

LC 2013 (SET D): PAPER 1**QUESTION 8 (60 MARKS)****Question 8 (a)**

Year	1	2	3	4	5	6
Eoin's salary (€)	20 000	20 500	21 000	21 500	22 000	22 500
Peter's salary (€)	17 000	18 250	19 500	20 750	22 000	23 250

Question 8 (b)

Year	1 (2005)	2 (2006)	3 (2007)	4 (2008)	5 (2009)	6 (2010)
Eoin's salary (€)	20 000	20 500	21 000	21 500	22 000	22 500
Peter's salary (€)	17 000	18 250	19 500	20 750	22 000	23 250

ANSWER: 2009

MARKING SCHEME NOTES**Question 8 (a) [Scale 5D (0, 4, 7, 11, 15)]**

- 4:** • One correct entry
7: • Errors in three or more terms, allowing for consistent errors
11: • Errors in two or less terms, allowing for consistent errors

Question 8 (b) [Scale 5A (0, 5)]

NOTE: Accept answers based on candidate's work

Question 8 (c)

- (i) An arithmetic sequence is one in which the difference between any two successive terms is a constant.
(ii) Yes. A constant amount is added to his salary in any year to give his salary for the following year.

MARKING SCHEME NOTES**Question 8 (c) (i) [Scale 5B (0, 2, 5)]**

- 2:** • Shows some understanding of an arithmetic sequence

Question 8 (c) (ii) [Scale 5B (0, 2, 5)]

- 2:** • Correct answer without valid explanation
• Correct explanation without giving an answer

Question 8 (d)

$a = 20\,000$ ← This is the first term.
 $d = 500$ ← This is the common difference.

$$\begin{aligned} T_n &= a + (n-1)d \\ &= 20\,000 + (n-1)500 \leftarrow \text{Multiply out brackets.} \\ &= 20\,000 + 500n - 500 \\ &= 19\,500 + 500n \leftarrow \text{This is the general term.} \end{aligned}$$

FORMULAE AND TABLES BOOK
Sequences and series:
Arithmetic series or sequence [page 22]

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

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

a is the first term
 d is the common difference

MARKING SCHEME NOTES

Question 8 (d) [Scale 5B (0, 2, 5)]

- 2:**
- Correctly identifies a or d for Eoin's salary
 - Correctly identifies a and d for Peter's salary
 - Writes $T_n = a + (n-1)d$

Question 8 (e)

Year 2015: $n = 11$

$$T_{11} = ?$$

$$T_n = 19\,500 + 500n$$

$$T_{11} = 19\,500 + 500(11) = \text{€}25\,000$$

Question 8 (f)

$$a = 17\,000$$

$$d = 1250$$

$$S_n = ?$$

$$\begin{aligned} S_n &= \frac{n}{2}[2(17\,000) + (n-1)1250] \\ &= \frac{n}{2}[34\,000 + 1250n - 1250] \\ &= \frac{n}{2}[32\,750 + 1250n] \\ &= n[16\,375 + 625n] \\ &= 625n^2 + 16\,375n \end{aligned}$$

Question 8 (g)

$$S_n = 625n^2 + 16375n$$

$$S_{11} = 625(11)^2 + 16375(11) = \text{€}255\,750$$

MARKING SCHEME NOTES

Question 8 (e) [Scale 10C (0, 3, 7, 10)]

- 3:**
- Finds the correct value of n and stops
 - Continues the pattern for one more term
 - Attempts substitution into candidate's formula
 - Some merit in work with the general term
- 7:**
- Continues pattern correctly but stops at the tenth year
 - Substitutes $n = 10$ into formula and calculates answer

Question 8 (f) [Scale 5C (0, 2, 4, 5)]

- 3:**
- Writes $S_n = \frac{n}{2}[2a + (n-1)d]$ or other valid formula
 - Identifies a or d for Peter's salary
 - Identifies a or d for Eoin's salary
- 7:**
- A correct formula substituted, except for one error, for Peter
 - A correct formula applied to Eoin's data, correctly

Question 8 (h)

The graph shows Peter's salary increasing constantly throughout the year which is not true. Peter's salary increases in steps at the end of each year and the graph does not reflect this.

MARKING SCHEME NOTES**Question 8 (g) [Scale 5C (0, 2, 4, 5)]**

NOTE: Accept candidate's answers from (f).

- 2:**
- Finds the correct value of n and stops.
 - Continues the pattern for one more term
 - Attempts substitution into candidate's formula
 - Some merit in work with the S_n formula
 - Uses Eoin's data incorrectly
- 4:**
- Continues the pattern correctly to 2015 but doesn't add the terms
 - Continues the pattern incorrectly (stops at $n = 10$ or one error with consistent terms) but adds the terms
 - Substitutes $n = 10$ into formula and calculates answer
 - Substitutes correctly into formula but doesn't calculate answer
 - Uses Eoin's data correctly

Question 8 (h) [Scale 5B (0, 2, 5)]

- 2:**
- A reason with some merit