SchoolNova, Math 5b
Homework 11
More Binary and Base-4 Numbers
January 20, 2019

Please provide sufficient details about how you solved the problem. More difficult problems are marked with a $*$. If unable to solve a problem, please present your thoughts and any partial solution.

1. Perform the following binary additions:

   (a) $1111 + 111$ (b) $1111 + 1$ (c) $11011 + 10$ (d) $100 + 101$

2. Perform the following subtractions in binary notation (utilize the borrow method):

   (a) $30 - 3$ (b) $32 - 1$ (c) $42 - 15$ (d) $60 - 20$

3. Add the following base-4 numbers together:

   (a) $222 + 1$ (b) $333 + 1$ (c) $300 + 200$ (d) $300 + 300$

4. If you put one grain of wheat on the first square of the chessboard, two on the second, then four, eight,..., approximately how many grains of wheat will there be? You can use $2^{10} = 1024 \approx 10^3$.

5. Kristina wants to use all five fingers of one hand and the binary numbers to count from 0 to 31. Can she do it?

6. $*$ Find the sum of the bits of the binary representation of $2^m - 2^n$, where m and n are integers and $m > n > 0$.

7. $*$ Let $T(n)$ be the binary number of n $1's$, for example:

   $T(3) = 111$ $T(5) = 11111$.

   (a) When is $T(n)$ divisible by 5?
   (b) When is $T(n)$ divisible by 7?

8. In the given Sudoku puzzle, the objective is to fill the grid with digits, so that each row, each column, and each 3×2 sub grid contains **all** the digits from 1 through 6. Complete the given puzzle.

		2			
6	4				2
	1	5			4
2			5	3	
4				6	5
			2		

9. Fill the following table with the names of powers of ten:

Power	Name
10^9	Billion
10^{12}	Trillion
10^{15}	
10^{18}	
10^{21}	
10^{24}	
10^{27}	
10^{100}	