**Test - sequences & series**

9 questions. Calculator is allowed on all questions.  

**total marks on test: 60**

1. Find the sum of the series: \(17 + 27 + 37 + \cdots + 417\)  
   \([6 \text{ marks}]\)

2. Find the sum of the infinite geometric series: \(\frac{2}{3} - \frac{4}{9} + \frac{8}{27} - \frac{16}{81} + \cdots\)  
   \([5 \text{ marks}]\)

3. Each day a runner trains for a 10 km race. On the first day she runs 1000 metres, and then increases the distance by 250 metres each day afterwards.  
   (a) On which day does she run a distance of 10 km in training?  
   \([4 \text{ marks}]\)  
   (b) What is the total distance she will have run in training by the end of that day? Give your answer exactly.  
   \([3 \text{ marks}]\)

4. In an arithmetic sequence, the first term is \(-2\), the fourth term is 16, and the \(n\)th term is 11998.  
   (a) Find the common difference \(d\).  
   \([3 \text{ marks}]\)  
   (b) Find the value of \(n\).  
   \([3 \text{ marks}]\)

5. The first term of an infinite geometric sequence is 18, while the third term is 8. There are two possible sequences. Find the sum of each sequence.  
   \([6 \text{ marks}]\)

6. The first four terms of a sequence are 18, 54, 162, 486.  
   (a) Find an expression for the \(n\)th term of the sequence.  
   \([2 \text{ marks}]\)  
   (b) If the \(n\)th term of the sequence is 1062882, find the value of \(n\).  
   \([3 \text{ marks}]\)

7. (a) Write down the first three terms of the sequence \(a_n = 3n\)  
   \([2 \text{ marks}]\)  
   (b) Find \(\sum_{n=1}^{20} 3n\)  
   \([3 \text{ marks}]\)

8. (a) Express the following series using sigma notation: \(192 + 96 + 48 + \cdots + 3\)  
   \([4 \text{ marks}]\)  
   (b) Find the sum of the series.  
   \([3 \text{ marks}]\)

9. Pietro organizes cans in triangular piles, where each row has one less can than the row below. For example, the pile of 15 cans shown has 5 cans in the bottom row and 4 cans in the row above it.  
   (a) A pile has 20 cans in the bottom row. Show that the pile contains 210 cans.  
   \([3 \text{ marks}]\)  
   (b) There are 3240 cans in a pile. How many cans are in the bottom row?  
   \([3 \text{ marks}]\)  
   (c) There are \(S\) cans and they are organized in a triangular pile with \(n\) cans in the bottom row. Show that \(S = \frac{n^2 + n}{2}\).  
   \([4 \text{ marks}]\)  
   (d) Pietro has 2100 cans. Explain why he cannot organize all of them in a triangular pile.  
   \([3 \text{ marks}]\)