CODE ANSWERS
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Guided Reading in CODE

The reading in **Code** builds up to how we can use binary and transistors to build a computer. Essentially the history of representing information using alternative methods such as Morse code and Braille, were technology breakthroughs. Automating alternative information representations with electricity continued this progress.

Start reading...

Chapters 1-10 describes basic concepts and history building up to digital logic.

No questions at this point.

Chapter 11

1. Briefly describe the four gates explained in Chapter 11. Describe the behavior of each gate based on the input values to the gate.

   Gate One is the AND gate. When the two inputs on the left are True, then the output on the right is activated. If only one of the inputs values as true, the gate does not open.

   Gate Two is the OR gate. The OR gate is fundamentally similar to the AND gate except it removes the restriction that both values must be true. If either one “or” the other is True or both, the gate opens.

   Gate Three is the NOR gate. It is the exact opposite of the OR gate in that it requires both of the values to be False to pass.

   Gate Four is the NAND gate. It is the opposite of the AND gate in that any value other than Both True opens the gate.

Chapter 12

1. A half adder is built from how many "sub components" and has how many inputs and outputs?

   A half adder is built from 8 subcomponents and has 2 inputs and 2 outputs, one of which is the carry.

2. A full adder is built from how many "sub components" and has how many inputs and outputs?

   A full adder is built from 18 sub components and has 3 inputs with 2 outputs.

3. How many total inputs and outputs are there for an 8-bit adding circuit?

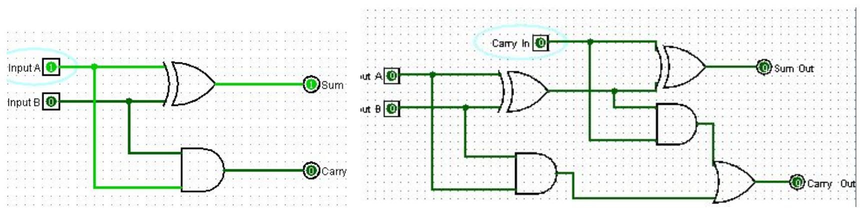
   8 Full adders mean 8*3 inputs and 8*2 outputs, for a total of 40. (24 + 16)

4. How many total transistors are needed for the ripple version of the 8-bit adder?

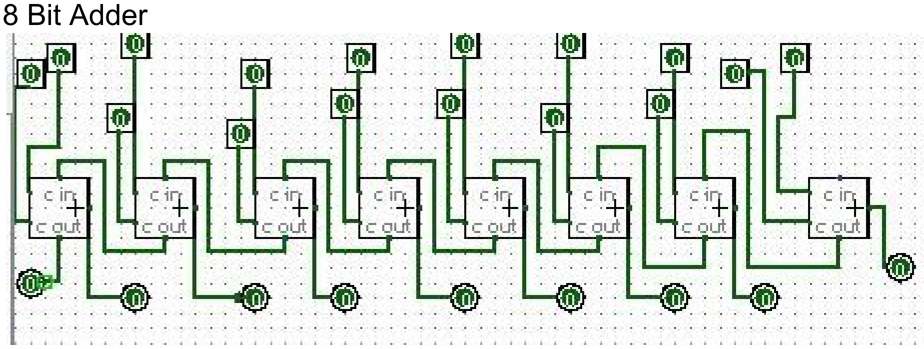
   There are a total of 144 transistors.

Chapter 13

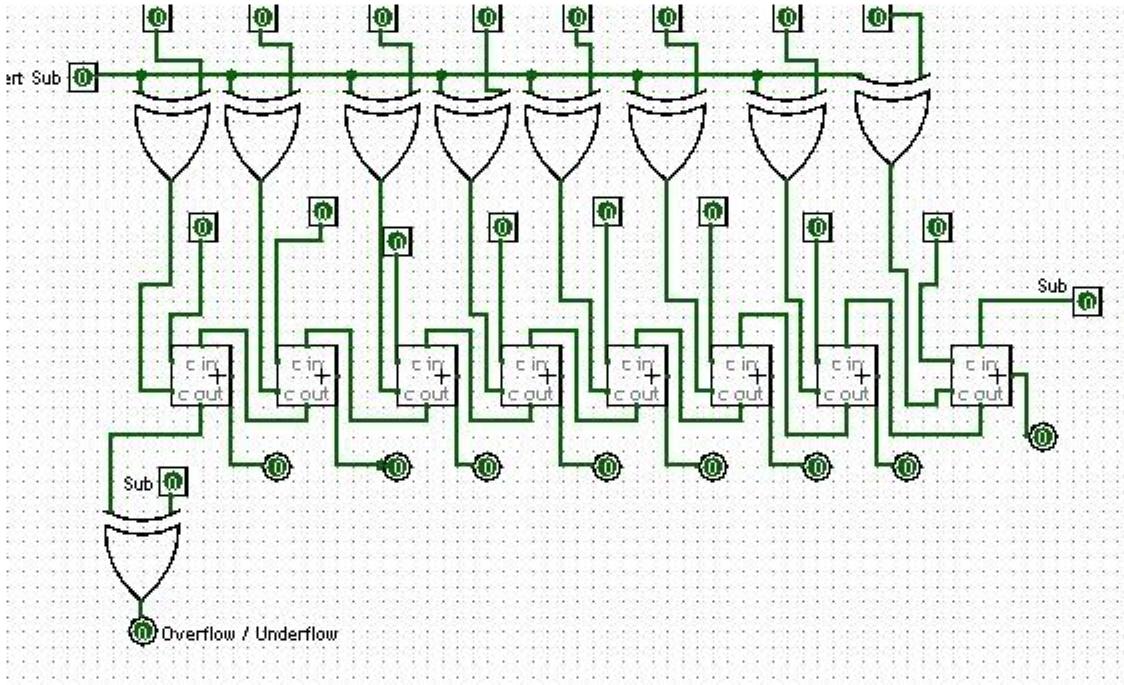
1. Design the following circuits with Logisim and post a snapshot of the circuit (a jing video of showing the circuit in action would be nice).
   a. Half Adder and Full Adder



   b. 8 Bit Adder

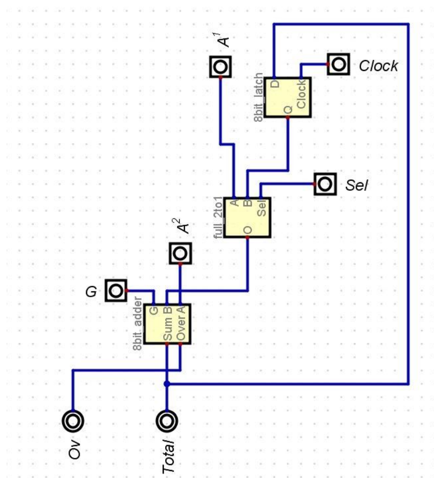


   c. 8 Bit Adder with the Ones' Complement circuit and the Sub input to the circuit for subtraction

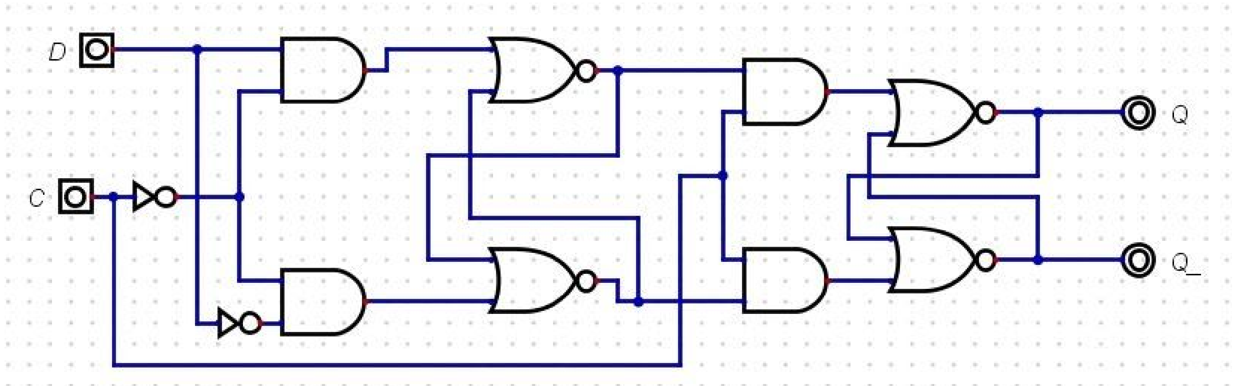


Chapter 14

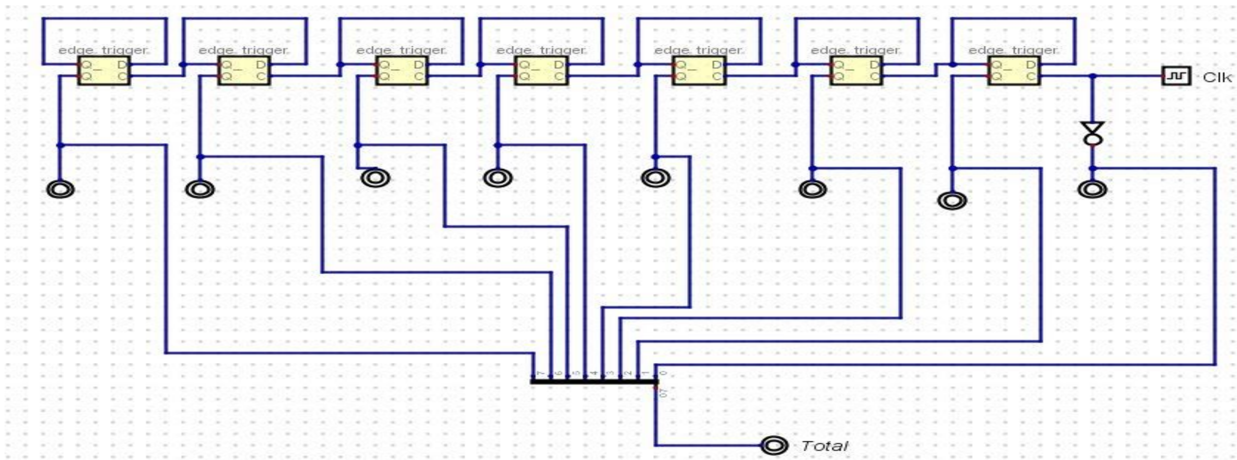
1. Design the following circuits with Logisim and post a snapshot of the circuit (a jing video of showing the circuit in action would be nice).
   a. Adding machine (page ~~159~~**168**). A bit of a challenge



   b. Edge Triggered D FlipFlop (page ~~163~~**172**)



c. 8 Bit ripple counter (use Logisim D FF, page ~~168~~**177**)



Chapter 15

1. Define byte.

   A byte is 8 bits of data. So an 8bit adder is really adding bytes.

2. What is the range of an unsigned byte? A signed two's complement byte?

   Since a byte is eight bits, it will max out at 11111111, giving it a minimum of 0 and a max of 255. That's 256 possible values or 2^8. When using a two's complement, instead of going from 0 to 255, numbers can now be negative due to subtraction. This gives a byte the ability to go as low as -128, but only as high as 127 because the difference between these 2 values is 255 which is the maximum range.

3. What does the X in the following binary number represent 1010**X**10101?

   0101

4. What is the base 16 number system called?

   The base 16 number system is called hexadecimal.

5. Why is base 16 a good choice for representing binary numbers?

   Each byte can equal 2 hex digits and they are easier to remember.

6. What base 16 number is 101011000011? What is an easy way to determine this without using a calculator?

Dividing the number into 3 4-bit sections we get 1010 1100 0011. 1010 is the cowboy hat so its 10 or A. 1100 is 12 so its the donuts or C. 0011 is 3. So the number is AC3.

7. What does the X represent in the following base 16 number D4A**X**F0?
   C
8. The book describes how to convert decimal to base 2 or base 16. Research and describe a technique that allows conversion of decimal to any base (2-36).
   Step 1 − Divide the decimal number to be converted by the value of the new base.

   Step 2 − Get the remainder from Step 1 as the rightmost digit (least significant digit) of new base number.

   Step 3 − Divide the quotient of the previous divide by the new base.

   Step 4 − Record the remainder from Step 3 as the next digit (to the left) of the new base number.

Chapter 16

1. What do the prefix names kilo, mega, giga, tera, and peta represent in bytes and what were the Greek origins of the words?
   1024 bytes = 1 kilobyte (kilo means thousand)
   1024 kilobytes = 1 megabyte (mega means great)
   1024 megabytes = 1 gigabyte (giga means giant)
   1024 gigabytes = 1 terabyte (tera means monster)
2. At the end of Chapter 16 the author reminds the reader about something that is "very important," what is this?
   When electricity stops flowing through the system the gates get set to their default state, clearing any held bits. This is why ram is known as volatile memory.