1. (a) (2 points) For the following four numbers given in decimal or hexadecimal notation, write the corresponding binary number using the indicated format.

$(-6)_{10}$ using 6-bit sign magnitude:                          $(10\,0110)_2$

$(37)_{10}$ using 6-bit unsigned:                                    $(10\,0101)_2$

$(-28)_{10}$ using 6-bit two's complement:            $(10\,0100)_2$

$(2B)_{16}$ using 6-bit unsigned:                                     $(10\,1011)_2$

(b) (3 points) State whether the following statements about the binary representation of numbers are *true* or *false*. Give **brief** explanations for the statements that are *false*.

- Both two's complement and sign/magnitude representation can be used to represent negative numbers in binary.

> **Solution:** True, however it is more difficult to design arithmetic circuits that work with sign/magnitude format. Still they are used.

- Using $N$ bits it is possible to represent $2^N$ different numbers when an unsigned number system is used.

> **Solution:** True.

- While there are methods to represent both positive and negative integers, it is not possible to represent fractions or real numbers using binary numbers.

> **Solution:** False, fixed and floating point number systems can be used to represent such numbers.