

10. A geometric series is $a + ar + ar^2 + \dots$

(a) Prove that the sum of the first n terms of this series is given by

$$S_n = \frac{a(1-r^n)}{1-r}.$$

(4)

(b) Find

$$\sum_{k=1}^{10} 100(2^k).$$

(3)

(c) Find the sum to infinity of the geometric series

$$\frac{5}{6} + \frac{5}{18} + \frac{5}{54} + \dots$$

(3)

(d) State the condition for an infinite geometric series with common ratio r to be convergent.

(1)



2. The fourth term of a geometric series is 10 and the seventh term of the series is 80.

For this series, find

- (a) the common ratio, (2)
- (b) the first term, (2)
- (c) the sum of the first 20 terms, giving your answer to the nearest whole number. (2)



- (a) Show that the value of the car exactly 3 years after it was purchased is £9216. (1)

(b) Find the value of n . (3)

(c) Find the cost of the scheme for the 5th year, giving your answer to the nearest penny. (2)

- (d) Find the total cost of the insurance scheme for the first 15 years. (3)

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3. The second and fifth terms of a geometric series are 750 and -6 respectively.

Find

- (a) the common ratio of the series, (3)
- (b) the first term of the series, (2)
- (c) the sum to infinity of the series. (2)



1. A geometric series has first term $a = 360$ and common ratio $r = \frac{7}{8}$

Giving your answers to 3 significant figures where appropriate, find

- (a) the 20th term of the series, (2)
- (b) the sum of the first 20 terms of the series, (2)
- (c) the sum to infinity of the series. (2)



- Calculate

- (2)

- (2)

(4)

- (1)

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5. The third term of a geometric sequence is 324 and the sixth term is 96

(a) Show that the common ratio of the sequence is $\frac{2}{3}$

(2)

(b) Find the first term of the sequence.

(2)

(c) Find the sum of the first 15 terms of the sequence.

(3)

(d) Find the sum to infinity of the sequence.

(2)

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- A model predicts that the adult population of the town will increase by 3% each year, forming a geometric sequence.

- (b) Write down the common ratio of the geometric sequence. (1)

The model predicts that Year N will be the first year in which the adult population of the town exceeds 40 000.

- $$(N-1)\log 1.03 > \log 1.6 \quad (3)$$

- (d) Find the value of N . (2)

At the end of each year, each member of the adult population of the town will give £1 to a charity fund.

Assuming the population model,

- (e) find the total amount that will be given to the charity fund for the 10 years from the end of Year 1 to the end of Year 10, giving your answer to the nearest £1000. (3)

- (4)

- (2)

- (2)

- (1)

(2)

8. A trading company made a profit of £50 000 in 2006 (Year 1).

A model for future trading predicts that profits will increase year by year in a geometric sequence with common ratio r , $r > 1$.

The model therefore predicts that in 2007 (Year 2) a profit of £50 000*r* will be made.

- (a) Write down an expression for the predicted profit in Year n . (1)

The model predicts that in Year n , the profit made will exceed £200 000.

- (b) Show that $n > \frac{\log 4}{\log r} + 1$.

Using the model with $r = 1.09$,

- (c) find the year in which the profit made will first exceed £200 000, (2)
- (d) find the total of the profits that will be made by the company over the 10 years from 2006 to 2015 inclusive, giving your answer to the nearest £10 000. (3)



6. The second and third terms of a geometric series are 192 and 144 respectively.

For this series, find

- (a) the common ratio, (2)
- (b) the first term, (2)
- (c) the sum to infinity, (2)
- (d) the smallest value of n for which the sum of the first n terms of the series exceeds 1000. (4)



9. A geometric series is $a + ar + ar^2 + \dots$

(a) Prove that the sum of the first n terms of this series is given by

$$S_n = \frac{a(1-r^n)}{1-r} \quad (4)$$

The third and fifth terms of a geometric series are 5.4 and 1.944 respectively and all the terms in the series are positive.

For this series find,

(b) the common ratio,

(c) the first term, (2)

(d) the sum to infinity. (3)



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1. The first three terms of a geometric series are

18, 12 and p

respectively, where p is a constant.

Find

- (a) the value of the common ratio of the series,

(1)

- (b) the value of p ,

(1)

- (c) the sum of the first 15 terms of the series, giving your answer to 3 decimal places.

(2)

