1.1 Which of the following are analog or digital quantities?

Note Title 26/04/2010

(a) number of atoms in a sample of material *digital*
(b) Altitude of an aircraft *analog*
(c) pressure in a bicycle tire *analog*
(d) current through a speaker *analog*
(e) timer setting on a microwave oven *digital*

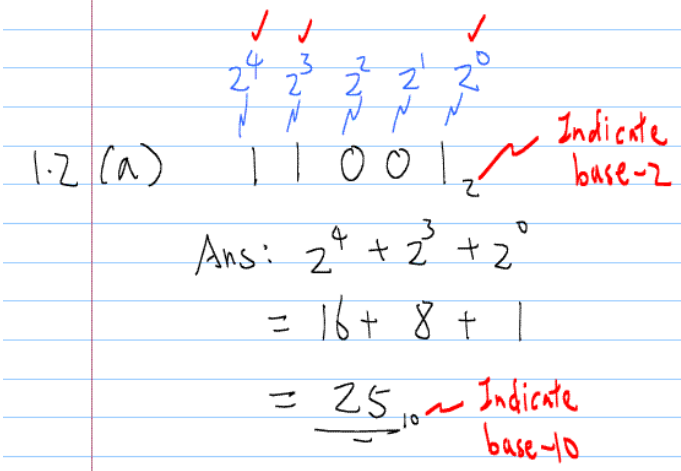
*Those with finite number of steps between any two values are discrete quantities (i.e. digital) - **can count**.*

*Those with infinite number of steps between any two values are continuous quantities (i.e. analog) - **cannot count**.*

1.2 Convert the following binary into their equivalent decimal

Note Title 20/04/2010

(a) 11001_2
(b) 1001.1001_2
(c) 10011011001.10110_2



1.2 (b) $2^3\ 2^2\ 2^1\ 2^0\ 2^{-1}\ 2^{-2}\ 2^{-3}\ 2^{-4}$

1001.1001_2

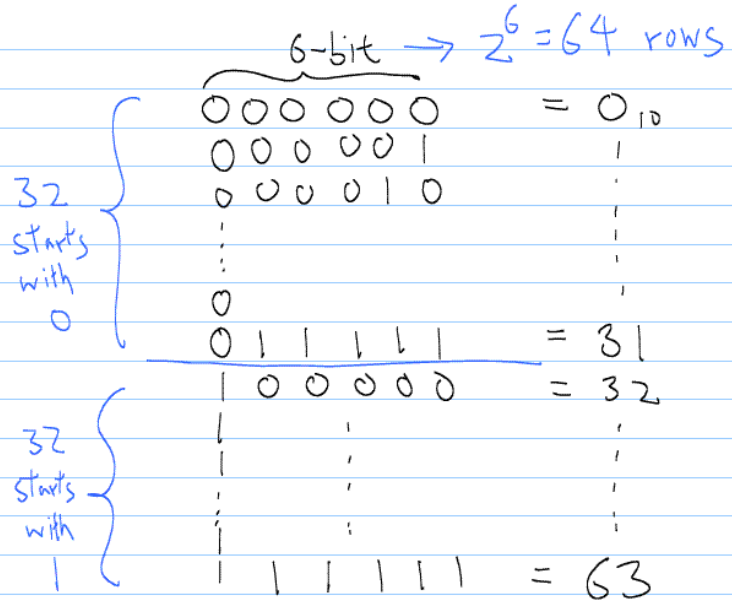
Ans: $2^3 + 2^0 + 2^{-1} + 2^{-4}$

$= 8 + 1 + \frac{1}{2} + \frac{1}{16}$

$= 9 + .5 + .0625$

$= 9.5625_{10}$

1.3 Using six bits, show the binary counting sequence from 000000 to 111111.



The full table for all 6-bit binary numbers (64 combinations):

0	= 000000	16	= 010000	32	= 100000	48	= 110000
1	= 000001	17	= 010001	33	= 100001	49	= 110001
2	= 000010	18	= 010010	34	= 100010	50	= 110010
3	= 000011	19	= 010011	35	= 100011	51	= 110011
4	= 000100	20	= 010100	36	= 100100	52	= 110100
5	= 000101	21	= 010101	37	= 100101	53	= 110101
6	= 000110	22	= 010110	38	= 100110	54	= 110110
7	= 000111	23	= 010111	39	= 100111	55	= 110111
8	= 001000	24	= 011000	40	= 101000	56	= 111000
9	= 001001	25	= 011001	41	= 101001	57	= 111001
10	= 001010	26	= 011010	42	= 101010	58	= 111010
11	= 001011	27	= 011011	43	= 101011	59	= 111011
12	= 001100	28	= 011100	44	= 101100	60	= 111100
13	= 001101	29	= 011101	45	= 101101	61	= 111101
14	= 001110	30	= 011110	46	= 101110	62	= 111110
15	= 001111	31	= 011111	47	= 101111	63	= 111111

1.4 What is the maximum number that we can count up to using 10 bits?

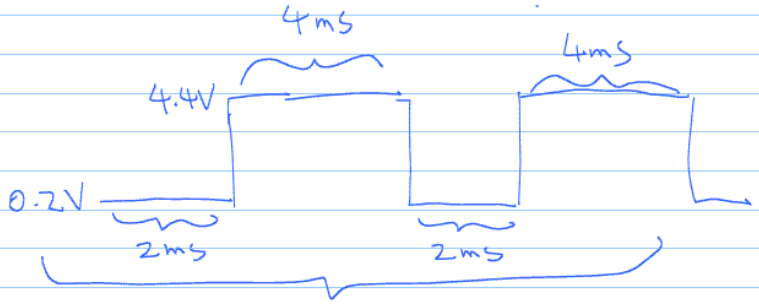
With 10-bit, there are $2^{10} = 1024$ nos.

But the 1st number is 0,

hence the last (ie biggest) ... is 1023.

1.6 Draw the timing diagram for a digital signal that continuously alternate between 0.2 V (binary 0) for 2 ms and 4.4V (binary 1) for 4ms.

repeatedly



Draw at least 2 cycles to show that it is repeating.