1. The class of 3n^2 + 5n + 7 is –

   ☐ $\Theta(n^2)$

   ☐ $O(n^3)$ only

   ☐ $\Theta(n)$

   ☐ $\Theta(n \log n)$

2. Index number i in a contiguous array costs –

   ☐ one computed address, O(1)

   ☐ a hash lookup

   ☐ a walk from the head, O(n)

   ☐ a sort

3. Under h(k) = k mod 13, the keys 4, 17, 30, 43 all land –

   ☐ no bucket

   ☐ bucket 4

   ☐ bucket 13

   ☐ distinct buckets

4. In a heap stored as an array, the children of index i sit at –

   ☐ i+1 and i+2

   ☐ 2i and 2i+1

   ☐ 2i+1 and 2i+2

   ☐ i-1 and i//2

5. Ten undirected edges need – adjacency-list entries

   ☐ 64

   ☐ 100

   ☐ 20

   ☐ 10

6. What is the minimum worst-case number of comparisons to sort 5 items?

   _____

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_____

8. With $T(n) = 2T(n/2) + n$ and $T(1) = 0$, what is $T(16)$?

   _____

9. Capacity starts at 1 and doubles when full. How many element copies do 32 appends cause?

   _____

10. Using the linear-probing estimate for a miss, how many probes at load factor 0.8?

    _____

1. $\Theta(n^2)$

   Drop constants and lower-order terms; the n squared term grows fastest.

2. **one computed address, O(1)**

   The cells sit side by side: the address is computed, not searched for.

3. **bucket 4**

   Each key leaves remainder 4 on division by 13 – one crowded bucket.

4. **2i+1 and 2i+2**

   The complete shape fixes the mapping: left child 2i+1, right child 2i+2.

5. **20**

   Each undirected edge is stored twice, once per endpoint.

6. **7**

   5! = 120 and log2 120 is about 6.9, so at least 7 comparisons.

7. **1**

   The first index where 4 could be inserted, keeping order, is 1.

8. **64**

   T(2) = 2, T(4) = 8, T(8) = 24, T(16) = 2(24) + 16 = 64 = 16 log2 16.

9. **31**

   Regrows copy 1 + 2 + 4 + 8 + 16 = 31 elements, still under n.

10. **13**

    One half of (1 + 1/0.2^2) = one half of (1 + 25) = 13 probes.

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