Intro to Computer Science Assignment 5

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Problem 5.1 define the base in decimal as B
$\gamma^2 = \gamma, \gamma + \gamma = \gamma \implies \gamma = 0$
$\alpha \neq \gamma, \alpha^2 = \alpha \implies \alpha = 1$
$\beta = \alpha + \alpha = 1 + 1 = 2$
$\delta^2 = \beta\beta \implies \delta^2 = \beta \cdot B + \beta = 2 \cdot B + 2$
$\delta + \delta = \alpha\alpha = B \cdot \alpha + \alpha = B + 1$
$\delta^2 = 2(B + 1) = 2(\delta + \delta) = 4\delta \implies \delta = 4$
$2\delta = \alpha\alpha = 8 \implies 8 = B + 1 \implies B = 7$
$0 = \gamma, 1 = \alpha, 2 = \beta, 4 = \delta, B = 7$
$99 = 201_7 \implies 99 = \beta\gamma\alpha$

Problem 5.2

a) $1 = 0001_5 \implies -1 = 4443_5 + 1 = 4444_5$;
$8 = 0013_5 \implies -8 = 4431_5 + 1 = 4432_5$;

b) $4444_5 + 4432_5 = 4431_5$ minus 1 and flip digit $\implies$ absolute value is $0014_5 = 1 \cdot 5 + 4 = 9$

Problem 5.3

a) -4.2, first take the sign out, set the first S = 1
normalize it using the exponential of 2, we have $4.2 = 1.05 * 2^2$
remove the heading one in the significant digit, we have $4.2 = 1 * 2^2 + 0.05 * 2^2$
For the exponential part, add 127 to its exponential $127 + 2 = 129$, convert it to binary form, we have $129_10 = 2^7 + 1 = 10000001_2$
Now convert the signficant part, 0.05 to its binary form $0 * 2^-1 + 0 * 2^-2 + 0 * 2^-3 + 0 * 2^-4 + 1 * 2^-5$...
So its binart form is $00001100110011001100110_2$
Clearly, its binart form is 1 10000001 00001100110011001100110

b) The decimal 1.05 is stored as .05 in the float number

Problem 5.4 Use a helper function inside to allow tail recursion call.

```
bin :: Integer -> [Integer]
bin x = binHelper [] x
    where  binHelper x 0 = x
           binHelper x y = binHelper ([(mod y 2)] ++ x) (div y 2)
```