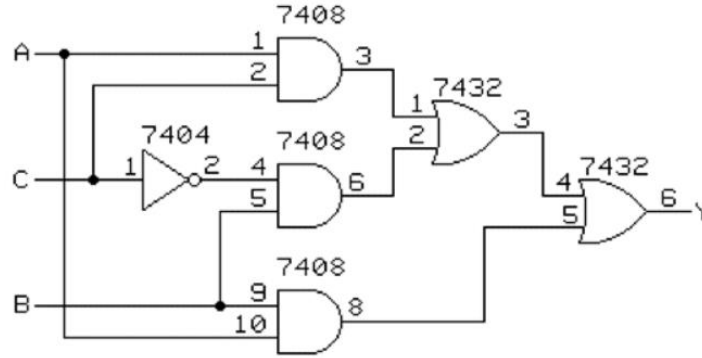
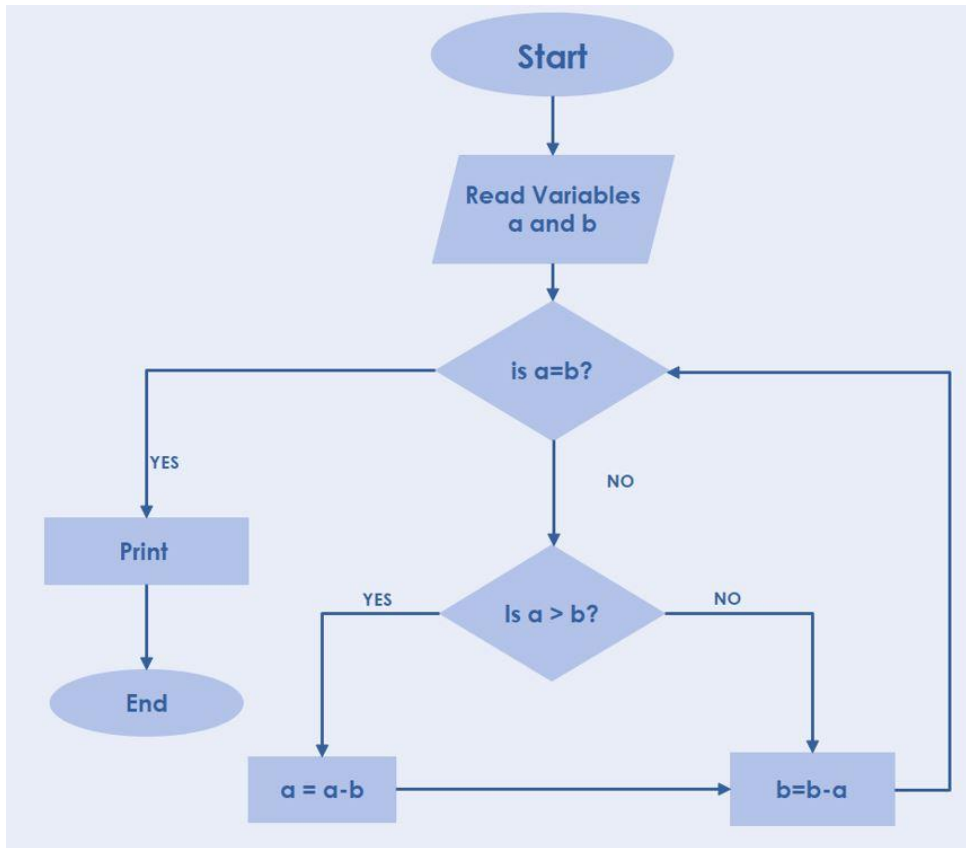


Challenge 6 is a mixture of problems that can be solved by pen and paper.

1. Find all ordered triples (A, B, C) that make the circuit TRUE. If Y is connected to an external device such as a LED, motor, etc., what control function could circuit perform?

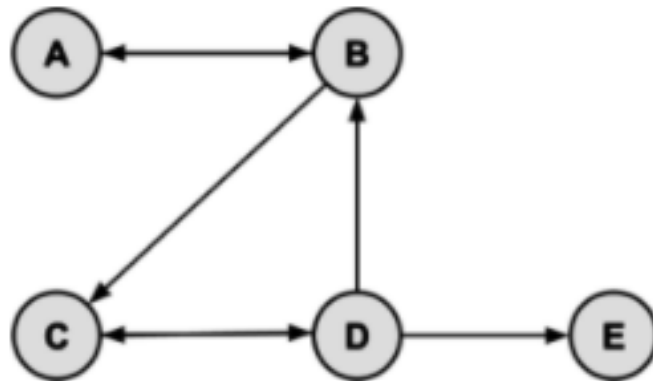


2. What does the following flowchart do?



3. The following diagram shows a directed graph with five vertices, called nodes (A, B, C, ..., E). The vertices have directed edges (lines with arrows) indicating transitions between nodes. For example, the edge BC indicates a transition from B to C. However, returning C to B is not possible, therefore BC is not a cycle of the graph.

**Problem:** List the cycles contained in the following directed graph.



4. **Problem:** Find the value of  $h(13)$  given the following definition of  $h$ :

$$h(x) = h(x-7) + 1, \text{ when } x > 5$$

$$h(x) = x, \text{ when } 0 \leq x \leq 5$$

$$h(x) = h(x+3) + 1, \text{ when } x < 0$$

-----

Example: Find finding the value of  $g(13)$ , given the recursive function:

$$g(x) = g(x-3) + 1 \text{ for } x > 0, \text{ otherwise } g(x) = 3x$$

Start with  $g(11)$

$$g(11) = g(8) + 1$$

$$g(8) = g(5) + 1$$

$$g(5) = g(2) + 1$$

$$g(-1) = -3$$

Knowing  $g(-1) = -3$  work back "up" the recursion

$$g(2) = -3 + 1 = -2$$

$$g(5) = -2 + 1 = -1$$

$$g(8) = -1 + 1 = 0$$

$$g(11) = 0 + 1 = 1$$

5 What is printed by the following java script?

```
1  int Q = 3; //not writing Scanner for this lol
2  int W = 2;
3
4  while (true) {
5      Q--;
6      if (Q == 0) {
7          break;
8      }
9      W *= 2;
10 }
11
12 System.out.println(Q);
```