Fixed Point Numbers Homework

You should refer to the **homework policy** for details on how this homework should be submitted.

Attempt all questions and show all working.

Question 1

Using one byte to hold each number, with an imaginary binary point fixed after the fourth digit, covert the following decimal numbers to binary:

1. 3.75

8	4	2	1	1/2	1/4	1/8
0	0	1	1	1	1	0

3.75 = 0011110 in binary

2. 5.1875

4	2	1	1/2	1/4	1/8	1\16
1	0	1	0	0	1	1

5.1875 = 1010011 in binary

3. 7.562

4	2	1	1/2	1/4	1/8	1\16
1	1	1	1	0	0	0

7.562 = 0.562
0.562 x 2 = 1.124
0.124 x 2 = 0.248
0.248 x 2 = 0.496

binary after point =100
7.562 = 1111000 in binary

4. 7.5627

4	2	1	1/2	1/4	1/8	1\16
1	1	1	1	0	0	1

7.5627 = 0.5627
0.5627 x 2 = 1.1254
0.1254 x 2 = 0.2508
0.2508 x 2 = 0.5016
0.5016 x 2 = 1.0032
binary after point = 1001
7.5627 = 1111001 in binary

(**8 marks**)

Question 2

Convert the following numbers to decimal, assuming 4-bits after the point:

1. 000000001011000

1024	512	256	128	64	32	16	8	4	2	1	1/2	1/4	1/8	1/16
0	0	0	0	0	0	0	0	1	0	1	1	0	0	0

4+1+1/2=**5.5**

2. 0000000000110010

2048	1024	512	256	128	64	32	16	8	4	2	1	1/2	1/4	1/8	1/16
0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0

2+1+1/8 = **3.125**

(**4 marks**)

Question 3

What is:

1. The largest positive number that can be held in **two bytes**

2048	**1024**	**512**	**256**	**128**	**64**	**32**	**16**	**8**	**4**	**2**	**1**	**1/2**	**1/4**	**1/8**	**1/16**
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

2048+1024+512+256+128+64+32+16+8+4+2+1+1/2+1/4+1/8+1/16 = **4095.9375**
2. The smallest positive number that can be held in **two bytes**
*The smallest number= **1/16***
In both instances assume that there are **four** bits after the point.

(**2 marks**)

Question 4

Using one byte to hold each number, with an imaginary binary point fixed after the fourth digit

1. What is the largest number that can be stored?

8	**4**	**2**	**1**	**1/2**	**1/4**	**1/8**	**1/16**
1	1	1	1	1	1	1	1

8+4+2+1+1/2+1/4+1/8+1/16= 15.9375

2. What is the difference between two consecutive values?
1/16
3. How could the precision of storing fractional numbers be improved?
Increase the number of bits after the binary point will increase precision.
4. What effect would this have on the range of numbers that could be stored?
This unfortunately causes the range of numbers to go down because less are able to be represented before the binary point.

(**4 marks**)

Total 18 marks