Chapter 15

Exercise 15A

1 a $u_1 = 5, u_2 = 10, u_3 = 15, u_{30} = 150$

b $u_1 = 8, u_2 = 10, u_3 = 12, u_{30} = 66$

c $u_1 = -1, u_2 = -4, u_3 = -7, u_{30} = -88$

d $u_1 = -3, u_2 = 0, u_3 = 5, u_{30} = 896$

e $u_1 = 2, u_2 = 8, u_3 = 26,$
$u_{30} = 2.0589 \times 10^{14}$

f $u_1 = 1, u_2 = 3, u_3 = 9,$
$u_{30} = 6.8630 \times 10^{13}$

g $u_1 = \frac{1}{2}, u_2 = \frac{1}{4}, u_3 = \frac{1}{8},$
$u_{30} = \frac{1}{1073741824}$

2 a $u_n = 4n$

b $u_n = 5n + 1$

c $u_n = 3n + 4$

d $u_n = 3n - 10$

e $u_n = 21 - 4n$

f $u_n = 2^n$

g $u_n = 3^n - 1$

h $u_n = 2^{7-n} + 2$

3 $u_n = 3n + 1$

4 $d_n = \frac{n^2 - 3n}{2}$

Exercise 15B

1 a $u_{n+1} = u_n + 4; u_1 = 4$

b $u_{n+1} = u_n + 5; u_1 = 6$

c $u_{n+1} = u_n + 3; u_1 = 7$

d $u_{n+1} = u_n + 3; u_1 = -7$

e $u_{n+1} = u_n - 4; u_1 = 17$

f $u_{n+1} = 2u_n; u_1 = 2$

g $u_{n+1} = -\frac{1}{2}u_n; u_1 = 80$

h $u_{n+1} = u_n + 3^{n-1}, u_1 = 1$

2 $u_{n+1} = 2u_n; u_0 = 150$

3 $u_{n+1} = 0.82u_n; u_0 = 40$ ml

4 $u_{n+1} = 1.005u_n + £50; u_0 = £100$

5 $u_{n+1} = 0.85u_n + 40$ ml; $u_0 = 500$ ml

Exercise 15C

1 $u_4 = 23$

2 $u_4 = 24.56$

3 $u_{n+1} = 0.8u_n + 40; u_0 = 80$
Depth of the river after 3 hours: 138.56 units.

4 $u_3 = 14k$

5 $m = \frac{10-c}{2}$

6 m = 6, c = −7

7 $a = \frac{4}{5}, b = 22$

8 Yes, the customer is correct.
Hint: the total interest is £ 1003.49; the initial amount decreases each month according to the recurrent relation $a_{n+1} = 1.035a_n - 400,$ with $a_0 = 4000$.

Exercise 15D

1 a $L = 8.57$

b $L = -40$

c $L = 0.71$

d The sequence does not have a limit.

e The sequence does not have a limit.

f The sequence does not have a limit.

g The sequence does not have a limit.

2 a $n = 6$

b $L = 20$

3 $m = 0.7$

4 $k = \frac{2}{3}$

5 In the long term Pest-Away will be more effective.

6 It is not safe to continue the treatment over a long period of time, because the medication will reach a limiting level $L = 156.25$ ml.

7 a $h = 3.5$m

b Minimum percentage = 28%

8 a $u_{n+1} = 1.024u_n + k$

b $k = 127.78$