# Linear probing

(a) We start with an empty array of size $10$.

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|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

The hash function to use is $h(k, N) = k \mod N$, as for this example becomes the same as $h(k, 10) = k \mod 10$. Thus, a number hashes to its last digit.

Use *linear probing* to insert these numbers into the array in the given order:

$$21, 54, 82, 10, 20, 44$$

Fill in the table as it looks after all the numbers have been entered with linear probing. Write the answer as a comma-separated list, where _ can be used to indicate an empty space.

(b) Explain briefly how the algorithm for insertion by linear probing works, and sketch out the algorithm with pseudocode. You can assume that the input array is not full, and that you have a hash function $h$ such that $h(k, N)$ gives a number between $0$ and $N - 1$ for an arbitrary key $k$. Free space in the array is indicated by **`null`**.

**Input:** An array A of size $N$, a key $k$ and value $v$
**Output:** An array containing $(k, v)$

```
1 Procedure LinearProbingInsert(A, k, v)
  |   // ...
```