Recurrence Relations 2 - Edexcel Past Exam Questions

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1. A sequence x_1, x_2, x_3, ... is defined by

$$x_1 = 1,$$

$$x_{n+1} = a x_n + 5, \qquad n \geq 1,$$

where a is a constant.

(a) Write down an expression for x_2 in terms of a. **(1)**

(b) Show that $x_3 = a^2 + 5a + 5$. **(2)**

Given that $x_3 = 41$

(c) find the possible values of a. **(3)**

Jan 12 Q4

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2. A sequence of numbers a_1, a_2, a_3, ... is defined by

$$a_1 = 3,$$

$$a_{n+1} = 2a_n - c, \qquad (n \geq 1),$$

where c is a constant.

(a) Write down an expression, in terms of c, for a_2. **(1)**

(b) Show that $a_3 = 12 - 3c$. **(2)**

Given that $\displaystyle\sum_{i=1}^{4} a_i \geq 23,$

(c) find the range of values of c. **(4)**

June 12 Q5

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3. A sequence $u_1,\ u_2,\ u_3,\ ...,$ satisfies

$$u_{n+1} = 2u_n - 1, \quad n \geq 1.$$

Given that $u_2 = 9$,

(a) find the value of u_3 and the value of u_4, **(2)**

(b) evaluate $\displaystyle\sum_{r=1}^{4} u_r$. **(3)**

Jan 13 Q4

4. A sequence $a_1,\ a_2,\ a_3,\ ...$ is defined by

$$a_1 = 4,$$
$$a_{n+1} = k(a_n + 2), \qquad \text{for } n \geq 1$$

where k is a constant.

(a) Find an expression for a_2 in terms of k. **(1)**

Given that $\displaystyle\sum_{i=1}^{3} a_i = 2$,

(b) find the two possible values of k. **(6)**

June 13 Q4

5. A sequence $x_1,\ x_2,\ x_3,\ ...$ is defined by

$$x_1 = 1,$$
$$x_{n+1} = (x_n)^2 - kx_n, \qquad n \geq 1,$$

where k is a constant.

(a) Find an expression for x_2 in terms of k. **(1)**

(b) Show that $x_3 = 1 - 3k + 2k^2$. **(2)**

Given also that $x_3 = 1$,

(c) calculate the value of k. **(3)**

(d) Hence find the value of $\displaystyle\sum_{n=1}^{100} x_n$. **(3)**

June 13(R) Q6

6. A sequence of numbers $a_1, a_2, a_3 \ldots$ is defined by

$$a_{n+1} = 5a_n - 3, \qquad n \geq 1.$$

Given that $a_2 = 7$,

(*a*) find the value of a_1. **(2)**

(*b*) Find the value of $\displaystyle\sum_{r=1}^{4} a_r$. **(3)**

June 14 Q5

7. A sequence $a_1, a_2, a_3, \ldots$ is defined by

$$a_{n+1} = 4a_n - 3, \qquad n \geq 1$$

$$a_1 = k, \qquad \text{where } k \text{ is a positive integer.}$$

(*a*) Write down an expression for a_2 in terms of k. **(1)**

Given that $\displaystyle\sum_{r=1}^{3} a_r = 66$

(*b*) find the value of k. **(4)**

June 14(R) Q3

8. (i) A sequence U_1, U_2, U_3, ... is defined by

$$U_{n+2} = 2U_{n+1} - U_n, \quad n \geq 1,$$

$$U_1 = 4 \text{ and } U_2 = 4.$$

Find the value of

(a) U_3, **(1)**

(b) $\displaystyle\sum_{n=1}^{20} U_n$. **(2)**

(ii) Another sequence V_1, V_2, V_3, ... is defined by

$$V_{n+2} = 2V_{n+1} - V_n, \quad n \geq 1,$$

$$V_1 = k \text{ and } V_2 = 2k, \text{ where } k \text{ is a constant.}$$

(a) Find V_3 and V_4 in terms of k. **(2)**

Given that $\displaystyle\sum_{n=1}^{5} V_n = 165$,

(b) find the value of k. **(3)**

June 15 Q4

9. A sequence a_1, a_2, a_3, … is defined by

$$a_1 = 4,$$

$$a_{n+1} = 5 - ka_n, \quad n \geq 1,$$

where k is a constant.

(a) Write down expressions for a_2 and a_3 in terms of k. **(2)**

Find

(b) $\displaystyle\sum_{r=1}^{3}(1 + a_r)$ in terms of k, giving your answer in its simplest form, **(3)**

(c) $\displaystyle\sum_{r=1}^{100}(a_{r+1} + ka_r)$. **(1)**

June 16 Q6

10. A sequence a_1, a_2, a_3,… is defined by

$$a_1 = 1$$

$$a_{n+1} = \frac{k(a_n + 1)}{a_n}, \qquad n \geqslant 1$$

where k is a positive constant.

(a) Write down expressions for a_2 and a_3 in terms of k, giving your answers in their simplest form. **(3)**

Given that $\displaystyle\sum_{r=1}^{3} a_r = 10$

(b) find an exact value for k. **(3)**

June 17 Q3