1. The following questions concern the binary representation of numbers and addition. Note that we will write binary numbers as $b_n, \ldots, b_0$ where b_n is the most significant bit whereas b_0 is the least significant bit. However, represented as a list in the computer, the same number would be $[b_0, b_1, \ldots, b_n]$.

4 / 4 points

- [x] The number 6 in decimal is represented by the list [0, 1, 1]

Correct
Correct $6_{10} = (110)_2$ is represented by the list [0, 1, 1]

- [x] Consider two lists [0, 1, 1] and [1, 1]. The sum of these two numbers is given by [1, 0, 0, 1]

Correct
Correct.

- [ ] The addition of a m bit number with a n bit number yields a number with as many as $m + n$ bits.
- [x] The addition of a m bit number with a n bit number yields a number with as many as $\max(m, n) + 1$ bits.

Correct
Correct. The result has one more bit than the larger of the two numbers.

- [x] The algorithm for adding two n bit numbers runs in time $\Theta(n)$.

Correct
Correct.

2. The following questions concern the grade school algorithm we studied in the lecture. Note that we will represent numbers as lists of bits. Select all the correct answers from the list below.

4 / 4 points

- [x] The grade school multiplication algorithms performs as many additions as the number of 1 bits in the second argument.

Correct
Correct since zero bits in the second argument do not contribute to the problem.

- [ ] The shift operation performed at each step of the multiplication algorithm appends a 0 to the end of the list.
- [x] The shift operation performed at each step of the multiplication algorithm appends a 0 to the beginning of the list.

Correct
Correct.

- [x] Consider the multiplication of two numbers represented by list a = [1, 0, 1] with b = [1, 1]. The grade school multiplication algorithm performs additions of the number [1, 0, 1,0] with the number [0, 1, 0, 1], yielding the result [1, 1, 1, 1]. Note the number $a_n \ldots a_0$ is represented as a list $[a_0, a_1, \ldots, a_n]$.

Correct
Correct.