

## LC 2014 (SET C): PAPER 1

### QUESTION 6 (25 MARKS)

#### Question 6 (a) (i)

To find the first 3 terms in the sequence replace  $n$  by 1, 2 and 3 to find  $T_1$ ,  $T_2$  and  $T_3$ .

$$T_n = 15 - 2n$$

$$T_1 = 15 - 2(1) = 15 - 2 = 13$$

$$T_2 = 15 - 2(2) = 15 - 4 = 11$$

$$T_3 = 15 - 2(3) = 15 - 6 = 9$$

#### Question 6 (a) (ii)

Write out the sequence: 13, 11, 9, 7, 5, 3, 1, -1, ...  
The eighth term,  $T_8$ , is the first negative term in the sequence.

*or*

Find the value of  $n$  for which the general term,  $T_n$ , of the sequence is less than zero (negative).

$$T_n = 15 - 2n < 0$$

$$15 < 2n$$

$$\frac{15}{2} < n$$

$$\therefore n > 7.5$$

Therefore, the eighth term,  $T_8$ , is the first negative term in the sequence.

#### **MARKING SCHEME NOTES**

##### **Question 6 (a) (i) [Scale 10C (0, 3, 7, 10)]**

- 3:**
- Finds one term only
  - Some correct substitution
- 7:**
- Finds 2 terms correctly
  - Correct substitution for all 3 terms but not evaluated

##### **Question 6 (a) (ii) [Scale 5C (0, 2, 3, 5)]**

- 2:**
- Insufficient listing, but must list beyond  $T_3$
  - Some attempt at substitution
  - Lets  $T_n = 0$  or  $T_n > 0$
- 3:**
- Stops at  $n > 7\frac{1}{2}$  or  $n = 7\frac{1}{2}$
  - List method, but fails to identify term or number of the terms
  - Sign error when solving inequality

#### Question 6 (b) (i)

You are being asked to add up the first  $n$  terms of the arithmetic sequence: 13, 11, 9, .... to find the general summing formula  $S_n$ .

First term  $a = 13$

Common difference  $d = 11 - 13 = -2$

$$S_n = \frac{n}{2}[2(13) + (n-1)(-2)]$$

$$= \frac{n}{2}[26 - 2n + 2]$$

$$= \frac{n}{2}[28 - 2n]$$

$$= n(14 - n)$$

#### **FORMULAE AND TABLES BOOK**

##### **Sequences and series:**

##### **Arithmetic series or sequence**

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$$T_n = a + (n-1)d$$

$$S_n = \frac{n}{2}[2a + (n-1)d]$$

**Question 6 (b) (ii)**

Put  $S_n = 0$  and solve for  $n$ .

$S_n = 0 \Rightarrow (n)(14 - n) = 0 \leftarrow$  Put each bracket equal to zero and solve for  $n$ .

$14 - n = 0 \Rightarrow n = 14$

$n = 0 \leftarrow$  Ignore this solution - it is meaningless.

$\therefore n = 14 \leftarrow$  Adding the first 14 terms gives a sum of zero.

**MARKING SCHEME NOTES****Question 6 (b) (i) [Scale 5C (0, 2, 3, 5)]**

- 2: • Correct formula written  
• Identifies  $a$  and/or  $d$
- 3: • Correct formula substituted with 1 error

**Question 6 (b) (ii) [Scale 5C (0, 2, 3, 5)]**

- 2: • Some correct simplification of expression for  $S_n$  carried to (b)(ii)  
• Solves  $T_n = 0$  correctly
- 3: • Writes **correct** (quadratic) expression for  $S_n = 0$
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