

1.4 Answers

GCSE Mathematics Iteration

1.4.1 Teaching Notes

With a high ability class you may like to ask for the mathematical iterative description of each flowchart and these are included in the answers below. More routinely, the iterative descriptions can be shown when going over the answers. For pupils that finish early, they could be asked to get the *scratch* program of question 8 running on their laptop or other device. This is via the interactive webpage at <https://scratch.mit.edu/projects/editor/?tutorial=getStarted>

1.4.2 Solution to 1.2 Example

$$U_1 = 34, \quad U_{n+1} = \frac{U_n + 2}{2}$$

U_1	U_2	U_3	U_4	U_5	U_6	U_7	U_8
34	18	10	6	4	3	2.5	2.25

[6 marks]

1.4.3 Solutions to 1.3 Exercise

Answer 1

$$V_1 = 366, \quad V_{n+1} = \frac{V_n + 3}{3}$$

V_1	V_2	V_3	V_4	V_5	V_6	V_7
366	123	42	15	6	3	2

[6 marks]

Answer 2

$$Q_1 = 1, \quad Q_{n+1} = 2 Q_n$$

Q_1	Q_2	Q_3	Q_4	Q_5	Q_6
1	2	4	8	16	32

$$Q_6 = 32$$

[2 marks]

Answer 3

$$D_1 = 189, \quad D_{n+1} = \frac{D_n - 3}{2}$$

D_1	D_2	D_3	D_4	D_5	D_6	D_7
189	93	45	21	9	3	0

[6 marks]

Answer 4

$$A_1 = 1000000, \quad A_{n+1} = \frac{A_n}{10}$$

(i) $A_2 = 100000$

[1 mark]

(ii) $A_3 = 10000$

[1 mark]

(iii) $A_7 = 1$

[1 mark]

(iv) $A_9 = 0.01$

[2 marks]

Answer 5

$$P_1 = 0, \quad P_{n+1} = 2 P_n + 1$$

P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9	P_{10}
0	1	3	7	15	31	63	127	255	511

[6 marks]

Answer 6

$$S_1 = 100, \quad S_{n+1} = 1.2 S_n$$

$$S_2 = 120$$

$$S_3 = 144 \text{ snails at noon on Wednesday}$$

[3 marks]

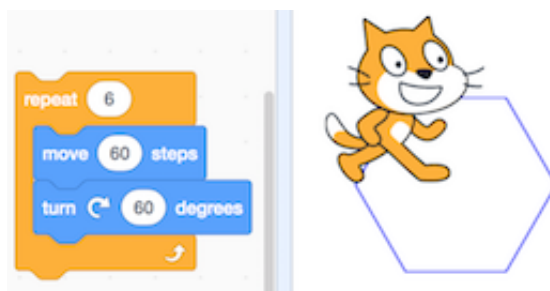
Answer 7

$$X_1 = 4, \quad X_{n+1} = \frac{(X_n)^2}{2} - 6$$

Z_1	Z_2	Z_3	Z_4	Z_5	Z_6	Z_7	Z_8	Z_9	Z_{10}
4	2	-4	2	-4	2	-4	2	-4	2

After the initial term the iteration oscillates between the value 2 and the value -4

[6 marks]

Answer 8

[2 marks]

Answer 9

$$U_1 = \frac{1}{16} \quad U_{n+1} = 64\sqrt{U_n}$$

P_1	P_2	P_3	P_4	P_5
$\frac{1}{16}$	16	256	1024	2048

[4 marks]