## Lecture 14-radix sort

1. What is the definition of radix according to Webster's dictionary?

a) The base of a number system

b) A sorting algorithm

c) A data structure

d) A type of computer memory

Answer: a) The base of a number system

2. What is the radix of binary numbers?

a) 10

b) 16

c) 2

d) 26

Answer: c) 2

3. When considering only capital letters, what is the radix of texts?

a) 26

b) 36

c) 62

d) 52

Answer: a) 26

4. Who first used radix sort in 1890?

a) Charles Babbage

b) Ada Lovelace

c) Hollerith

d) Alan Turing

Answer: c) Hollerith

5. What is the time complexity of radix sort?

a) O(N log N)

b) O(N^2)

c) O(M \* N)

d) O(N)

Answer: c) O(M \* N)

6. What is the basic idea behind radix sort?

a) Divide and conquer

b) Bucket sort on each digit, from least significant to most significant

c) Comparing adjacent elements

d) Partitioning around a pivot

Answer: b) Bucket sort on each digit, from least significant to most significant

7. In radix sort, how many buckets are used for a radix of R?

a) R-1

b) R

c) R+1

d) 2R

Answer: b) R

8. What is a potential problem when sorting elements with a large range?

a) The algorithm becomes unstable

b) The range (L, H) may be too large

c) It requires more comparisons

d) It cannot handle negative numbers

Answer: b) The range (L, H) may be too large

9. What is the range for sorting 4-byte unsigned integers?

a) [0, 2^16-1]

b) [0, 2^32-1]

c) [-2^31, 2^31-1]

d) [0, 2^64-1]

Answer: b) [0, 2^32-1]

10. When sorting strings using radix sort, what needs to be known?

a) The alphabetical order of characters

b) The length of the biggest string

c) The total number of strings

d) The ASCII values of characters

Answer: b) The length of the biggest string

11. What is the bias added to the exponent in IEEE single-precision floats?

a) 64

b) 127

c) 255

d) 1023

Answer: b) 127

12. How many bits are used for the exponent field in double precision floating-point numbers?

a) 8

b) 11

c) 16

d) 23

Answer: b) 11

13. What does flipping the sign bit do in floating-point representation?

a) Changes the exponent

b) Flips the sign of the number

c) Inverts the significand

d) Has no effect

Answer: b) Flips the sign of the number

14. In IEEE 754 floating point numbers, why is the exponent biased?

a) To save memory

b) To allow for faster calculations

c) To make comparison easier

d) To represent more numbers

Answer: c) To make comparison easier

15. For a single-precision float, what range of exponents can be represented after biasing?

a) -126 to +127

b) 0 to 255

c) 1 to 254

d) -127 to +128

Answer: c) 1 to 254

16. How many bits are used for the significand (fraction) in single-precision floats?

a) 8

b) 16

c) 23

d) 32

Answer: c) 23

17. When sorting non-negative floating-point numbers, how should buckets be joined?

a) Larger bits/digits first

b) Smaller bits/digits first

c) Random order

d) Alternating large and small

Answer: b) Smaller bits/digits first

18. When sorting negative floating-point numbers, how should buckets be joined?

a) Larger bits/digits first

b) Smaller bits/digits first

c) Random order

d) Alternating large and small

Answer: a) Larger bits/digits first

19. What happens if you sort both positive and negative floating-point numbers together as if they were unsigned integers?

a) The result is completely random

b) Negative numbers come before positive numbers in ascending order

c) Positive numbers are in ascending order, negative numbers are in descending order

d) The algorithm fails

Answer: c) Positive numbers are in ascending order, negative numbers are in descending order

20. To fix the order after sorting both positive and negative floating-point numbers together, what should be done?

a) Reverse the entire list

b) Flip the order of negative numbers and move them before positive numbers

c) Sort the list again using a different algorithm

d) No fix is needed

Answer: b) Flip the order of negative numbers and move them before positive numbers