INF2270, exercise in combinational logic and two's complement arithmetic

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Abstract

In this exercise you will design a combinational circuit with 'diglog' and briefly check if you understand how to interpret the two's complement representation.

Task 1

To find the inverse of a two's complement binary number one needs to invert each single bit and add 1. Thus, a circuit that increments a two's complement number may be useful to complete an inversion. Try to design a circuit that increments a 9 bit two's complement number. Hint: you will not need a full-adder to add the constant '000000001' but you can actually do it with cascaded half adders. Try to figure it out!

In order to test your circuit, design it with the 'diglog' simulator. This will get you acquainted with the tool you will need for the mandatory exercise.

Task 2

Please convert the following two's complement binary numbers to signed decimal:

11011	=	?
1110111	=	?
1010101	=	?
100000001	=	?
111111111	=	?

What is the corresponding 8 bit two's complement number for:

-31	=	?
-32	=	?
-127	=	?
-128	=	?
-77	=	?
22	=	?