1. (a) (3 points) You receive the following 12-bit binary sequence:

$$\texttt{0000 0111 1100}$$

Which decimal numbers are encoded in this sequence, if you were told that the sequence contained:

Two 6-bit numbers using two's complement: $\underline{\hspace{3cm} 1, -4 \hspace{3cm}}$

A single 12-bit unsigned number: $\underline{\hspace{3cm} 124 \hspace{3cm}}$

Three 4-bit numbers using sign/magnitude: $\underline{\hspace{3cm} 0, 7, -4 \hspace{3cm}}$

(b) (2 points) In the lecture, it was explained that the two's complement was the better alternative to represent negative numbers. Name two main advantages of the two's complement representation over a sign/magnitude representation:

> **Solution:**
>
> 1. Zero is represented only once
>
> 2. Standard binary addition works with two's complement numbers without additional effort
>
> 3. Associativity law holds