Number Systems: Answer the following questions. Make sure to show your work. (3 points each for total 21 points).

Do NOT use a calculator of any kind, you need to know how to solve these problems by hand.

If you need help, ask a TA.

1. What is the binary number 1101 in decimal?

1101=13

13

2. What is the decimal number 234 in binary?

128 64 32 16 8 4 2 1

1 1 1 0 1 0 1 0

234-128 = 106

106-64 = 42

42- 32=10

10-8 = 2

2-2 = 0

11101010

3. Convert the hexadecimal number A3D into binary.

D = 13

A = 10

13+ 3\*16 + 10\* 16^2 = 2621

4. Add 1010001 and 111111 in binary. Convert the answer to decimal. Verify your answer by first converting the binary numbers into decimal, then adding.

1 0 1 0 0 0 1

64 32 16 8 4 2 1

64+16+1 = 81

1 1 1 1 1 1

32 16 8 4 2 1

32+16+8+4+2+1 = 63

81+63 = 144

5. What is the largest unsigned (positive) 4-bit binary number? What is the largest unsigned N-bit binary number?

largerst unsigned 4-bit binary number is: 1111 0r 15

largest unsigned N-bit binary number is 2^n -1

6. Convert the following decimal numbers to hexadecimal numbers.

a. 1010

3\*256= 768

1010-768 = 242

16\*15 = 240

242-240 = 2

2-2 = 0

3F2

b. 1410

5\*256 = 1280

1410 - 1280 = 130

8\* 16 = 128

130 - 128 = 2

582

c. 5210

1\*4096 = 4096

5210 - 4096 = 1114

4\*256 = 1024

1114 - 1024 = 90

5 \* 16 = 80

90-80 = 10

10-10 = 0

145A

d. 84510

1 \* 65536 = 65536

84510 - 65536 = 18974

4 \*4096 = 16384

18974-16384 = 2590

10 \* 256 = 2560

2590-2560 = 30

1 \* 16 = 16

30-16 = 14

14 - 14 = 0

14A1E

7. How many bytes are in a KB (kilobyte)? In a MB (megabyte)? In a GB (gigabyte)?

KB = 1 thousand 1,000

MB = 1 Million 1,000,000

GB = 1billion 1,000,000,000