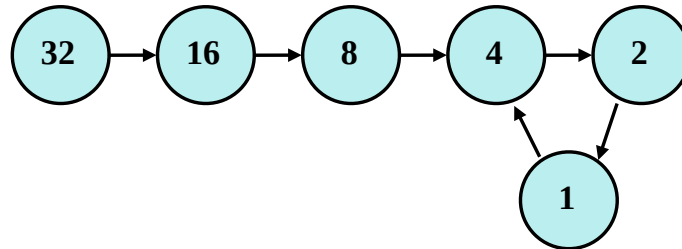


1.8 Answers

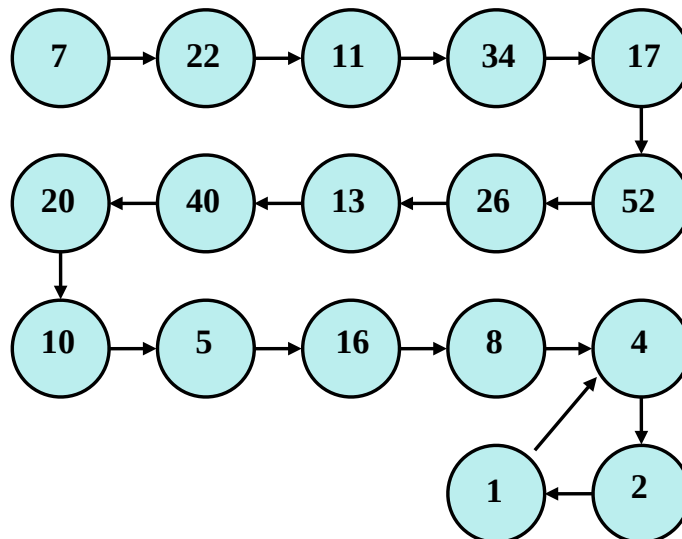
A-Level Mathematics Project The Collatz Conjecture

1.8.1 Solution to 1.2 The Iteration At The Heart of the Collatz Conjecture



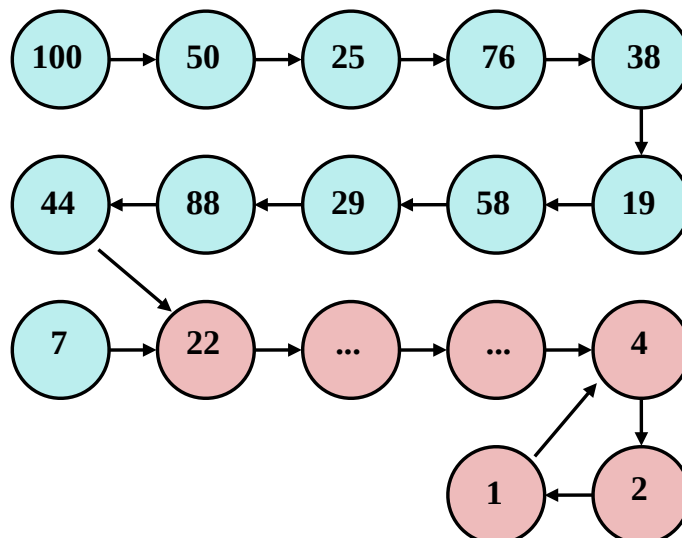
[2 marks]

1.8.2 Solution to 1.3 Starting From Seven



[3 marks]

1.8.3 Solution to 1.6 An Efficient Counterexample Search

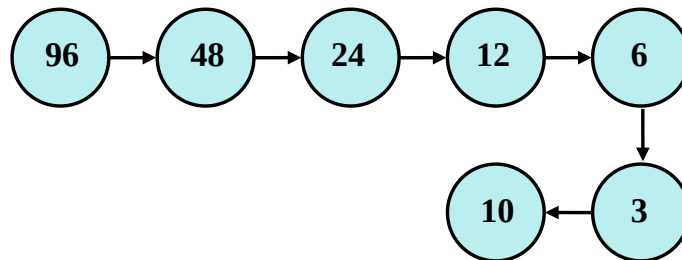


[2 marks]

1.8.4 Solutions to 1.7 Exercise

Answer 1

(i)



[1 mark]

(ii) The number 10 has already occurred (in the starting from 7 sequence) and so, once we got it here we “knew how the story would end”.

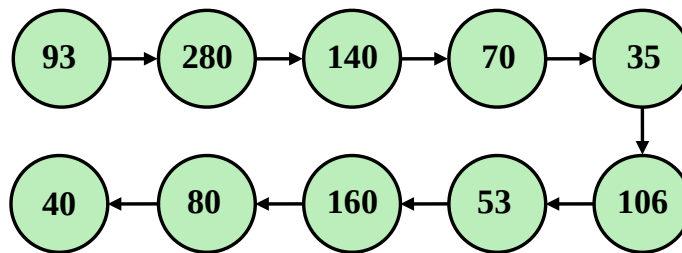
[1 mark]

(iii) See tree and *Collatz 100 table*, two pages further on.

[2 marks]

Answer 2

(i)



[2 marks]

(ii) See tree and *Collatz 100 table*, two pages further on.

[2 marks]

Answer 3

See 64 above 32 on tree and *Collatz 100 table*, two pages further on.

[1 mark]

Answer 4

(i) See 104 and 208 on tree two pages further on.

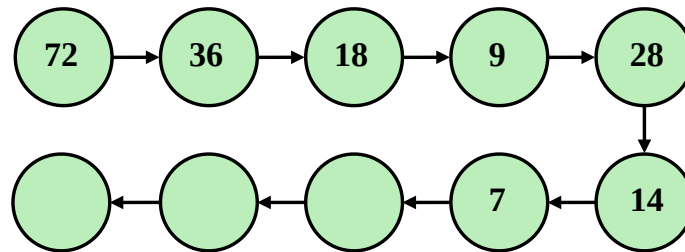
[1 mark]

(ii) See 69 and 416 on tree on the next page.
Add 69 to *Collatz 100 table*, two pages further on.

[2 marks]

Answer 5

(i)



(The 7 occurred in 1.3 Starting From 7)

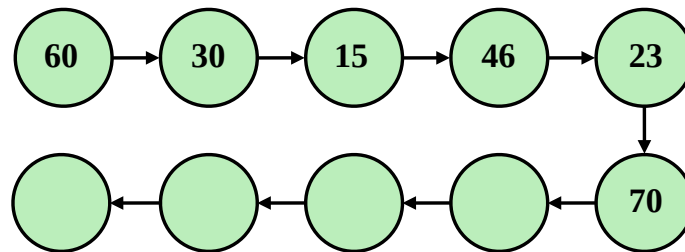
[2 marks]

(ii) See tree and *Collatz 100 table*, on the next page.

[2 marks]

Answer 6

(i)



(The 70 occurred in Answer 2)

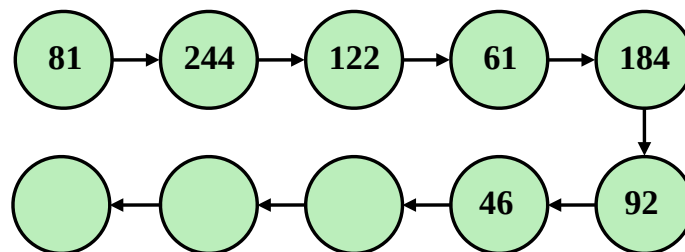
[2 marks]

(ii) See tree and *Collatz 100 table*, on the next page.

[2 marks]

Answer 7

(i)



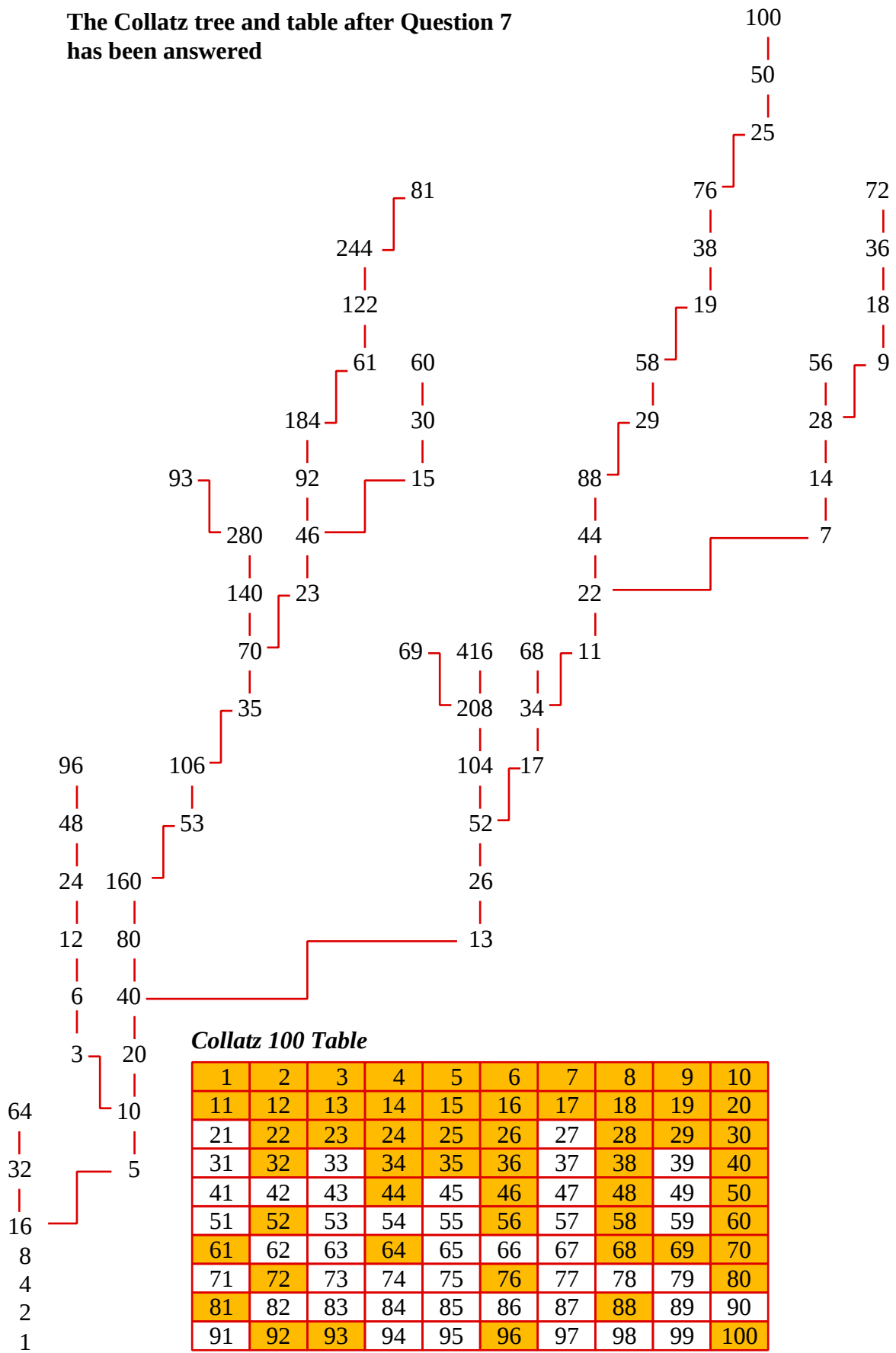
(The 46 occurred in Answer 6)

[2 marks]

(ii) See tree and *Collatz 100 table*, on the next page.

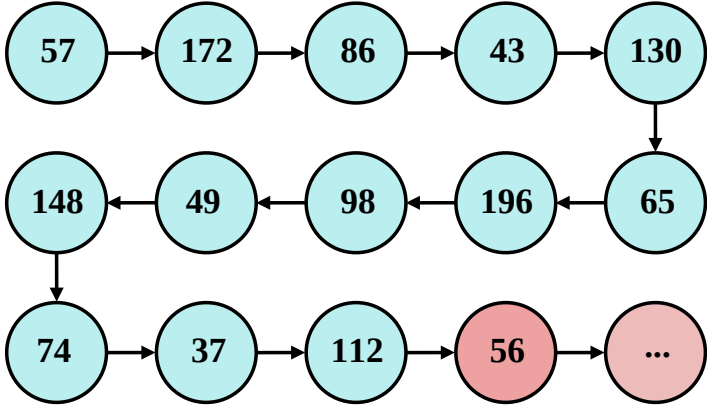
[2 marks]

**The Collatz tree and table after Question 7
has been answered**



Answer 8

(i)



[3 marks]

(ii) The extension does not fit onto the paper provided !

[1 mark]

(iii) The eight numbers accounted for by this sequence are shaded yellow in the following table;

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
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
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

[2 marks]