## Sequences \& Series (Q 5, Paper 1)

## Lesson No. 8: Geometric Series

## 2007

5 (c) The first two terms of a geometric series are $\frac{1}{3}+\frac{1}{9}+\ldots$
(i) Find $r$, the common ratio.
(ii) Find an expression for $S_{n}$, the sum of the first $n$ terms.

Write your answer in the form $\frac{1}{k}\left(1-\frac{1}{3^{n}}\right)$ where $k \in \mathbf{N}$.
(iii) The sum of the first $n$ terms of the geometric series $\frac{p}{3}+\frac{p}{9}+\ldots$ is $1-\frac{1}{3^{n}}$.

Find the value of $p$.

## 2006

5 (b) The $n$th term of a geometric series is
$T_{n}=4\left(\frac{1}{2}\right)^{n}$.
(i) Find $a$, the first term.
(ii) Find $r$, the common ratio.
(iii) Write $4-S_{10}$ in the form $\frac{1}{2^{k}}, k \in \mathbf{N}$, where $S_{10}$ is the sum of the first ten terms.

## 2004

5 (c) The first term of a geometric series is 1 and the common ratio is -4 .
(i) Write down the first three terms of the series.
(ii) Find $S_{6}$, the sum of the first 6 terms.
(iii) Show that $16 S_{4}-3=S_{6}$, where $S_{4}$ is the sum of the first 4 terms.

## 2003

5 (b) The first two terms of a geometric series are $32+8+\ldots$
(i) What us the value of $r$, the common ratio?
(ii) Find an expression for $S_{n}$, the sum of the first $n$ terms.
(iii) Find $S_{10}$, the sum of the first 10 terms.

Given your answer correct to four decimal places.

## 2001

5 (b) The $n$th term of a geometric series is given by $T_{n}=3^{n}$.
(i) What is the value of $a$, the first term?
(ii) What is the value of $r$, the common ratio?
(iii) Show that $S_{10}$, the sum of the first ten terms, is $\frac{3}{2}\left(3^{10}-1\right)$.

2000
5 (b) The first term of a geometric series is 1 and the common ratio is $\frac{11}{10}$.
(i) Write down the second, thirds and fourth terms of the series.
(ii) Calculate $S_{4}$, the sum of the first four terms. Give your answer as a decimal.

## 1999

5 (b) The first two terms of a geometric series are $2+\frac{2}{3}+\ldots$
(i) Find $r$, the common ratio.
(ii) Write down the third and fourth terms of the series.
(iii) Show that $S_{6}$, the sum to 6 terms, is $3-\frac{1}{3^{5}}$.

## 1998

5 (b) The $n$th term of a geometric sequence is

$$
T_{n}=\frac{2^{n}}{3^{n}} .
$$

(i) Find the first three terms of the sequence.
(ii) Show that $S_{5}$, the sum of the first five terms, is $\frac{422}{243}$.

## 1996

5 (b) The $n$th term, $T_{n}$, of a geometric series is

$$
T_{n}=3^{n-1} .
$$

Find
(i) $T_{1}$, the first term
(ii) $r$, the common ratio
(iii) $S_{n}$, the sum to $n$ terms.

Investigate if

$$
2 S_{n}-T_{n}=2 T_{n}-1 .
$$

## Answers

2007 (c) (i) $\frac{1}{3}$
(ii) $\frac{1}{2}\left(1-\frac{1}{3^{n}}\right)$
(iii) $p=2$
20065 (b) (i) $a=2$
(ii) $r=\frac{1}{2}$
(iii) $\frac{1}{2^{8}}$
20045 (c) (i) 1, -4, 16
(ii) -819
20035 (b) (i) $\frac{1}{4}$
(ii) $\frac{128}{3}\left(1-\left(\frac{1}{4}\right)^{n}\right)$
(iii) $42 \cdot 6666$
20015 (b) (i) 3
(ii) 3
20005 (b) (i) $\frac{11}{10}, \frac{121}{100}, \frac{1331}{1000}$
(ii) 4.641
19995 (b) (i) $r=\frac{1}{3}$
(ii) $\frac{2}{9}, \frac{2}{27}$
19985 (b) (i) $\frac{2}{3}, \frac{4}{9}, \frac{8}{27}$
19965 (b) (i) 1
(ii) $r=3$
(iii) $S_{n}=\frac{1}{2}\left(3^{n}-1\right)$; Yes

