

Core 2 Sequences Questions

- 5 The n th term of a sequence is u_n .

The sequence is defined by

$$u_{n+1} = pu_n + q$$

where p and q are constants.

The first three terms of the sequence are given by

$$u_1 = 200 \quad u_2 = 150 \quad u_3 = 120$$

- (a) Show that $p = 0.6$ and find the value of q . (5 marks)
- (b) Find the value of u_4 . (1 mark)
- (c) The limit of u_n as n tends to infinity is L . Write down an equation for L and hence find the value of L . (3 marks)
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- 3 The first term of an arithmetic series is 1. The common difference of the series is 6.

- (a) Find the tenth term of the series. (2 marks)
- (b) The sum of the first n terms of the series is 7400.
- (i) Show that $3n^2 - 2n - 7400 = 0$. (3 marks)
- (ii) Find the value of n . (2 marks)
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- 4 (a) The expression $(1 - 2x)^4$ can be written in the form

$$1 + px + qx^2 - 32x^3 + 16x^4$$

By using the binomial expansion, or otherwise, find the values of the integers p and q . (3 marks)

- (b) Find the coefficient of x in the expansion of $(2 + x)^9$. (2 marks)
- (c) Find the coefficient of x in the expansion of $(1 - 2x)^4(2 + x)^9$. (3 marks)
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5 The second term of a geometric series is 48 and the fourth term is 3.

(a) Show that one possible value for the common ratio, r , of the series is $-\frac{1}{4}$ and state the other value. (4 marks)

(b) In the case when $r = -\frac{1}{4}$, find:

(i) the first term; (1 mark)

(ii) the sum to infinity of the series. (2 marks)

7 (a) The first four terms of the binomial expansion of $(1 + 2x)^8$ in ascending powers of x are $1 + ax + bx^2 + cx^3$. Find the values of the integers a , b and c . (4 marks)

(b) Hence find the coefficient of x^3 in the expansion of $\left(1 + \frac{1}{2}x\right)(1 + 2x)^8$. (3 marks)

2 The n th term of a geometric sequence is u_n , where

$$u_n = 3 \times 4^n$$

(a) Find the value of u_1 and show that $u_2 = 48$. (2 marks)

(b) Write down the common ratio of the geometric sequence. (1 mark)

(c) (i) Show that the sum of the first 12 terms of the geometric sequence is $4^k - 4$, where k is an integer. (3 marks)

(ii) Hence find the value of $\sum_{n=2}^{12} u_n$. (1 mark)

4 An arithmetic series has first term a and common difference d .

The sum of the first 29 terms is 1102.

(a) Show that $a + 14d = 38$. (3 marks)

(b) The sum of the second term and the seventh term is 13.

Find the value of a and the value of d . (4 marks)