

Sequences and series

A-level Pure Mathematics (Year 2) | Edexcel 9MA0 | 12 questions, 77 marks

A-level Maths topic practice



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Name: _____ **Date:** _____ **Score:** _____ / 77

1 The 5th term of an arithmetic sequence is 23 and the 12th term is 51

- a. Find the first term and the common difference.
- b. Find the sum of the first 20 terms.

(4 marks)

Answer _____

2 A geometric series has first term 48 and common ratio $\frac{3}{4}$

- a. Find the exact value of the 6th term.
- b. Find the sum of the first 10 terms, giving your answer to 3 significant figures.
- c. Find the sum to infinity.

(5 marks)

Answer _____

3 Find the value of

a. $\sum_{r=1}^{30} (5r - 2)$

b. $\sum_{r=1}^8 3 \times 2^r$

(4 marks)

Answer _____

4 A sequence is defined by

$$u_1 = 2, \quad u_{n+1} = ku_n + 3$$

where k is a positive constant. Given that $u_3 = 23$

a. show that $2k^2 + 3k - 20 = 0$

b. find the value of k

c. find $\sum_{r=1}^4 u_r$

(6 marks)

Answer _____

5 A sequence is defined by

$$u_1 = 3, \quad u_{n+1} = \frac{1}{1 - u_n}$$

- a. Find u_2 , u_3 and u_4
- b. Describe the behaviour of the sequence.

- c. Find the value of $\sum_{r=1}^{100} u_r$

(6 marks)

Answer _____

6 The first three terms of a geometric sequence are

$$k + 3, \quad k - 3, \quad 7 - k$$

where k is a constant.

- a. Show that $k^2 - 5k - 6 = 0$

Given that the series converges,

- b. find the value of k , giving a reason for your answer,
- c. find the sum to infinity of the series.

(6 marks)

Answer _____

7 Priya saves money each month. She saves £40 in the first month and each month after that she saves £5 more than the month before.

- Find how much she saves in the 12th month.
- Show that the total she has saved after n months is $\frac{5}{2}n(n + 15)$ pounds.
- Find the month in which her total savings first exceed £3000

(6 marks)

Answer _____

8 *In this question you must show all stages of your working. Solutions relying entirely on calculator technology are not acceptable.*

A bakery made a profit of £20 000 in its first year of trading, Year 1. A model predicts that the profit will increase by 4% each year, so that the profits form a geometric sequence.

- Find the first year in which the predicted profit is more than £30 000
- Find the total predicted profit for the first 15 years, giving your answer to the nearest £1000
- Give one reason why the model may not be suitable in the long term.

(7 marks)

Answer _____

9

A geometric series has second term 48 and sum to infinity 300

- Show that the common ratio, r , satisfies $25r^2 - 25r + 4 = 0$
- Given that $r > \frac{1}{2}$, find the first term of the series.
- Find the smallest value of n for which the sum of the first n terms is greater than 299

(8 marks)

Answer _____

10

A geometric series has first term a and common ratio r , where $r \neq 1$

- Prove that the sum of the first n terms of the series is $a \frac{1 - r^n}{1 - r}$
- Hence, or otherwise, show that $\sum_{n=1}^{\infty} 12 \cos^{2n} \left(\frac{\pi}{6} \right) = 36$

(7 marks)

Answer _____

11

a. Given that $\sum_{r=1}^n (4r + 1) = 1430$, find the value of n .

b. Find the value of k for which $\sum_{r=1}^k \log_2 (8^r) = 315$

c. Show that $\sum_{r=1}^{20} \ln (3^r e^2) = 210 \ln 3 + 40$

(8 marks)

Answer

12

A fishery stocks a lake with fish. A model for the number of fish, P_n , in the lake at the start of year n is

$$P_1 = 500, \quad P_{n+1} = 0.8P_n + 150$$

- Find P_2 and P_3
- Show that $P_n = 750 - 250(0.8)^{n-1}$ satisfies the model.
- Explain why the sequence is increasing, and state the long-term number of fish predicted by the model.
- Find the first year in which the model predicts more than 740 fish.

(10 marks)

Answer

End of questions | Total 77 marks