

11) 2 points. Roughly speaking, what is the value of 2^{25} (two to the twenty-third power). I don't want the exact value; this should be the approximate value you would use for estimating.

32 million, 32,000,000

12) 6 points. Write C code for Hello World. The whole thing. Get all of it, so it would compile and run. The syntax has to be right.

```
#include <stdio.h>
int main()
{
    printf("Hello, world\n");
}
// Semicolon, quotes, backslash n,
// all important. Int on main is
// optional. Could be main(void)
```

13) 6 points. Write C code to compute the sum of the numbers from 9 to 27 (inclusive). Use a loop.

```
int sum, i;
sum = 0;
for (i = 9; i <= 27; i = i + 1)
    sum = sum + 1;
// Init sum to 0!
```

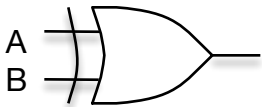
14) 2 points. What text editors have you used?

Any reasonable text editors are fine

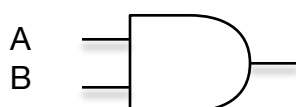
15) 2 points. What command do you use to compile a C program on a Linux machine?

gcc, cc, make. Any reasonable response is fine

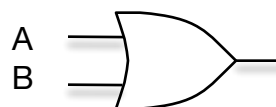
16) 8 points. Fill out Truth Tables for each of these simple gates



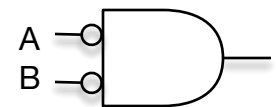
A	B	Output
0	0	0
0	1	1
1	0	1
1	1	0



A	B	Output
0	0	0
0	1	0
1	0	0
1	1	1



A	B	Output
0	0	0
0	1	1
1	0	1
1	1	1



A	B	Output
0	0	1
0	1	0
1	0	0
1	1	0

17) 4 points. Simplify this Boolean equation (using Boolean algebra). Show your work.
 $AB(AC+ABC)$

$AB(AC(1+B))$
 $ABAC$
 $ABC \leftarrow$ final answer

18) Show the truth tables for a HALF ADDER (2 points) and a FULL ADDER (4 points)

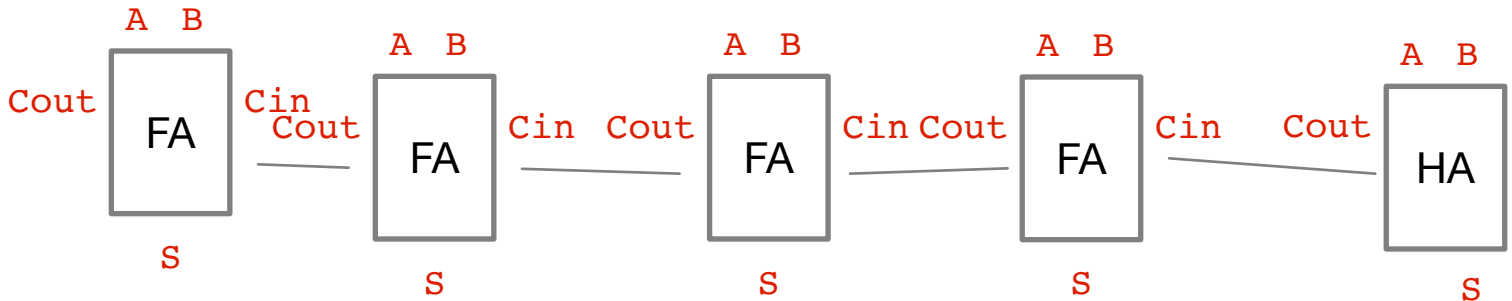
A	B	C	S
0	0	0	0
0	1	0	1
1	0	0	1
1	1	1	0

Half

A	B	Cin	Cout	S
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	0	1	1	0
1	1	0	1	0
1	1	1	1	1

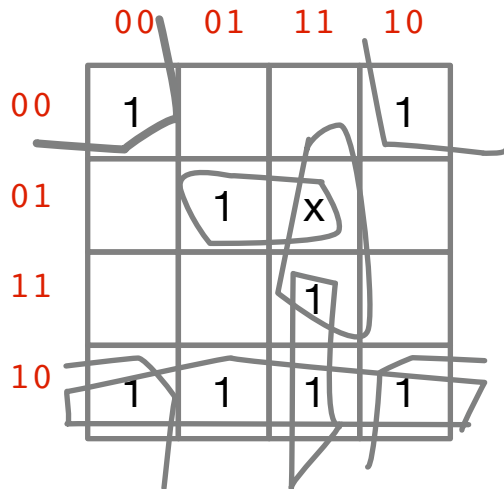
Full

19) 4 points. Suppose you have some half adders and full adders. Show how you would arrange and connect them to make a 5-bit adder. You can label your half adders with HA, and your full adders with FA. **NOTE! It's a 5-bit adder!**



20) 12 points. For the following truth table, construct a Karnaugh map and simplify the circuit. Show both the Boolean equation, and the circuit using AND and OR gates. Use the Sum-of-Products form (the way we have done most examples).

ABCD	Y
0000	1
0001	
0010	1
0011	
0100	
0101	1
0110	1
0111	
1000	1
1001	
1010	1
1011	
1100	
1101	x
1110	1
1111	1



Four corners, !B !D
Bottom row C !D
1&X horiz. B!CD

Then one of the two
ABD or
ABC

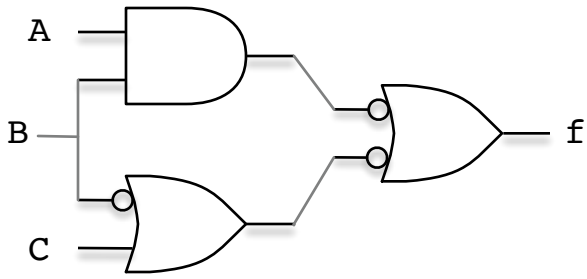
There only need to be
four terms.

6 points for Karnaugh map
2 points for correct circling of terms
2 points for naming the terms
2 points for drawing the circuit

21) 4 points. An electrical engineer specifies a logic function for a 3-input circuit as Sigma(2, 4, 5). What are the three min-terms?

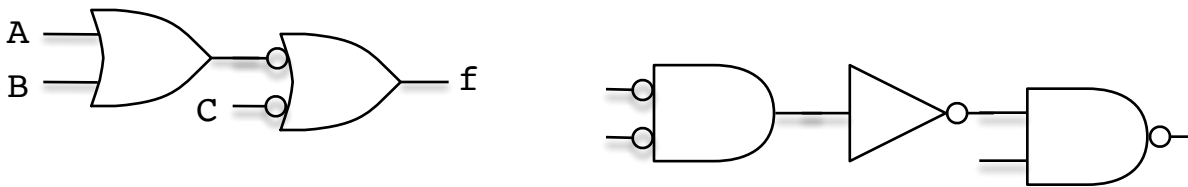
- 2 -> 010 -> !A B !C
- 4 -> 100 -> A !B !C
- 5 -> 101 -> A !B C

22) 8 points. Show the truth table for this circuit.



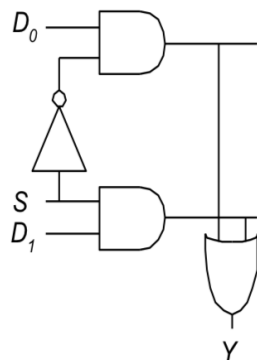
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

23) 6 points. Your spaceship has crashed on Mars, and the circuit below has shorted out. As it turns out, Mars has an abundant supply of AND and NOT gates but no OR gates. Construct a replacement circuit, so that you can get your spaceship running again. (This is a bubble-pushing question!)

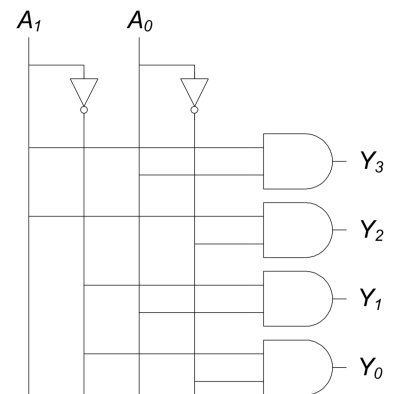


The trick is to bubble push the second gate to turn it into a NAND, and then insert two inverters on the connecting wire - one of those inverters lets you bubble push the first OR gate into an AND with two bubbles at the inputs.

24) 4 points. Draw a 2-input MUX using Boolean logic gates



25) 4 points Draw decoder using E gates



Secret Question: how many points is the secret question worth?

One extra point for any answer that is NOT a number. I'm expecting silly answers.