39. *(a)* The second term of a geometric series is 6 and the fifth term is 384.

    (i)   Find the common ratio of the series.

    (ii) Find the sum of the first eight terms of the geometric series.   [6]

  (b) The first term of another geometric series is 5 and the common ratio is 1·1.

    (i)   The nth term of this series is 170, correct to the nearest integer. Find the value of n.

    (ii) Dafydd, who has been using his calculator to investigate various properties of this geometric series, claims that the sum to infinity of the series is 940. Explain why this result cannot possibly be correct.

                                                                    [5]

                                                            Jan 2011

40. *(a)* A geometric series has first term a and common ratio r. Prove that the sum of the first n terms is given by

$$S_n = \frac{a(1-r^n)}{1-r}.$$ [3]

  (b) The sum to infinity of a geometric series is equal to four times the first term of the series.

    (i)   Find the value of the common ratio of the series.

    (ii) Given that the sum of the first two terms of the series is 35, find the sum of the first nine terms of the series. Give your answer correct to the nearest whole number.

                                                                    [6]

                                                             June 2011

41. *(a)* A geometric series has first term a and common ratio r. Prove that the sum of the first n terms is given by

$$S_n = \frac{a(1-r^n)}{1-r}.$$ [3]

  (b) The sum of the first two terms of a geometric series is 25·2. The sum to infinity of the series is 30. Given that the common ratio is positive, find the common ratio and first term of this geometric series.   [6]

                                                                     Jan 2012

42. A geometric series has first term a and common ratio r. The sum of the first and second terms of the series is 72. The sum of the first and third terms of the series is 120.

  (a) Show that r satisfies the equation

$$3r^2 - 5r - 2 = 0.$$ [4]

  (b) Given that $|r| < 1$, find the value of r and the sum to infinity of the series.   [5]

                                                                     June 2012