

Q1.

$$+49 = 32 + 16 + 1 = 2^5 + 2^4 + 2^0 = 00110001$$

Q2.

$$-37 = \sim(+37) + 1$$

$$+37 = 32 + 4 + 1 = 2^5 + 2^2 + 2^0 = 00100101$$

$$\sim(00100101) = 11011010$$

$$-37 = 11011011$$

Q3.

$$+49.5$$

$$49.5 = (2^5 + 2^4 + 2^0 + 2^{-1}) = 110001.1 = 1.100011 * 2^5$$

$$\text{Sign} = 0$$

$$\text{Exponent} = 127 + 5 = 132 = 10000100$$

$$\text{Mantissa} = 100011000000000000000000$$

$$\text{Answer} = 01000010010001100000000000000000$$

Q4.

$$-5.75$$

$$5.75 = (2^2 + 2^0 + 2^{-1} + 2^{-2}) = 101.11 = 1.0111 * 2^2$$

$$\text{Sign} = 1$$

$$\text{Exponent} = 127 + 2 = 129 = 10000001$$

$$\text{Mantissa} = 011100000000000000000000$$

$$\text{Answer} = 11000000101110000000000000000000$$

Q5.

$$\text{"Banchero" = 5} = 42\ 61\ 6e\ 63\ 68\ 65\ 72\ 6f\ 20\ 3d\ 20\ 35\ 00$$

Q6.

Pi is one such number that cannot be exactly represented by a 32 bit computer as it is irrational and cannot be represented by fractions so powers of 2 (which is how the 32 bit computer counts) can never exactly represent pi.

(Another example is any integer value greater than  $2^{32} - 1$  as that is out max integer value for 32 bit representation.)

Q7.

- a) stack
- b) Stack
- c) heap
- d) global data
- e) heap

Q8.

It will return 0 as 21.34 (\*points\_ptr) is larger than 11.0 (\*rebounds\_ptr + rebounds\_ptr[1]) and the foo function returns the larger value of the two and this is more than 10.5 so main function returns 0.

Q9.

real 0m0.904s

user 0m0.895s

sys 0m0.009s

real 0m0.315s

user 0m0.311s

sys 0m0.005s

Runtime Unopt: 0.904s

Runtime Opt: 0.315s (lower)

The unoptimized code took nearly 3 times as long to run compared to the optimized code. This is **as expected** as we specified the unoptimized code to be compiled with less efficiency (O0 compared to the other O3).