

## Recurrence Relations – basics

1. A recurrence relation is defined as

$$u_{n+1} = 2u_n + 10, u_0 = 20$$

(a) Find the values of  $u_1$  and  $u_2$ .

(b) Find the smallest value of  $n$  such that  $u_n > 500$ .

2. A recurrence relation is defined as

$$u_{n+1} = 0.5u_n + 6, u_0 = 8$$

Find the values of  $u_1$ ,  $u_2$  and  $u_3$

3. A recurrence relation is defined as

$$u_n = 3u_{n-1} + 1.5, u_1 = 30$$

(a) Find the values of  $u_2$  and  $u_3$

(b) Find the smallest value of  $n$  such that  $u_n > 1000$ .

4. A recurrence relation is defined as

$$u_n = 0.25u_{n-1} - 4, u_1 = 10$$

(a) Find the values of  $u_2$  and  $u_3$

(b) Find the smallest value of  $n$  such that  $u_n < -5.3$ .

5. A recurrence relation is defined as

$$u_n = 4u_{n-1} + 8, u_1 = 88$$

Find the values of  $u_0$  and  $u_2$

6. A recurrence relation is defined as

$$u_{n+1} = 0.4u_n + 2, u_2 = 6$$

(a) Find the values of  $u_3$  and  $u_4$

(b) Find the values of  $u_1$  and  $u_0$

7. A recurrence relation is defined as

$$u_{n+1} = 2u_n + 40, u_6 = 240$$

(a) Find the value of  $u_7$

(b) Find the values of  $u_5$  and  $u_4$

8. A recurrence relation is defined as

$$u_{n+2} = 5u_{n+1} + 2, u_3 = 212$$

(a) Find the values of  $u_4$  and  $u_5$

(b) Find the values of  $u_2$  and  $u_1$

(c) Find the smallest value of  $n$  such that  $u_n > 30\,000$ .

9. A recurrence relation is defined as

$$u_{n+1} = 2u_n + 5, u_1 = 55$$

(a) Find the values of  $u_2$  and  $u_3$

(b) How many terms of this sequence lie between 1000 and 10 000.

10. A recurrence relation is defined by

$$u_{n+1} = pu_n + 2, u_0 = p$$

(a) Find an expression for  $u_1$

(b) Given  $u_1 = 6$ , find **two** values for  $p$ .

11. A recurrence relation is defined by

$$u_{n+1} = ku_n - 4, u_0 = 2$$

(a) Find expressions for  $u_1$  and  $u_2$  in terms of  $k$ .

(b) Given  $u_2 = 2$ , find the value of  $k$  if  $k > 0$ .

12. A recurrence relation is defined by

$$u_n = mu_{n-1} + 1, u_1 = 3$$

(a) Find expressions for  $u_2$  and  $u_3$  in terms of  $m$ .

(b) If  $u_3 = 3$ , find  $m$ .