Question 1
If \( a \) is a real number, \( \lfloor a \rfloor \) denotes the largest integer \( n \) with \( n \leq a \), and \( \{ a \} \) denotes the number \( r \) with \( 0 \leq r < 1 \) for which \( a - r \) is an integer. For example \( \lfloor \frac{9}{4} \rfloor = 2 \) and \( \{ \frac{9}{4} \} = \frac{1}{4} \). Which values of \( x \) (if any) satisfy
\[
2 \lfloor x \rfloor = x + 2 \{ x \}.
\]

Question 2
Starting with a positive integer \( n \), form the sum of decimal digits of \( n \), then form the sum of digits of this new number and so on, until the process stabilizes. The result is called the ultimate digital sum of \( n \). What is the ultimate digital sum of \( 2^{2012} \)?

Question 3
A car, van, truck and bike are all travelling in the same direction on the road. Each travels at a constant speed, but the speeds of the 4 vehicles may be different. At 10 am the car overtakes the van. At noon it overtakes the truck. At 2 pm it overtakes the bike. At 4 pm the truck overtakes the bike. At 6 pm the van overtakes the truck. When does the van overtake the bike?

Question 4
Two congruent non-overlapping equilateral triangles are placed wholly within a square of side length 1. What is the maximum area they could cover?

Question 5
Suppose \( x, y \) and \( z \) are numbers satisfying
\[
\begin{align*}
x + y + z & = -2 \\
x^2 + y^2 + z^2 & = 122 \\
x^3 + y^3 + z^3 & = 142
\end{align*}
\]
What is the value of \( xyz \)?