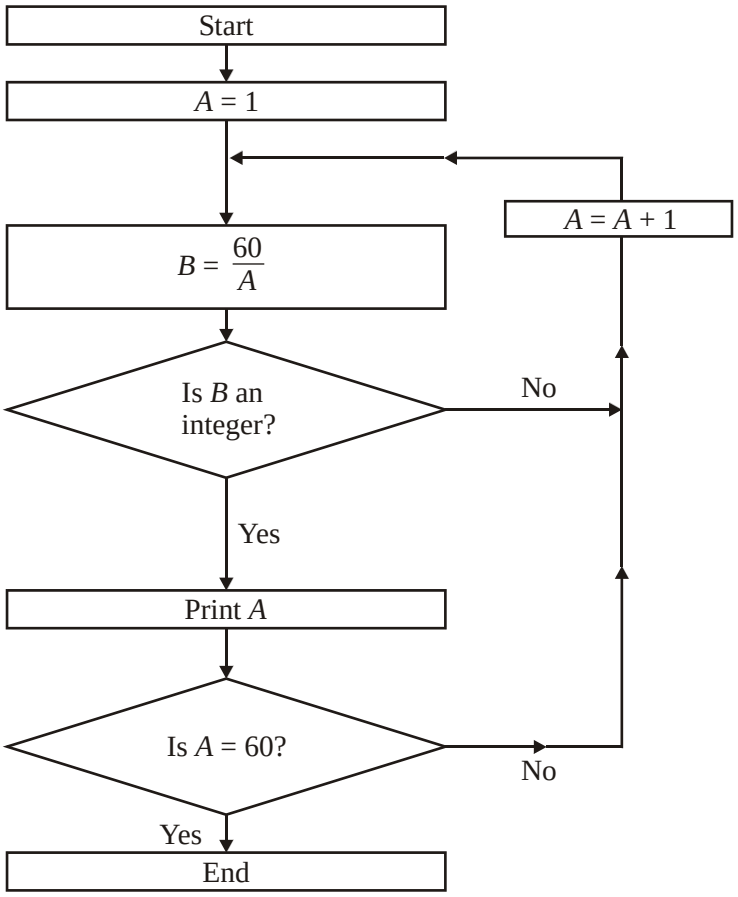
(b) Explain the significance of the output list.

(2)

(c) Write down the final value of c for **any** initial value of a.

(1)
(Total 10 marks)

5. *This question should be answered on the page below.*



Implement the algorithm given by the flow chart above and state what the algorithm actually produces.

(Total 5 marks)

Sheet for use in answering this question

Is $B = \frac{60}{A}$ an integer?

A	Yes or No
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	

A	Yes or No
31	
32	
33	
34	
35	
36	
37	
38	
39	
40	
41	
42	
43	
44	
45	
46	
47	
48	
49	
50	
51	
52	
53	
54	
55	
56	
57	
58	
59	
60	

What the algorithm produces:

……

……

……

1. (a)

S	T	R	R>0?	Output	
25000	0	17000	Y		Line 1
	3400				Line 2
		7000			Line 3
			Y		Line 4
	4450				Line 5
		–5000			Line 6
			n		Line 7
				4450	

Lines 1 & 2: M1A1

Lines 3-7: M1A1

Output correct: A1 5

(b) Tax on £25 000 is £4450 B1ft 1

(c) Tax free sum = £8000: B1 1

[7]

2. (a)

A	*x*	*y*	*x* even?	*x* = 0?	
0	54	63	Y		M1A1
	27	126	N		
126	26			N	A1ft
	13	252	N		
378	12			N	M1
	6	504	Y		
	3	1008	N		A1ft
1386	2			N	
	1	2016	N		
3402	0			Y	A1

A = 3402 B1ft 7

(b) The product *xy*. B2,1,0 2

[9]

3.

A	B	n	C	D	E		
1.618	–0.618	1	1.618	–0.618	1	M1 A1 A1	 3
		2	2.618	0.382	1	M1 A1ft	
		3	4.236	–0.236	2	A1ft	
		4	6.854	0.146	3	A1	
		5	11.089	–0.090	5	A1	5

Output : 1, 1, 2, 3, 5 A1ft 1

[9]

4. (a)

a	**b**	**c**	**Integer?**	**Output list**	**a = b?**	
90	2	45	Yes	2	No	M1
45	2	22.5	No			A1
45	3	15	Yes	3	No	A1ft
15	2	7.5	No			M1
15	3	5	Yes	3	No	A1
5	2	2.5	No			
5	3	$1\frac{2}{3}$	No			M1
5	5	1	Yes	5	Yes	

Output list: 2,3,3,5 A1ft 7

(b) Gives the prime factorisation of a B2, 1, 0 2

(c) C = 1 B1 1

[10]

5. Is $B = \frac{60}{A}$ an integer?

A	Yes or No
1	Yes
2	Yes
3	Yes
4	Yes
5	Yes
6	Yes
7	No
8	No
9	No
10	Yes
11	No
12	Yes

A	Yes or No
31	No
32	No
33	No
34	No
35	No
36	No
37	No
38	No
39	No
40	No
41	No
42	No

13	No
14	No
15	Yes
16	No
17	No
18	No
19	No
20	Yes
21	No
22	No
23	No
24	No
25	No
26	No
27	No
28	No
29	No
30	Yes

43	No
44	No
45	No
46	No
47	No
48	No
49	No
50	No
51	No
52	No
53	No
54	No
55	No
56	No
57	No
58	No
59	No
60	Yes

M1

A3 (–1 eeoo)

What the algorithm produces:

The algorithm produces all the factors of 60 B1 8

[8]

1. This question proved accessible to almost all, with very many perfect solutions seen, an improvement in performance compared with previous examinations. There were only a handful of arithmetic errors here. Most candidates successfully completed the first few steps of the algorithm. The majority of errors arose from writing down the incorrect (size of) answer, e.g. –500 instead of –5000. There were some who inserted too many entries in the output column. Quite a few inserted an expression rather than an amount in then T column (e.g. 0.2R). Despite errors in the output, most realised that this was the amount they had to show for the amount of income tax paid, earning a follow through mark in part (b). In part (c) many stated that the maximum was £7999.99 rather than the £8000.

2. Although there were many very good responses seen many candidates seemed to get into difficulty by the end of the second line. This question requires a methodical, accurate and diligent approach and the examiners were surprised at the number of candidates who found difficulty following the instructions. 126 was often seen in the second line of A, the 26 in x was often omitted, as was the 12, some candidates changed the A or y entries too early, or too late, and some candidates entered superfluous 'yes' and 'no' entries in the last two columns. Many candidates compressed their entries – so that they were no longer 'in line', others repeated entries, others wrote more than one entry in each box; this made it difficult to determine the stage at which the candidates were changing the entries. Only the best candidates were able to give the correct answer in part (b), with 'the value of A when x = 0', and 'LCM' being the most popular incorrect answers – although HCF, HCM and LCF were also seen.

3. Most candidates completed the table but many did not precisely follow the instructions or else had difficulty in using their calculator correctly. This was therefore disappointingly done. Many candidates did not obey the directions relating to accuracy, stating an incorrect number of decimal places or significant figures or making rounding errors. Some very careless calculator work was seen, the values of D should have alternated in sign, but were often negative throughout and many candidates had difficulty in calculating values for E, either omitting the bracket, or the square root, or both. Very few listed all the E values as the output – with most stating only their final E value.

4. Most candidates were able to make some progress with this question and for a number it was a rich source of marks. In part (a) the most common error was a failure to 'reset' the list to 2 after answering 'no'. A surprisingly large number of candidates did not seem to understand what was meant by the word 'integer'. In part (b) only the most able were able to recognise the list as the prime factorisation of a, and poor knowledge/understanding of the terms prime, factor and multiple. Most candidates who completed part (a) correctly were able to answer part (c) correctly.

5. No Report available for this question.