

# Arithmetic and Geometric Progression

## Question Paper 3

<b>Level</b>	International A Level
<b>Subject</b>	Maths
<b>Exam Board</b>	CIE
<b>Topic</b>	Series
<b>Sub Topic</b>	Arithmetic and Geometric Progression
<b>Booklet</b>	Question Paper 3

**Time Allowed:** 65 minutes

**Score:** /54

**Percentage:** /100

**Grade Boundaries:**

A*	A	B	C	D	E	U
>85%	77.5%	70%	62.5%	57.5%	45%	<45%

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- 1 (a) In an arithmetic progression, the sum,  $S_n$ , of the first  $n$  terms is given by  $S_n = 2n^2 + 8n$ . Find the first term and the common difference of the progression. [3]
- (b) The first 2 terms of a geometric progression are 64 and 48 respectively. The first 3 terms of the geometric progression are also the 1st term, the 9th term and the  $n$ th term respectively of an arithmetic progression. Find the value of  $n$ . [5]
- 2 The first term of an arithmetic progression is 61 and the second term is 57. The sum of the first  $n$  terms is  $n$ . Find the value of the positive integer  $n$ . [4]
- 3 (a) In a geometric progression, all the terms are positive, the second term is 24 and the fourth term is  $13\frac{1}{2}$ . Find
- (i) the first term, [3]
- (ii) the sum to infinity of the progression. [2]
- (b) A circle is divided into  $n$  sectors in such a way that the angles of the sectors are in arithmetic progression. The smallest two angles are  $3^\circ$  and  $5^\circ$ . Find the value of  $n$ . [4]
- 4 The first term of a geometric progression is  $5\frac{1}{3}$  and the fourth term is  $2\frac{1}{4}$ . Find
- (i) the common ratio, [3]
- (ii) the sum to infinity. [2]
- 5 (a) The first two terms of an arithmetic progression are 1 and  $\cos^2 x$  respectively. Show that the sum of the first ten terms can be expressed in the form  $a - b \sin^2 x$ , where  $a$  and  $b$  are constants to be found. [3]
- (b) The first two terms of a geometric progression are 1 and  $\frac{1}{3} \tan^2 \theta$  respectively, where  $0 < \theta < \frac{1}{2}\pi$ .
- (i) Find the set of values of  $\theta$  for which the progression is convergent. [2]
- (ii) Find the exact value of the sum to infinity when  $\theta = \frac{1}{6}\pi$ . [2]

- 6 (a) In an arithmetic progression, the sum of the first  $n$  terms, denoted by  $S_n$ , is given by

$$S_n = n^2 + 8n.$$

Find the first term and the common difference. [3]

- (b) In a geometric progression, the second term is 9 less than the first term. The sum of the second and third terms is 30. Given that all the terms of the progression are positive, find the first term. [5]

- 7 The first three terms in the expansion of  $(1 - 2x)^2(1 + ax)^6$ , in ascending powers of  $x$ , are  $1 - x + bx^2$ . Find the values of the constants  $a$  and  $b$ . [6]

- 8 The first term of an arithmetic progression is 12 and the sum of the first 9 terms is 135.

- (i) Find the common difference of the progression. [2]

The first term, the ninth term and the  $n$ th term of this arithmetic progression are the first term, the second term and the third term respectively of a geometric progression.

- (ii) Find the common ratio of the geometric progression and the value of  $n$ . [5]