

1. A sequence a_1, a_2, a_3, \dots is defined by

$$a_{n+1} = 4 - a_n$$

$$a_1 = 3$$

Find the value of

(a) (i) a_2

(ii) a_{107}

(2)

(b) $\sum_{n=1}^{200} (2a_n - 1)$

(2)

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7. (i) A geometric sequence has first term 4 and common ratio 6

Given that the n^{th} term is greater than 10^{100} , find the minimum possible value of n .

(3)

(ii) A different geometric sequence has first term a and common ratio r .

Given that

- the second term of the sequence is -6
- the sum to infinity of the series is 25

(a) show that

$$25r^2 - 25r - 6 = 0$$

(3)

(b) Write down the solutions of

$$25r^2 - 25r - 6 = 0$$

(1)

Hence,

(c) state the value of r , giving a reason for your answer,

(1)

(d) find the sum of the first 4 terms of the series.

(2)

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2: A geometric series has first term a and common ratio r .

Given that

- the third term in the series is 64
- the sixth term in the series is -8

(a) show that $r = -\frac{1}{2}$

(2)

(b) find the sum to infinity of the series.

(4)

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7. Wheat is grown on a farm.

- In year 1, the farm produced 300 tonnes of wheat.
- In year 12, the farm is predicted to produce 4 000 tonnes of wheat.

Model A assumes that the amount of wheat produced on the farm will increase by the same amount each year.

- (a) Using model A , find the amount of wheat produced on the farm in year 4.
Give your answer to the nearest 10 tonnes.

(3)

Model B assumes that the amount of wheat produced on the farm will increase by the same percentage each year.

- (b) Using model B , find the amount of wheat produced on the farm in year 2.
Give your answer to the nearest 10 tonnes.

(3)

- (c) Calculate, according to the two models, the difference between the total amounts of wheat predicted to be produced on the farm from year 1 to year 12 inclusive.
Give your answer to the nearest 10 tonnes.

(3)