

Step 1: Start Execution - main Method

1. Stack Memory

- A stack frame is created for main.
- Local variables:
 - name: "Kevin" (stored in stack as a reference to a String in the heap)
 - list: reference to a new ArrayList object in the heap
 - times: 10 (primitive int stored directly in the stack)

2. Heap Memory

- A new String object "Kevin" is created if not already in the string pool.
- An ArrayList object is created for list.

Step 2: fill Method Call

1. The fill method is called with arguments:

- collection: list (reference to the ArrayList in the heap)
- str: "KevinKevin" (a new String created by concatenation)
- times: 10

2. Stack Memory (New Stack Frame for fill)

- Local variables:
 - collection: reference to the ArrayList from main
 - str: reference to the String "KevinKevin" in the heap
 - times: 10

3. Heap Memory

- A new String "KevinKevin" is created for str.

Step 3: shrink Method Call

1. The shrink method is called with the argument:

- str: "KevinKevin"

2. Stack Memory (New Stack Frame for shrink)

- Local variables:
 - str: reference to "KevinKevin"

3. Heap Memory

- shrink creates a new String object "KvnKv" by keeping every other character from str:
 - newLength is calculated as 5 (half of 10, rounded up).
 - A char[] array of length 5 is created, and characters are assigned: K, v, n, K, v.

4. The shrink method returns "KvnKv".

Step 4: Back to fill Method

1. Stack Memory

- Back in fill, shrunk is assigned "KvnKv" (reference in heap).

2. Update to times Calculation

- times is updated to $(10 + 5) / 2$, resulting in 7.

3. Loop Execution

- The for loop iterates $7 / 2 = 3$ times:
 - "KvnKv" is added to the collection (ArrayList) three times.

4. fill returns 7.

Step 5: Back to main Method

1. Stack Memory

- The result from fill (7) is used in the println statement: `System.out.println(times + 7)`.
- This outputs $10 + 7 = 17$.

Final Stack-Heap Summary

Stack Memory:

- Each method's stack frame (with local variables) is pushed and popped in the LIFO (Last-In-First-Out) order.

Heap Memory:

- Objects created in the heap include:
 - String objects: "Kevin", "KevinKevin", "KvnKv"
 - ArrayList referenced by list, containing three references to "KvnKv"