mozakraa lec 9 Maps & Hash tables MCQ

Subjects Data structure

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Questions 1–40:

1. Which Python class represents a map?

   A. list

   B. set

   [✓ C. dict]

   D. tuple

   Answer: C

2. Which operation retrieves a value using a key in a map?

   A. `M.get(k)`

   [✓ B. `M[k]`]

   C. `M.find(k)`

   D. `M.value(k)`

   Answer: B

3. What does `__getitem__` in Python implement?

   A. Setting a value

   [✓ B. Retrieving a value]

   C. Deleting a key

   D. Checking length

   Answer: B

4. Which special method implements `del M[k]` ?

   A. `__removeitem__`

   B. `__delete__`

   [✓ C.] `__delitem__`

   D. `__erase__`

   Answer: C

5. Which method provides default-safe access to a map value?

   A. `M.lookup(k)`

   [✓ B.] `M.get(k, default)`

   C. `M.find(k)`

   D. `M.default(k)`

   Answer: B

6. Which map operation removes all items?

   A. `M.delete()`

   B. `M.pop()`

   [✓ C.] `M.clear()`

   D. `M.flush()`

   Answer: C

7. Which operation returns only the keys of a map?

   [✓ A.] `M.keys()`

   B. `M.items()`

   C. `M.values()`

   D. `M.iter()`

   Answer: A

8. Which of the following is a hashable type in Python?

   A. list

   [✓ B. tuple]

   C. dict

   D. set

   Answer: B

9. **Which method tests if a key exists in a map?**

   A. `M.has(k)`

   [✓ B.] `k in M`

   C. `M.exists(k)`

   D. `M.test(k)`

   Answer: B

10. **What does `M.popitem()` do?**

    A. Returns all key-value pairs

    [✓ B.] Removes and returns a key-value pair

    C. Removes all items

    D. Clears memory

    Answer: B

11. **Which Python module provides Mapping classes?**

    [✓ A.] `collections`

    B. `hashmap`

    C. `mappings`

    D. `dictlib`

    Answer: A

12. **What is the base class for user-defined maps?**

    A. `CustomMap`

    B. `AbstractMap`

    [✓ C.] `MutableMapping`

    D. `UserMap`

    Answer: C

13. **Which of the following map types uses a list of (key, value) pairs?**

    [✓ A.] `UnsortedTableMap`

    B. `HashMap`

    C. `TreeMap`

    D. `SortedMap`

    Answer: A

14. Which operator allows for loop iteration over map keys?

    A. `for key in M.items()`

    B. `for key in M.get()`

    [✓ C.] `for key in M:`

    D. `for key of M:`

    Answer: C

15. Which method checks the number of items in a map?

    [✓ A.] `len(M)`

    B. `M.count()`

    C. `M.size()`

    D. `M.length()`

    Answer: A

16. What is the time complexity of `__getitem__` in an `UnsortedTableMap`?

    A. O(1)

    B. O(log n)

    [✓ C.] O(n)

    D. O(n log n)

    Answer: C

17. Which of these is NOT a valid map behavior?

    A. `M.setdefault(k, v)`

    B. `M[k] = v`

    [✓ C.] `M.add(k, v)`

    D. `del M[k]`

    Answer: C

18. Which hash function is used by default in Python?

    A. `md5()`

    B. `sha256()`

    [✓ C.] `hash()`

    D. `hashlib()`

    Answer: C

19. **What is the purpose of the `__hash__` method in a class?**

    A. Override equality

    [✓ B. Provide hashability]

    C. Make class immutable

    D. Link with dictionaries

    Answer: B

20. **Why must hashable objects be immutable in Python?**

    A. To optimize performance

    [✓ B. To maintain consistent hash values]

    C. To reduce memory

    D. For security reasons

    Answer: B

21. **Which method uses both multiplication and division for hashing?**

    A. Division method

    [✓ B. MAD method]

    C. Polynomial hashing

    D. Bit rotation

    Answer: B

22. **What is the primary purpose of a compression function?**

    A. To speed up hashing

    [✓ B. To map hash codes into valid indices]

    C. To avoid type errors

    D. To reduce memory usage

    Answer: B

23. **In separate chaining, each bucket typically stores:**

    A. A set

    [✓ B. A list-based map]

    C. A binary tree

    D. A tuple

    Answer: B

24. **Which metric defines average items per bucket in a hash table?**

    A. Table factor

    [✓ B. Load factor]

    C. Hash rate

    D. Fill ratio

    Answer: B

25. **Which hash code method is best for character strings?**

    A. Bit-based hash

    [✓ B. Polynomial hash]

    C. Random hash

    D. Cyclic XOR

    Answer: B

26. **What does linear probing use to handle collisions?**

    A. Secondary hash

    [✓ B. Incremental search of buckets]

    C. Linked list

    D. BST

    Answer: B

27. **What happens if a hash table's load factor exceeds 0.5 in `HashMapBase`?**

    A. It clears the table

    [✓ B. It resizes and rehashes]

    C. It throws an error

    D. It stops accepting new keys

    Answer: B

28. **What object marks a deleted entry in linear probing?**

    A. `None`

    B. `0`

    [✓ C. `AVAIL` sentinel]

    D. `False`

    Answer: C

29. Which map class uses a binary search for fast access?

A. `UnsortedTableMap`

[✓ B. `SortedTableMap`]

C. `ChainHashMap`

D. `ProbeHashMap`

Answer: B

30. Which method finds the smallest key-value pair in a sorted map?

[✓ A. `M.get_min()`]

B. `M.find_min()`

C. `M.least()`

D. `M.start()`

Answer: B

31. What does the `MAD` method help avoid in hash tables?

A. Deletion markers

[✓ B. Repeated patterns in hash codes]

C. Key collisions

D. Large memory usage

Answer: B

32. What behavior must be overridden when subclassing `HashMapBase`?

A. `__iter__`

[✓ B. `_bucket_getitem`, `_bucket_setitem`, `_bucket_delitem`]

C. `__len__`

D. `__repr__`

Answer: B

33. What is the expected time complexity of map operations with good separate chaining?

A. O(log n)

[✓ B. O(n/N)]

C. O(N)

D. O(n^2)

Answer: B

34. **Why is a prime number used in the division method of compression?**

[✓ A. It spreads hashed values more uniformly]

B. It's a requirement of Python

C. To match table size

D. To reduce time complexity

Answer: A

35. **What problem occurs when removing items directly in linear probing?**

[✓ A. Search termination breaks]

B. KeyError is raised

C. Hash function fails

D. Duplicate keys form

Answer: A

36. **In a polynomial hash code, what is the role of the constant `a`?**

A. Represents the maximum hash value

[✓ B. Acts as the polynomial base]

C. Multiplies all keys

D. Prevents floating-point error

Answer: B

37. **Which map implementation uses both chaining and inheritance from `MapBase`?**

[✓ A. `ChainHashMap`]

B. `SortedTableMap`

C. `ProbeHashMap`

D. `TableMap`

Answer: A

38. **What does `_find_index()` do in `SortedTableMap`?**

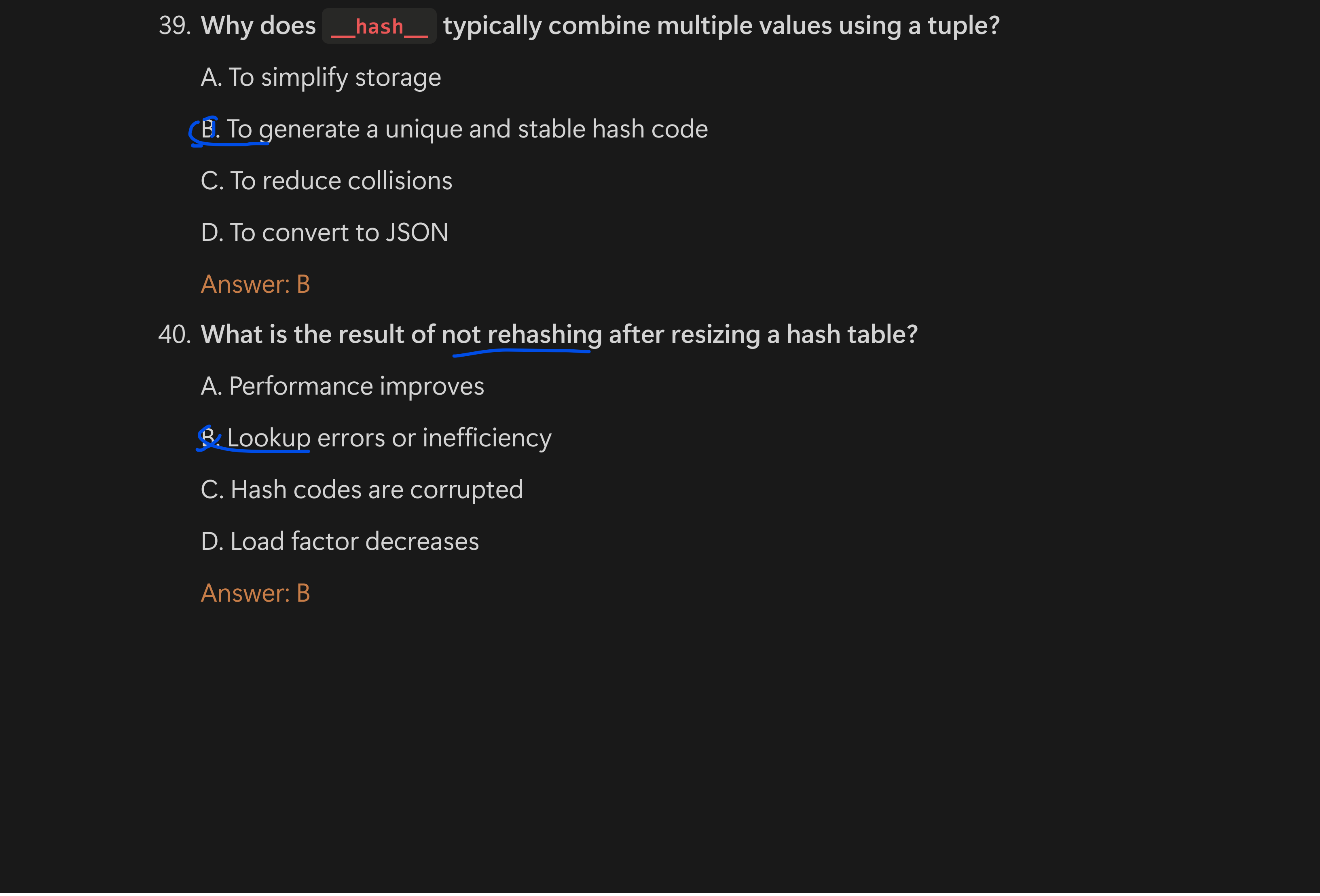
A. Returns exact match or None

[✓ B. Finds insertion index for binary search]

C. Finds max key

D. Locates last element

Answer: B



39. **Why does `__hash__` typically combine multiple values using a tuple?**

    A. To simplify storage

    [✓ B. To generate a unique and stable hash code]

    C. To reduce collisions

    D. To convert to JSON

    Answer: B

40. **What is the result of not rehashing after resizing a hash table?**

    A. Performance improves

    [✓ B. Lookup errors or inefficiency]

    C. Hash codes are corrupted

    D. Load factor decreases

    Answer: B