Sigma Notation & Recurrence Relations - Edexcel Past Exam Questions

1. The rth term of an arithmetic series is $(2r - 5)$.

(a) Write down the first three terms of this series. **(2)**

(b) State the value of the common difference. **(1)**

(c) Show that $\sum_{r=1}^{n}(2r-5) = n(n-4)$. **(3)**

Jan 05 Q5

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2. The sequence of positive numbers u_1, u_2, u_3, ..., is given by

$$u_{n+1} = (u_n - 3)^2, \qquad u_1 = 1.$$

(a) Find u_2, u_3 and u_4. **(3)**

(b) Write down the value of u_{20}. **(1)**

Jan 06 Q2

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3. A sequence a_1, a_2, a_3, . . . is defined by

$$a_1 = 3,$$

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

(a) Find the value a_2 and the value of a_3. **(2)**

(b) Calculate the value of $\sum_{r=1}^{5} a_r$ **(3)**

June 06 Q4

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

$$a_1 = k,$$

$$a_{n+1} = 3a_n + 5,\quad n \geq 1,$$

where k is a positive integer.

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

(b) Show that $a_3 = 9k + 20$. **(2)**

(c) (i) Find $\sum_{r=1}^{4} a_r$ in terms of k.

(ii) Show that $\sum_{r=1}^{4} a_r$ is divisible by 10. **(4)**

June 07 Q8

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5. A sequence is given by

$$x_1 = 1,$$

$$x_{n+1} = x_n(p + x_n),$$

where p is a constant ($p \neq 0$).

(a) Find x_2 in terms of p. **(1)**

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

Given that $x_3 = 1$,

(c) find the value of p, **(3)**

(d) write down the value of x_{2008}. **(2)**

Jan 08 Q7

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

$$x_1 = 1,$$

$$x_{n+1} = ax_n - 3, \quad n \geq 1,$$

where a is a constant.

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

(b) Show that $x_3 = a^2 - 3a - 3$. **(2)**

Given that $x_3 = 7$,

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

June 08 Q5

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

$$a_1 = k,$$

$$a_{n+1} = 2a_n - 7, \quad n \geq 1,$$

where k is a constant.

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

(b) Show that $a_3 = 4k - 21$. **(2)**

Given that $\sum_{r=1}^{4} a_r = 43$,

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

June 09 Q7

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8. A sequence of positive numbers is defined by

$$a_{n+1} = \sqrt{(a_n^2 + 3)}, \quad n \geq 1,$$

$$a_1 = 2.$$

(*a*) Find a_2 and a_3, leaving your answers in surd form. **(2)**

(*b*) Show that $a_5 = 4$. **(2)**

June 10 Q5

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

$$a_1 = 2,$$

$$a_{n+1} = 3a_n - c$$

where *c* is a constant.

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

Given that $\sum_{i=1}^{3} a_i = 0$,

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

Jan 11 Q4

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

$$a_1 = k,$$

$$a_{n+1} = 5a_n + 3, \quad n \geq 1,$$

where *k* is a positive integer.

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

(*b*) Show that $a_3 = 25k + 18$. **(2)**

(*c*) (i) Find $\sum_{r=1}^{4} a_r$ in terms of *k*, in its simplest form.

(ii) Show that $\sum_{r=1}^{4} a_r$ is divisible by 6. **(4)**

June 11 Q5
