

Lab 01: Signed and Unsigned Integers

A. Why?

There are three different ways to represent signed binary integers; each way has its own peculiarity. Two's complement is typically used in hardware.

B. Outcomes

After this lab, you should be able to

- Take the negative of an integer in each of the three ways to represent signed integers.
- Say how many versions of zero there are and what they look like in each of the three ways.
- Say what the most positive and negative integers are in each of the three ways.
- Recognize some cases of overflow in each of the three ways.
- Subtract two numbers in two's complement.

C. Finish the Activity: Practice on Signed Integers

Finish the last three questions of the activity on signed integers: For each of the three ways to represent signed binary integers (sign-magnitude, one's complement, and two's complement), answer the following questions.

5. What does 11111 represent?
6. What does 10000 represent?
7. What is $01111+10000$?

D. Questions

For each of the three ways to represent signed binary integers (sign-magnitude, one's complement, and two's complement), answer the following questions.

1. How do you take the negative of a number?
2. What is the negative of 01101?
3. What is the negative of the negative of 01101?
4. How many versions of zero are there in each of the three ways?
5. What is the most positive 5-bit signed integer?
6. What is the most negative 5-bit signed integer?
7. What is the negative of the most negative 5-bit signed integer?
8. What does $01111+00001$ represent? (Do the addition as if the values were unsigned, but read the result as signed.) Has overflow occurred?
9. What does $11100+10100$ represent? (Do the addition as if the values were unsigned, but read the result as signed.) Has overflow occurred?

In two's complement,

10. What is $01101-01010$?
11. What is $01010-01101$?

12. What is 10011-00100?