Lecture 7-hash table

1. What is the primary advantage of using a hash table over brute-force linear search?
A) Guaranteed O(1) time complexity
B) Direct index calculation using key data
C) Built-in sorting capability
D) Automatic memory management
Answer: B

2. Which property is NOT required for an ideal hash function?
A) Uniform key distribution
B) Efficient computability
C) Fixed output size regardless of input
D) Avoidance of prime numbers
Answer: D

3. According to Java's contract, which statement is always true?
A) Objects with different hash codes must be unequal
B) Equal objects must have equal hash codes
C) Unequal objects must have different hash codes
D) Hash codes are unique for all objects
Answer: B

4. Which collision resolution method uses linked lists?
A) Linear probing
B) Quadratic probing
C) Separate chaining
D) Double hashing
Answer: C

5. Primary clustering in linear probing occurs because:
A) Hash functions produce sequential indices
B) Collisions form long contiguous blocks
C) Table size is a prime number
D) Keys are not uniformly distributed
Answer: B

6. Which of the following is NOT a method for handling collisions in a hash table?
A) Linear probing
B) Separate chaining
C) Quadratic probing
D) Binary search
Answer: D)

7. Why is Math.abs() insufficient for modular hashing?
A) It reduces hash code entropy
B) Integer.MIN_VALUE can't be made positive

C) It causes primary clustering
Answer: B

8. Which of the following is NOT a method to mitigate primary clustering?
A) Better-designed hash function
B) Alternative probing methods
C) Resizing the hash table
D) Using a binary search tree
Answer: D

9. A load factor of 0.75 with open addressing indicates:
A) 75% of slots are occupied
B) Collision probability is 75%
Answer: A (Note that this is not true for Separate Chaining (Closed Addressing), since each slot may contain multiple keys)

10. Which method is one of the approaches to open addressing?
A) Separate chaining
B) Double hashing
C) Linked list buckets
D) Recursive hashing
Answer: B

11. Secondary clustering occurs with:
A) Linear probing
B) Quadratic probing
C) Separate chaining
D) Perfect hashing
Answer: B

12. For user-defined types, the standard hashCode() recipe uses:
A) Multiplication by 31 and addition
B) XOR of all field values
C) Sum of primitive fields
D) Memory address bitshift
Answer: A

13. Quadratic probing uses which probe sequence?
A) h+1, h+2, h+3,...
B) $h+1^2$, $h+2^2$, $h+3^2$,...
C) h+hash2(key), 2*hash2(key),...
D) Random permutation
Answer: B

13. Linear probing's main advantage over separate chaining is:
A) Easier implementation
B) Better cache performance
C) Less sensitive to poorly-designed hash functions
D) Faster deletion operations

Answer: B)

14. Separate chaining's main advantage over open addressing is:
A) Better cache performance
B) Simpler deletion handling
C) Smaller memory footprint
Answer: B

15. In Java's Double.hashCode(), XOR is used to:
A) Combine exponent and mantissa
B) Convert to IEEE 754 format
C) Prevent sign-bit collisions
D) Mix high/low 32-bit portions
Answer: D