# Optimal Page Replacement Algorithm

```
import java.util.ArrayList;
import java.util.Scanner;

public class OptimalPageReplacement {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        System.out.print("Enter the number of frames: ");
        int numFrames = scanner.nextInt();

        System.out.print("Enter the number of page references: ");
        int numReferences = scanner.nextInt();

        System.out.print("Enter the page reference string, e.g., 1 2 3 4: ");
        scanner.nextLine(); // Consume the newline
        String input = scanner.nextLine();
        String[] referenceString = input.split(" ");
        if (referenceString.length != numReferences) {
            System.out.println("Number of references does not match the input string length.");
            return;
        }

        ArrayList<Integer> frames = new ArrayList<>();
        int pageFaults = 0;

        for (int i = 0; i < numReferences; i++) {
            int page = Integer.parseInt(referenceString[i]);
            if (!frames.contains(page)) {
```

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            pageFaults++;
            if (frames.size() < numFrames) {
                frames.add(page);
            } else {
                int index = predictOptimal(frames, referenceString, i);
                frames.set(index, page);
            }
        }
    }

    System.out.println("Number of page faults: " + pageFaults);

    scanner.close();
  }

  private static int predictOptimal(ArrayList<Integer> frames, String[] referenceString, int currentIndex) {
    int farthest = -1;
    int index = -1;
    for (int i = 0; i < frames.size(); i++) {
        int frame = frames.get(i);
        int j;
        for (j = currentIndex + 1; j < referenceString.length; j++) {
            if (frame == Integer.parseInt(referenceString[j])) {
                if (j > farthest) {
                    farthest = j;
                    index = i;
                }
                break;
            }
        }
```

```
            if (j == referenceString.length) {
                return i;
            }
        }
        return (index == -1) ? 0 : index;
    }
}
```

# Output:

Enter the number of frames: 4

Enter the number of page references: 14

Enter the page reference string, e.g., 1 2 3 4: 7 0 1 2 0 3 0 4 2 3 0 3 2 3

Number of page faults: 6