

### 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  $k = 127.78$