The IEEE 32-bit floating-point format is assumed below.

1. Determine the gap between $0.5$, $0.125$, $2^{-148}$, $1000$ and the next largest floating-point number.

2. Write the representations of $-10$, $50$, $51$, and $100$.

3. What number is represented by $[ 0 | 00000001 | 00000000000000000000000 ]$?

4. Write the representations of $0.3$ and $1/3$ using each of the four rounding modes.

5. Show that the equality $(x + y) + z = x + (y + z)$ may fail for positive numbers.

6. (Extra) Let $X$ be a given array of numbers of length $N$.
   The following summation algorithm is relatively very accurate.
   
   $$
   s = X(1);
   c = 0;
   
   for \ k = 2 : N
   \begin{align*}
   y &= X(k) - c; \\
   t &= s + y; \\
   c &= (t - s) - y; \\
   s &= t;
   \end{align*}
   
   Do you see why?