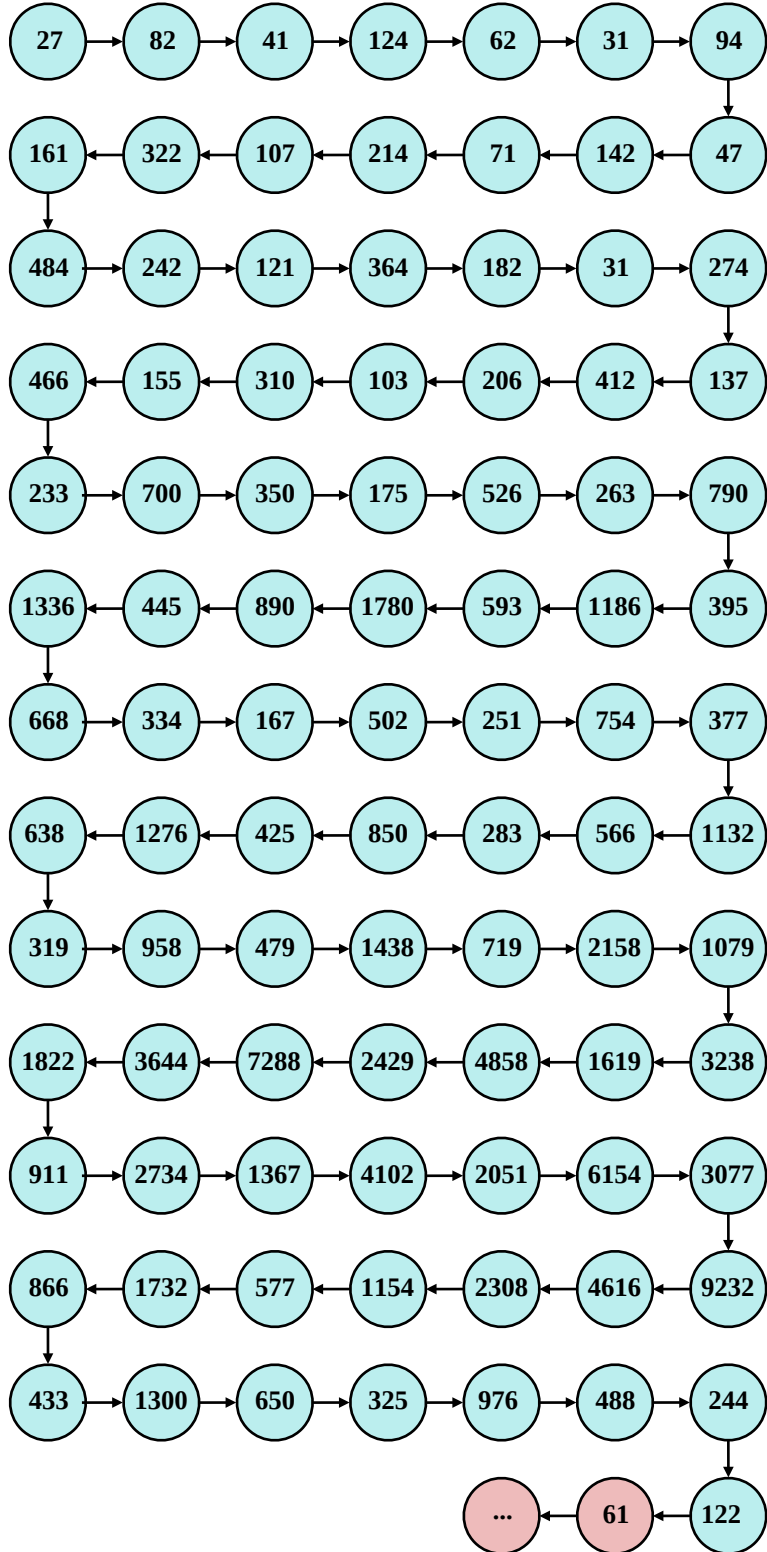


3.3 Answers

A-Level Mathematics Project
The Collatz Conjecture

3.3.1 Solutions to 3.1 The Monster 27 Sequence



[6 marks]

The updated Collatz 100 Table is;

Collatz 100 Table

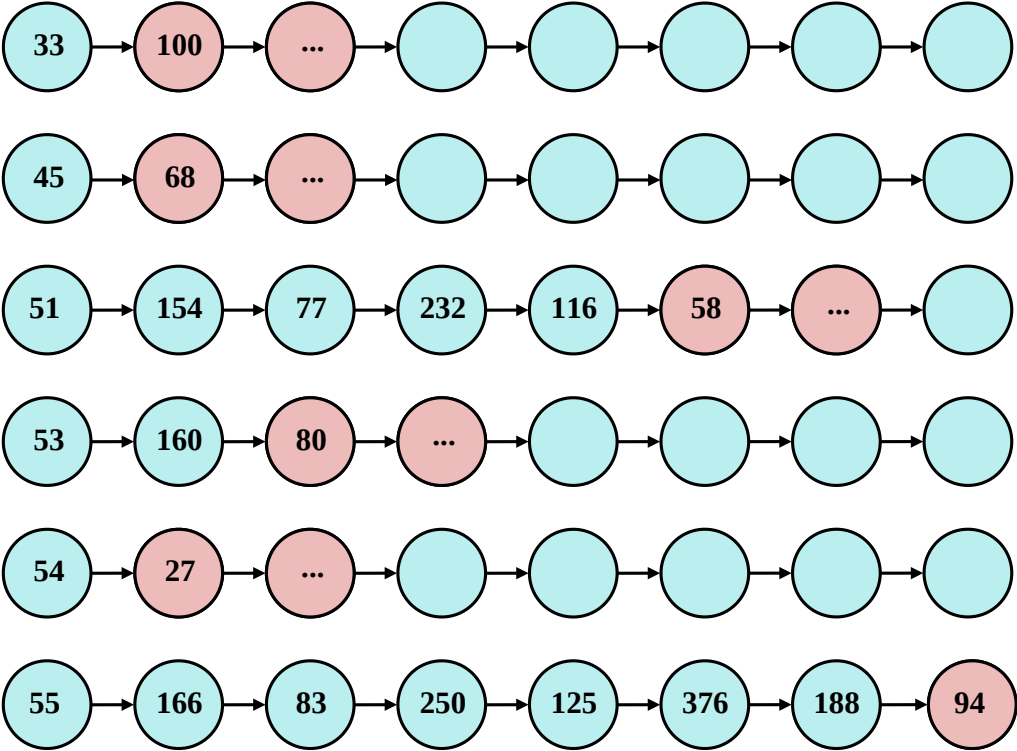
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

[2 marks]

3.3.1 Solutions to 3.2 Exercise

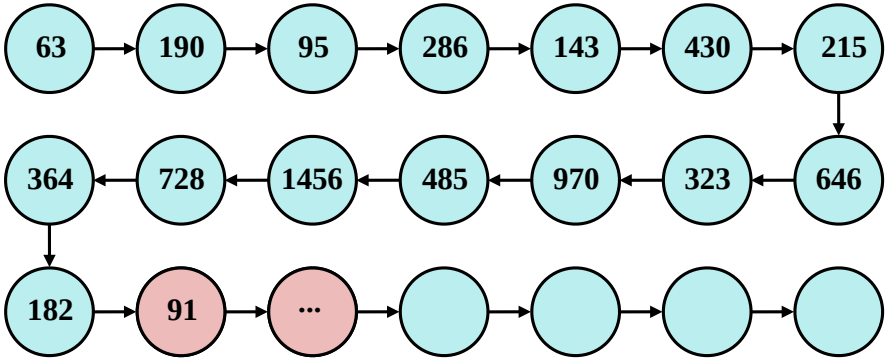
Answer 1

(i) Starting to working through the numbers not yet accounted for...



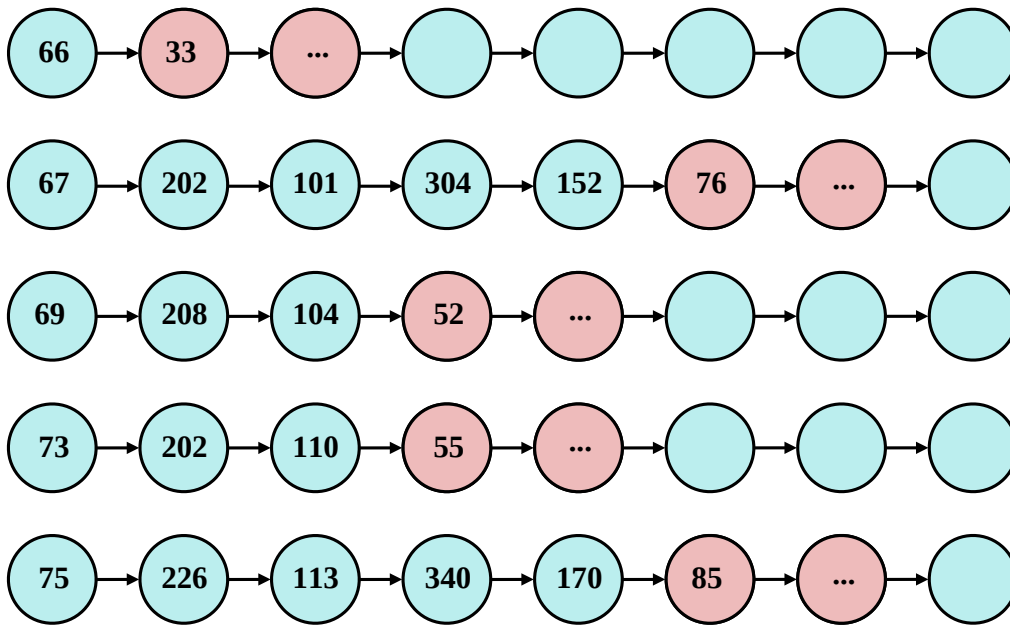
[6 marks]

(ii) A longer sequence...



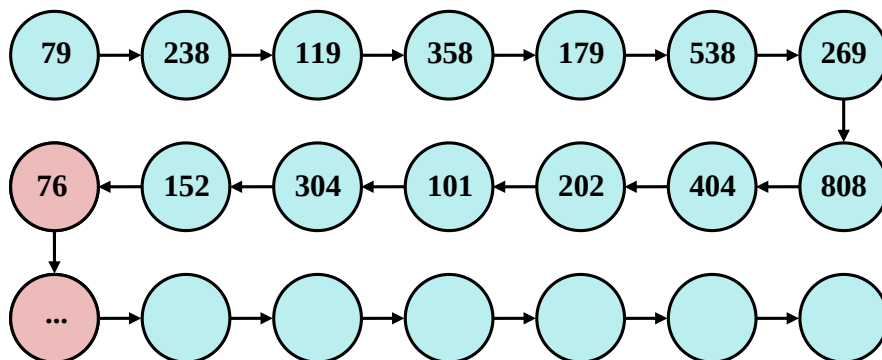
[3 marks]

(iii) Some more that join on to known numbers quickly...



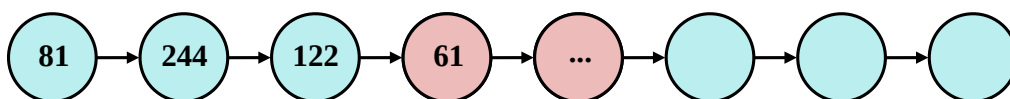
[5 marks]

(iv) Another longer sequence ...



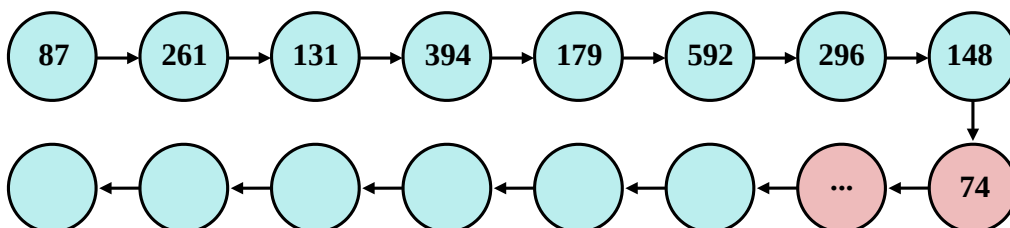
[3 marks]

(v) Short ...



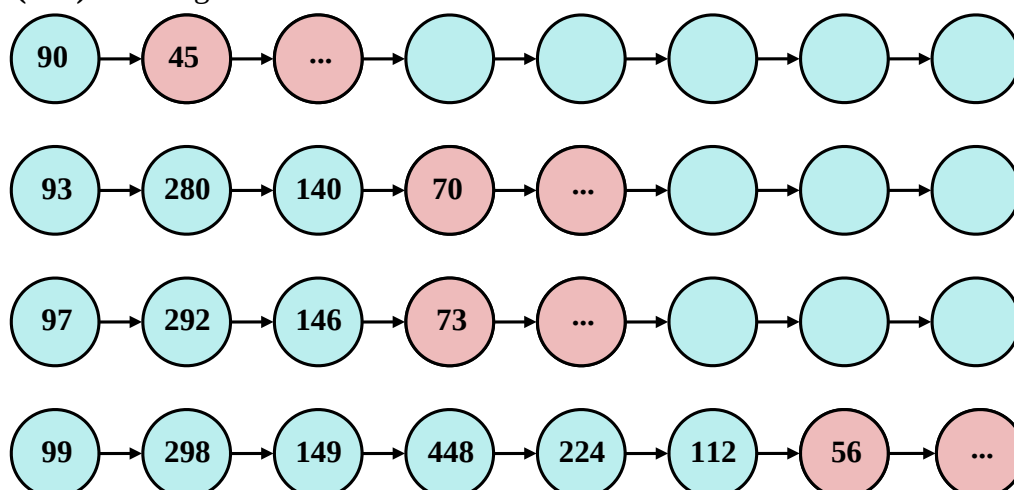
[1 mark]

(vi) Long ...



[2 marks]

(vii) Going for the finish ...



[4 marks]

Answer 2

(i) 118

[2 marks]

(ii) 97

[2 marks]

(iii)

Total Stopping Times 101 - 200

	1	2	3	4	5	6	7	8	9	10
100	25	25	87	12	38	12	100	113	113	113
110	69	20	12	33	33	20	20	33	33	20
120	95	20	46	108	108	108	46	7	121	28
130	28	28	28	28	41	15	90	15	41	15
140	15	103	103	23	116	116	116	23	23	15
150	15	23	36	23	85	36	36	36	54	10
160	98	23	23	111	111	111	67	10	49	10
170	124	31	31	31	80	18	31	31	31	18
180	18	93	93	18	44	18	44	106	106	106
190	44	13	119	119	119	26	26	26	119	26

[12 marks]

(iv) Four: none found between 1 and 200

Five: five consecutive 28s are highlighted

(There's also five consecutive 25s on the join between the two tables)

Six: none found between 1 and 200

[4 marks]

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In October 2020, Shrewsbury School was voted "**Independent School of the Year 2020**"

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Detailed worked solutions to the exercises are available from m.hamsen2@unimail.derby.ac.uk