numberConversion

Number Conversion

Convert to decimal the following binary numbers

$$1000 = 1 \cdot 2^3 + 0 \cdot 2^2 + 0 \cdot 2^1 + 0 \cdot 2^0 = 8$$

$$1010 = 1 \cdot 2^3 + 0 \cdot 2^2 + 1 \cdot 2^1 + 0 \cdot 2^0 = 10$$

$$11011 = 1 \cdot 2^4 + 1 \cdot 2^3 + 0 \cdot 2^2 + 1 \cdot 2^1 + 1 \cdot 2^0 = 27$$

$$100011110 = 1 \cdot 2^8 + 0 + 0 + 0 + 1 \cdot 2^4 + 1 \cdot 2^3 + 1 \cdot 2^2 + 1 \cdot 2^1 + 0 \cdot 2^0 = 286$$

Convert to binary the following decimal numbers

$$16 = 10000 \qquad \text{because of } 2^5$$

$$17 = 10001 \qquad \text{because of } 16 + 1$$

$$
\begin{aligned}
15/2 &= 7 & r &= 1 \\
7/2 &= 3 & r &= 1 \\
3/2 &= 1 & r &= 1 \\
1/2 &= 0 & r &= 1 \\
15 &= 1111
\end{aligned}
$$

$$
\begin{aligned}
100/2 &= 50 & r &= 0 \\
50/2 &= 25 & r &= 0 \\
25/2 &= 12 & r &= 1 \\
12/2 &= 6 & r &= 0 \\
6/2 &= 3 & r &= 0 \\
3/2 &= 1 & r &= 1 \\
1/2 &= 0 & r &= 1 \\
100 &= 1100100
\end{aligned}
$$

Convert to binary the following hexadecimal numbers

```
                          123ABC
                     0x1 = 0001
                     0x2 = 0010
                     0x3 = 0011
                     0xA = 1010
                     0xB = 1011
                     0xC = 1100
     123ABC = 1 0010 0010 0011 1010 1011 1100
```

B0B
B = 1011
0 = 0000
B = 1011
B0B = 1011 0000 1011

ABAC0
A = 1010
B = 1011
A = 1010
C = 1100
0 = 0000
ABAC0 = 1010 1011 1010 1100 0000

F1FA
F = 1111
1 = 0001
F = 1111
A = 1010
F1FA = 1111 0001 1111 1010

Number Representation

$$11_b = 10_{10} \qquad\qquad \Rightarrow 9$$
$$11_b = 101_2 = 5_{10} \qquad \Rightarrow 4$$
$$100_b = 8_{10}$$
$$1x^2 = 8 \rightarrow x = \sqrt{8} \qquad \Rightarrow \sqrt{8}$$
$$16_b = 10001_2 = 17 \qquad \Rightarrow 11$$

How many bits do you need to store the number 129 in memory?

You need at least 8 bits, because 7 bit can only represent 128 values and are therefore not sufficient to store numbers higher that 127.