1. (a) Express the number 10011010010_2 in octal (base 8) and hexadecimal (base 16) formats. [2]

   (b) i. Sketch an equilateral triangle of side 2 units and draw a perpendicular from one vertex to the opposite side. Mark on your diagram the length of the perpendicular and hence write down the values of $\cos 30^\circ$ and $\sin 30^\circ$ as fractions. Explain why one of those fractions is irrational. (You do not need to prove it is irrational.) [3]

   ii. Let $z = \frac{1}{2}(3 - \sqrt{3}i)$ where $i = \sqrt{-1}$. Using your results of the previous part and De Moivre's theorem, or otherwise, express z^{12} in the form $a + bi$ where a, b are real numbers. [3]

   (c) Suppose neither of the vectors $\underline{a} = (a_1, a_2)$ nor $\underline{b} = (b_1, b_2)$ is the zero vector. Define what it means for $\underline{a}$ and $\underline{b}$ to be *linearly independent*. Derive a condition on the components of $\underline{a}$ and $\underline{b}$ for them to be linearly independent. [2]