Digital Systems Review

* Binary to Decimal

27 26 252 4 232 2 21 20 - Binary goes by bases of 2

128 64 32 16 8 4 2 1

Then 512, 1024

And then we can circle the ones with a 1 and add those spots up (to convert to decimal)

* Decimal to binary

13 = 8 + 4 + 1 (23+ 22 + 20)

1101

It only works for powers of 2 and you need to go through biggest options first (aka find greatest possible numbers to combine) and smaller numbers

114 (dec to bin)

64 + 50 (32+18) (16+2)

01110010

* Decimal to hexadecimal

163 162 161 160

4096 256 16 1

2000 (dec to hex)

7\*256 + 208 (13\*16)

256s 16s 1s

7 D 0

* Hexadecimal to decimal

Base 16

0 1 2 3 4 5 6 7 8 9 A(10) B(11) C(12) D(13) E(14) F(15)

E7 would be

161 160

(16\*14) = 224 + 7 = 231

* Adding in binary

Use the carry

1+1 = 0 and carry the one

* Multiply binary

0x1 = 0

1x1 = 1

And then use the standard multiplication algorithm

1001 \* 101 = 101101 (three rows and make sure to account for places)

* Binary to Hex

101101110 - 16E

Can skip base 10 and convert between both (both multiples of 2)

Split up to groups of 4 (16s) and then times it 14 =

Left hand = multiply , right = divide (when we have fractions/not full number) from other bases to decimal

* Base 10 to binary

Successively divide by base (we want to convert to – so 2)

Then do the remainder each time

243

121 – rem 1

60 – rem 1

30 – rem 0

15 – rem 0

7 rem 1

3 rem 1

1 rem 1

0 rem 1

Then remainder column , but backwards

# of combinations = base # of digits

* Encoding
* Decimal to binary
  + Divide on left (as normal) and multiply on right side
  + 12.185 in base 10
  + 0| .37
  + 0 | . 74
  + 1 | .48
  + 0 | .96
  + Only multiply right side