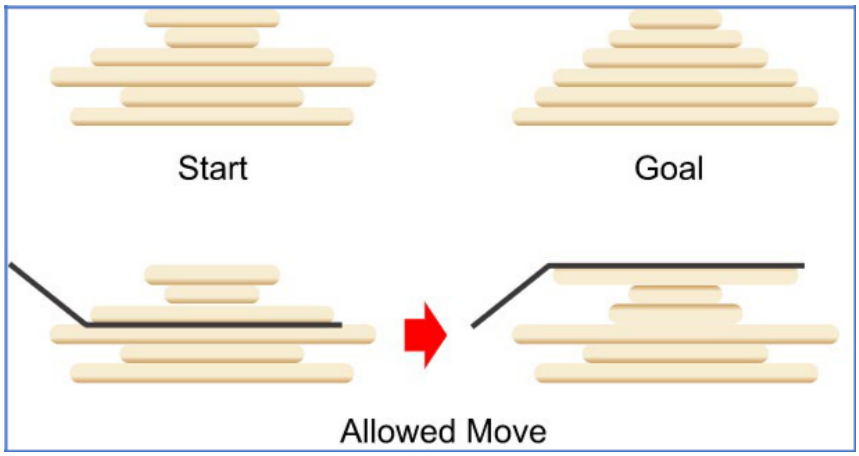
Pancake Sorting

Pancake sorting is a common computer science problem, where given a stack of pancakes of varying diameter, an algorithm must sort the pancakes in ascending order (determined by size) from the bottom of the stack to the top. The idea is a spatula can be inserted into the stack at any position and used to "flip" the elements on top of it (reversing the order of how they appear in the stack).



Create a class called *Pancake* which implements the *Comparable* interface to represent a single pancake.

Pancake
- colour : Colour - size : int - selected : int
+ Pancake(size:int, colour:Colour) + compareTo(other : Pancake) : int + getSize() : int + highlight(selected : boolean) : void + draw(g : Graphics) : void

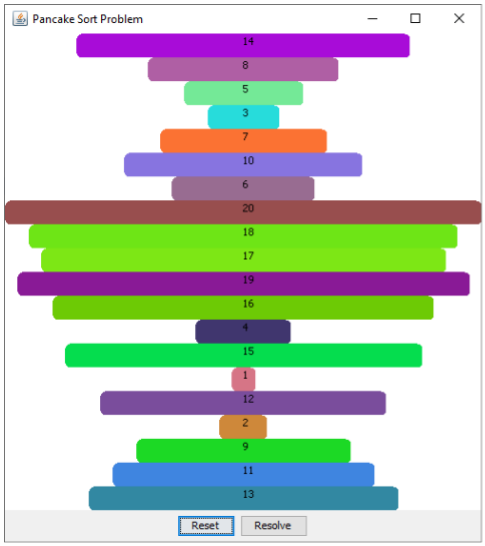
Sometimes a single data structure cannot be used on its own to solve a problem and what is needed is a blend of **two** data structures. Create a class called *PancakeStack* which extends *ArrayList* and designed specifically to hold a collection of *Pancake* objects. Create suitable methods as follows:

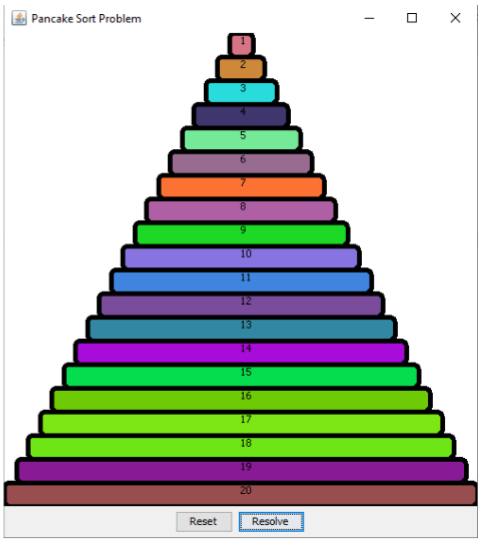
- Stack methods *push*, *pop*, *peek* which wrap over existing *ArrayList* operations to perform O(1) stack operations. *+push(p : Pancake):void, + pop(): Pancake, +peek():Pancake*
- A *findMax* method which finds the Index of the maximum pancake from an "offset" using the Pancake as a Comparable- searching from the offset index towards the top of the stack, it returns the index of where the largest pancake is. *+findMax(offset : int) : int*
- A *flip* method, which is used to reverse the order of elements from an offset parameter index to the top of the stack. *+ flip(offset : int) : void*

Create a GUI which can be used to visualize the *PancakeStack*. The GUI should have the following features:

- It should visually display each pancake in the pancake stack using at least 12 pancakes.

- Mouse input to allow a user to click a pancake to flip it to the top of the stack (reversing the order in which pancakes appear above the clicked pancake).
- A button to reset the pancake stack – populating it with pancakes of different sizes in a "shuffled" order.
- A button which uses a separate thread to run a "pancake sort" routine – which sorts the pancakes in ascending order, with a careful combination of flips, where the biggest pancake ends up at the bottom of the stack. Use highlighting and thread sleeps to animate the steps in the pancake sort algorithm.





The pancake sort algorithm works by starting at the bottom of the stack (level 0) and finding the position of the largest element working towards the top of the stack. It then flips the stack from the position of the largest element – now the largest element is on top. It then flips again from the starting position (level 0) so now the largest pancake is at the bottom of the stack. The algorithm repeats now from level 1 finding the second largest pancake using the same combination of two flips. This algorithm completes once all pancakes are in ascending order.