

## Algebra – Tutorial week 4

**T4.1.** Find the results of the following operations on integers written in base 5. Do the calculations working directly in base 5, without converting the numbers to decimal.

$$(1234)_5 + (343)_5 = ? \quad (1234)_5 - (343)_5 = ? \quad (34)_5 \cdot (42)_5 = ?$$

**T4.2.** Compute the sum of the infinite geometric series

$$18 + 6 + 2 + \frac{2}{3} + \frac{2}{9} + \cdots .$$

**T4.3.** Compute the value of the infinite geometric series

$$1 + \frac{1+i}{2} + \left(\frac{1+i}{2}\right)^2 + \left(\frac{1+i}{2}\right)^3 + \cdots ,$$

expressing the result in the simplest possible way (separating the real part from the imaginary part).

Draw a few partial sums in the complex plane. (That means mark the sums of the first 1, 2, 3, ... terms as points in the complex plane. If you join each partial sum to the next one by a vector, those vectors will be the individual terms that you add to make up the sum.)

**T4.4.** Write the number  $1/5$  in base 2, in exact form (that is, as a periodic binary number, with dots above the first and the last digit of the period).

Now write  $1/5$  in base 3, then in base 4, then in base 5, and finally in base 6.