## 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 [Motivation section]

**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 [Hash Function section]

**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 [Java's Hash Code Conventions]

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

**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 [Primary Clustering section]

**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) Binary search

**7. Why is Math.abs() insufficient for modular hashing?**  
A) It produces negative numbers  
B) Integer.MIN\_VALUE can't be made positive  
C) It causes primary clustering  
D) It reduces hash code entropy  
**Answer:** B [1-in-a-billion bug section]

**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) Using a binary search tree

**9. A load factor of 0.75 indicates:**  
A) 25% of slots are empty  
B) The table should be resized  
C) Collision probability is 75%  
D) 75% of slots are occupied  
**Answer:** D [Collision and Resolution section]

**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 [Collision Resolution Methods]

**11. Secondary clustering occurs with:**  
A) Linear probing  
B) Quadratic probing  
C) Separate chaining  
D) Perfect hashing  
**Answer:** B [Primary vs Secondary Clustering]

**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 [User-defined Types section]

**13. Quadratic probing uses which probe sequence?**  
A) h+1, h+2, h+3,...  
B) h+1², h+2², h+3²,...  
C) h+hash2(key), 2\*hash2(key),...  
D) Random permutation  
**Answer:** B [Linear Probing: Primary Clustering]

**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) [Separate Chaining vs Linear Probing]

**14. Separate chaining's main advantage over open addressing is:**  
A) Better cache performance  
B) Simpler deletion handling  
C) No primary clustering  
D) Smaller memory footprint  
**Answer:** B [Separate Chaining vs Linear Probing]

**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 [Implementing Hash Code: Doubles]