

1. A geometric series has first term a and common ratio $r = \frac{3}{4}$.

The sum of the first 4 terms of this series is 175.

- (a) Show that $a = 64$. (2)
- (b) Find the sum to infinity of the series. (2)
- (c) Find the difference between the 9th and 10th terms of the series.
Give your answer to 3 decimal places. (3)

(Total 7 marks)

2. 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)

(Total 6 marks)

3. A geometric series has first term a , where $a \neq 0$, and common ratio r .
The sum to infinity of this series is 6 times the first term of the series.

(a) Show that $r = \frac{5}{6}$. (2)

Given that the fourth term of this series is 62.5,

(b) find the value of a , (2)

(c) find the difference between the sum to infinity and the sum of the first 30 terms, giving your answer to 3 significant figures. (4)

(Total 8 marks)

4. A company predicts a yearly profit of £120 000 in the year 2013. The company predicts that the yearly profit will rise each year by 5%. The predicted yearly profit forms a geometric sequence with common ratio 1.05.

(a) Show that the predicted profit in the year 2016 is £138 915. (1)

(b) Find the first year in which the yearly predicted profit exceeds £200 000. (5)

(c) Find the total predicted profit for the years 2013 to 2023 inclusive, giving your answer to the nearest pound. (3)

(Total 9 marks)

5. 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)
- (Total 7 marks)**
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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)
- (Total 10 marks)**
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7. The first three terms of a geometric sequence are

$$7k - 5, \quad 5k - 7, \quad 2k + 10$$

where k is a constant.

(a) Show that $11k^2 - 130k + 99 = 0$ (4)

Given that k is not an integer,

(b) show that $k = \frac{9}{11}$ (2)

For this value of k ,

- (c) (i) evaluate the fourth term of the sequence, giving your answer as an exact fraction,
(ii) evaluate the sum of the first ten terms of the sequence. (6)

(Total 12 marks)

8. 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, (2)

- (c) the first term, (2)

- (d) the sum to infinity. (3)

(Total 11 marks)

TOTAL FOR PAPER: 70 MARKS