Pearson Edexcel

A Level Mathematics 9MA0

Unit Test

4 Sequences Series

Time allowed: 50 **minutes**

School:

Name:

Teacher:

Question	Points	Score
1	4	
2	8	
3	5	
4	4	
5	6	
6	9	
7	9	
8	5	
Total:	50	

1. The first 3 terms of a geometric sequence are $k+2, 4k, 2k^2, k > 0$. Find the value of k. [4]

2. For an arithmetic sequence $a_4 = 98$ and $a_{11} = 56$.

   (a) Find the value of the 20th term. [4]

   (b) Given that the sum of the first n terms is 78, find the value of n. [4]

Total: 8

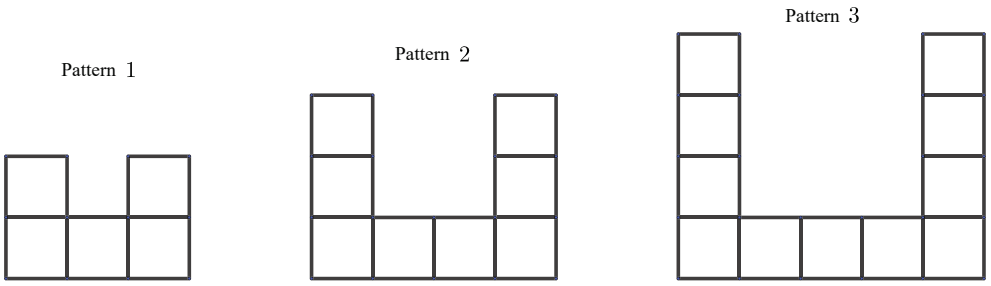
3. (a) Prove that the sum of the first n terms of an arithmetic series is [3]

$$S = \frac{n}{2}(2a + (n-1)d)$$

   (b) Hence, or otherwise, find the sum of the first 200 odd numbers. [2]

Total: 5

4. Jacob is making some patterns out of squares. The first 3 patterns in the sequence are shown.



   (a) Find an expression, in terms of n, for the number of squares required to make pattern n. [2]

   (b) Jacob uses a total of 948 squares in constructing the first k patterns. [2]

   Show that $3k^2 + 7k - 1896 = 0$.

Total: 4

5. A sequence is given by $x_1 = 4, x_{n+1} = px_n - 9$, where p is an integer.

   (a) Show that $x_3 = 4p^2 - 9p - 9$. [2]

   (b) Given that $x_3 = 46$, find the value of p. [3]

   (c) Hence find the value of x_5. [1]

Total: 6

6. A ball is dropped from a height of 80cm. After each bounce it rebounds to 70% of its previous maximum height.

   (a) Write a recurrence relation to model the maximum height in centimetres of the ball after each subsequent bounce. [2]

   (b) Find the height to which the ball will rebound after the fifth bounce. [2]

   (c) Find the total vertical distance travelled by the ball before it stops bouncing. [4]

   (d) State one limitation with the model. [1]

Total: 9

7. At the beginning of each month Kath places £100 into a bank account to save for a family holiday. Each subsequent month she increases her payments by 5%.
   Assuming the bank account does not pay interest, find

   (a) the amount of money in the account after 9 months. [3]

   Month n is the first month in which there is more than £6000 in the account.

   (b) Show that [4]
   $$n > \frac{\log(4)}{\log(1.05)}.$$

   Maggie begins saving at the same time as Kath. She initially places £50 into the same account and plans to increase her payments by a constant amount each month.

   (c) Given that she would like to reach a total of £6000 in 29 months, by how much should Maggie increase her payments each month? [2]

Total: 9

8. An infinite geometric series has first four terms

$$1 - 4x + 16x^2 - 64x^3 + \cdots$$

   The series is convergent.

   (a) Find the set of possible values of x for which the series converges. [2]

(b) Given that [3]

$$\sum_{r=1}^{\infty}(-4x)^{r-1} = 4,$$

calculate the value of x.

Total: 5