CSE 351 Summer 2021 – Unit Summary #1 – Task 3
Due Mon 7/12 8pm to Gradescope

Your Name:_____

UWNet ID (email):_____

Academic Integrity Statement_____

All work on these questions in my own. I have not shared or discussed my answers with anyone else. (please sign) (1 point)

- To complete Task 3, please either:
  - print these THREE pages, fill them out and then scan and convert into a pdf
  - use digital ink or otherwise annotate the pdf electronically
- Gradescope requires you to upload a pdf
- Fill in your name and UW NetID above, then read the Academic Integrity Statement and sign your name indicating that you understand and will comply with the statement. If you are not printing this out or do not have access to digital ink, just type your full name.
- You may show scratch work for potential partial credit but showing work is not required. Be sure your final answer is placed in the blanks, boxes, or spaces provided.
- You may use your study guide from Task 1, course lecture slides and Ed Lessons, and course textbooks while completing this task.
- Use of reference materials external to those listed above is not allowed (e.g., Stack Overflow, web searches, communicating with anyone other than the course staff, etc.)
- If you have questions, please ask on the Ed Board. A private post is fine! Questions about the unit summaries will not be answered in office hours.
- Refer to the Unit Summary webpage for additional information: https://courses.cs.washington.edu/courses/cse351/21su/unit_summaries/

Good Luck!

1. Integers and Floats (12 points total)

a) (1 pt) If we have only 17 bits and are using **two's complement representation**, how many **positive, non-zero** numbers can we represent?
Give an exact number, not a formula.

b) (1 pt) If we have only 17 bits and are using **sign-magnitude representation**, how many **positive, non-zero** numbers can we represent?
Give an exact number, not a formula.

c) (6 pt) Given the following in C: `signed char x = 0b 1100 1101`

i. (2 pts) What is the value of **x** in decimal? Give an exact number.

ii. (4 pts) For each of the following expressions, indicate whether it will result in a positive, negative or a zero result. (Circle one)

- `x << 2` Positive Negative Zero
- `x + 0x78` Positive Negative Zero
- `x >> 4` Positive Negative Zero
- `!(x ^ 0xE)` Positive Negative Zero

d) (4 pts) Assume we have a floating point representation that follows the same conventions as IEEE 754, except that it uses 12 bits. 1 bit is for the sign, 5 bits are used for the exponent and 6 bits are used for the mantissa.

i. What is the bias for this representation?

ii. What is the **decimal** value encoded by the bit pattern: 0 10110 011010?
For potential partial credit, you may show your work, but work is not required.

Is this number (circle one):
positive or
negative

2. Pointers & Memory (8 points total)

For this problem, assume we are executing on a 64-bit x86-64 machine (little endian) and that the initial contents of memory are shown below. Write the **type** and **hexadecimal value** for each expression in the table below, assuming these five statements have been executed. Write UNKNOWN if the value cannot be determined. **Make sure to specify all bits for the result of each expression** (i.e., use the correct number of bits as determined by the expression's resulting type).

Address	+0	+1	+2	+3	+4	+5	+6	+7
0x50	1D	FC	C8	21	75	25	09	56
0x58	05	6C	36	03	42	BF	0D	D9
0x60	50	00	00	00	00	00	00	00
0x68	40	03	08	15	A9	8B	F2	3F
0x70	AA	BB	CC	DD	EE	64	01	02

```
int i = 16;
char* cp = 0x62;
long** qp = 0x50;
short* sp = 0x5E;
int* ip = 0x6C;
```

Expression (in C)	Type	Value (in hex)
`i`	int	0x 0000 0010
`*sp`		
`*(cp + 11)`		
`&qp`		
`*((int*) qp)`		
`((char*) sp) + 3`		
`(short*) (ip + 2)`		
`sp[-4] - 2`		
`*((int*)qp[2]) + 2`		