PRINCETON UNIVERSITY

COS 226–Algorithms and Data Structures

Week 10: *Radix Sorts, Compression*
(Algs. §5.1 & §5.5)

Version: April 25, 2018

Exercise 1 – Radix sorting

Put an X in each box if the string sorting algorithm (the standard version considered in class) has the corresponding property. When considering sublinear runtime, we are defining linear runtime as $n * w$ where n is the total number of strings and w is the number of characters in the longest string.

	mergesort	LSD radix sort	MSD radix sort	3-way radix quicksort
stable				
in-place				
fixed-length strings only				
sublinear time (in best case)				

Exercise 2 – Compression

A. What is the compression ratio achieved by the run-length coding algorithm and inputs?Calculate and circle the final ratios. Recall, the compression ratio is the number of bits in the compressed message divided by the number of bits in the original message.

    1. Run-length coding with 8-bit counts for best-case inputs of N bits.

    2. Run-length coding with 8-bit counts for worst-case inputs of N bits.

B.   1. Give the LZW encoding for the following string using the `compress()` method of Algorithm 5.11.

```
B A N D A N A B A N A N A

input        encoding        Trie ST
---          -----           ---
 B              42           BA, 81

 A              41

 N              4e

 D              44
```

    2. What is the compression ratio achieved by the above 13 byte string?

    3. What is the compression ratio in the best case of an 8 byte string?