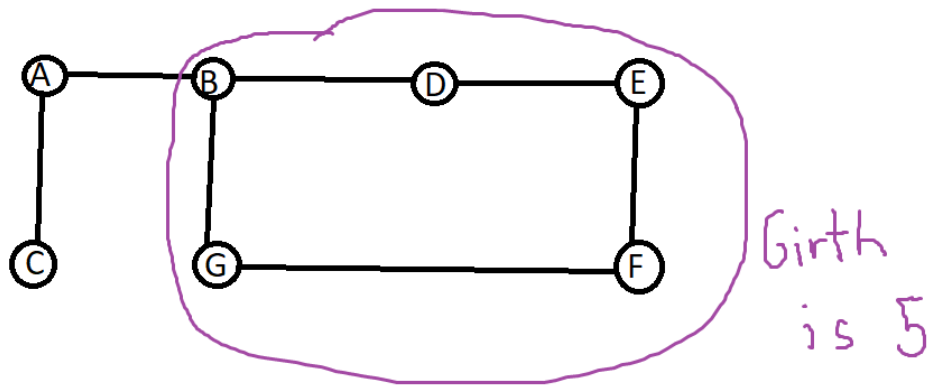


**Exercise 4.1.18::** The girth of a graph is the length of its shortest cycle. If a graph is acyclic, then its girth is infinite. Add a method `girth()` to `GraphProperties` that returns the girth of the graph. Hint : Run BFS from each vertex. The shortest cycle containing  $s$  is a shortest path from  $s$  to some vertex  $v$ , plus the edge from  $v$  back to  $s$ .

**Solution:**



BFS can find/detect a cycle as it goes down a layer. It see/checks if something previously has been marked. If so, then cycle is formed.

BFS\_cycle: Detect and calculate length of cycle.

OUT: A

Queue:  $A_\phi, B_A, C_A, D_B, G_B, E_D, F_G$

Dequeuing E, we find already marked but not yet Dequeued. So we know  $E - F$  is part of the cycle