QUIZ4

1. **Neural Network and Deep Learning**
   A fully connected Neural Network has $L = 2$; $d^{(0)} = 5$, $d^{(1)} = 3$, $d^{(2)} = 1$. If only products of the form $w_{ij}^{(\ell)} x_i^{(\ell-1)}$, $w_{ij}^{(\ell+1)} \delta_j^{(\ell+1)}$, and $x_i^{(\ell-1)} \delta_j^{(\ell)}$ count as operations (even for $x_0^{(\ell-1)} = 1$), without counting anything else, which of the following is the total number of operations required in a single iteration of backpropagation (using SGD on one data point)?

   A. 47

   B. 43

   C. 53

   D. 59

   E. none of the other choices

2. Consider a Neural Network without any bias terms $x_0^{(\ell)}$. Assume that the network contains $d^{(0)} = 10$ input units, 1 output unit, and 36 hidden units. The hidden units can be arranged in any number of layers $\ell = 1, \cdots, L-1$, and each layer is fully connected to the layer above it. What is the minimum possible number of weights that such a network can have?

   A. 46

   B. 44

   C. none of the other choices

   D. 43

   E. 45

3. Following Question 2, what is the maximum possible number of weights that such a network can have?

   A. 510

   B. 520

   C. none of the other choices

   D. 500

   E. 490