Exercise 2023-12ƎD-00015(3) (From: NSC Paper 1 Feb/March 2012)

(1) Given the arithmetic series: $-7 - 3 + 1 + \ldots\ldots + 173$

(a) How many terms are there in the series? (3)

(b) Calculate the sum of the series. (3)

(c) Write the series in sigma notation. (3)

(2) Consider the geometric sequence: $4 ; -2 ; 1 ; \ldots\ldots$

(a) Determine the next term of the sequence. (2)

(b) Determine n if the n^{th} term is $\frac{1}{64}$. (4)

(3) Calculate the sum to infinity of the series $4 ; -2 ; 1 ; \ldots\ldots$ (2)

(4) If x is a REAL number, show that the following sequence can NOT be geometric:

$1 ; x+1 ; x - 3 ; \ldots\ldots$ (4)

(5) An athlete runs along a straight road. His distance d from a fixed-point P on the road is measured at different times, n, and has the form $d(n) = an^2 + bn + c$. The distances are recorded in the table below:

Time (in seconds) → n	1	2	3	4	5	6
Distance (in metres) → d	17	10	5	2	r	s

(a) Determine the values of r and s. (3)

(b) Determine the values of a, b and c. (4)

(c) How far is the athlete from P when $n = 8$? (2)

(d) Show that the athlete is moving towards P when $n < 5$ and away from $n > 5$. (4)