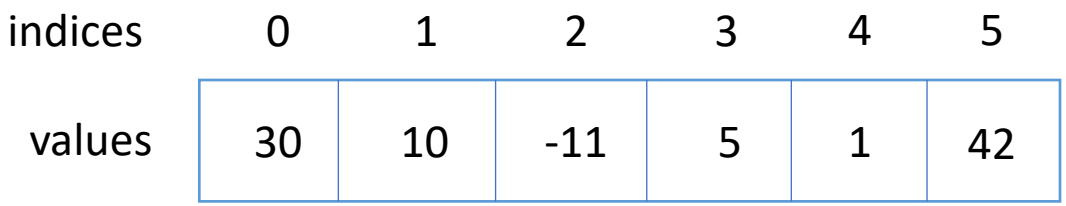
Array Bounds

Indexing into Collections

- Arrays (C/C++) or lists (Python) can give us direct access to data stored at a given index (position)



- The first index is 0
- The size of the array above is 6, but the last index is 5
- The largest possible index is always size - 1

An Example in C

- Declaring and initializing an array in C:

```
int array[4] = { 3, -10, 14, 4};
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- What is the index of value 3?

An Example in C

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int array[4] = { 3, -10, 14, 4};
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- What is the index of value 3? 0
- What is the index of value 14?

An Example in C

- Declaring and initializing an array in C:

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int array[4] = { 3, -10, 14, 4};
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- What is the index of value 3? 0
- What is the index of value 14? 2
- What value is at index 4?

An Example in C

- Declaring and initializing an array in C:

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int array[4] = { 3, -10, 14, 4};
```

- What is the index of value 3? 0
- What is the index of value 14? 2
- What value is at index 4? ???

How Arrays are Stored

- Arrays are stored in **contiguous** block of memory
  - Values in the same array are always right next to each other
- The index is calculated based on where the first element is stored
  - The first is 0 away from the first, 1 away from the second, etc.

```
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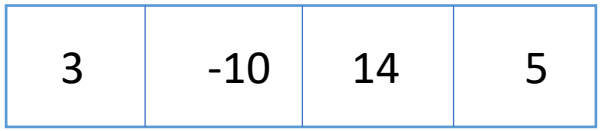

- What happens if we ask for a position not in the array?

An Array in Memory

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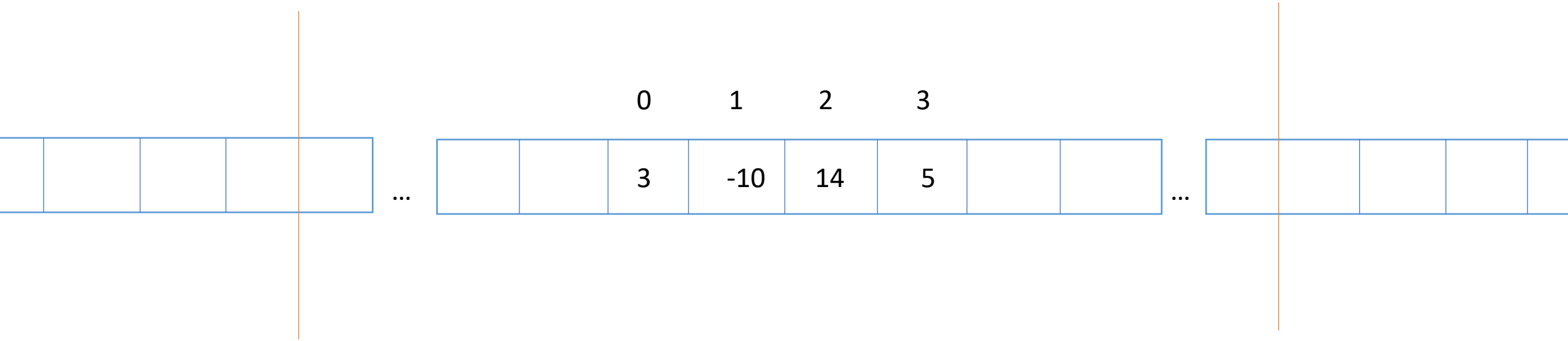

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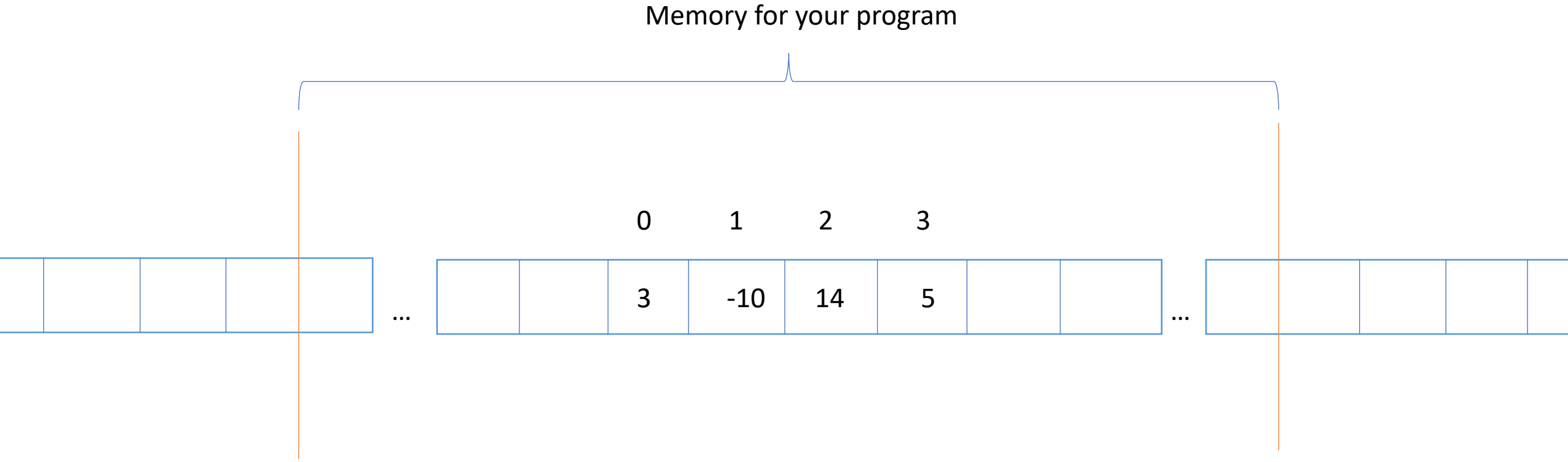

Out of Bounds

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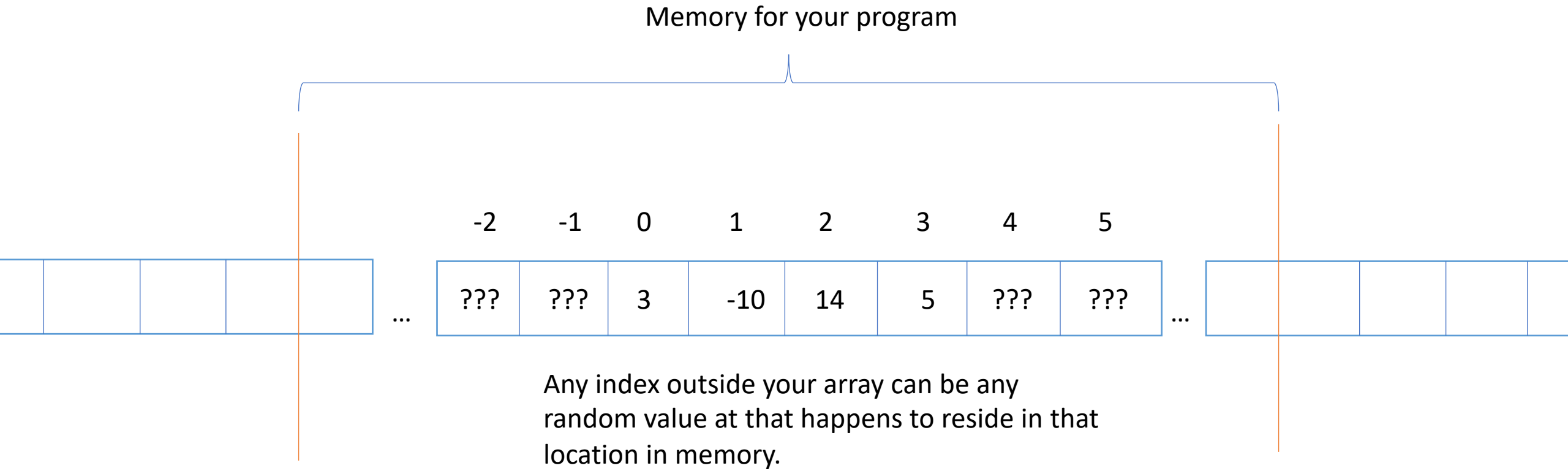

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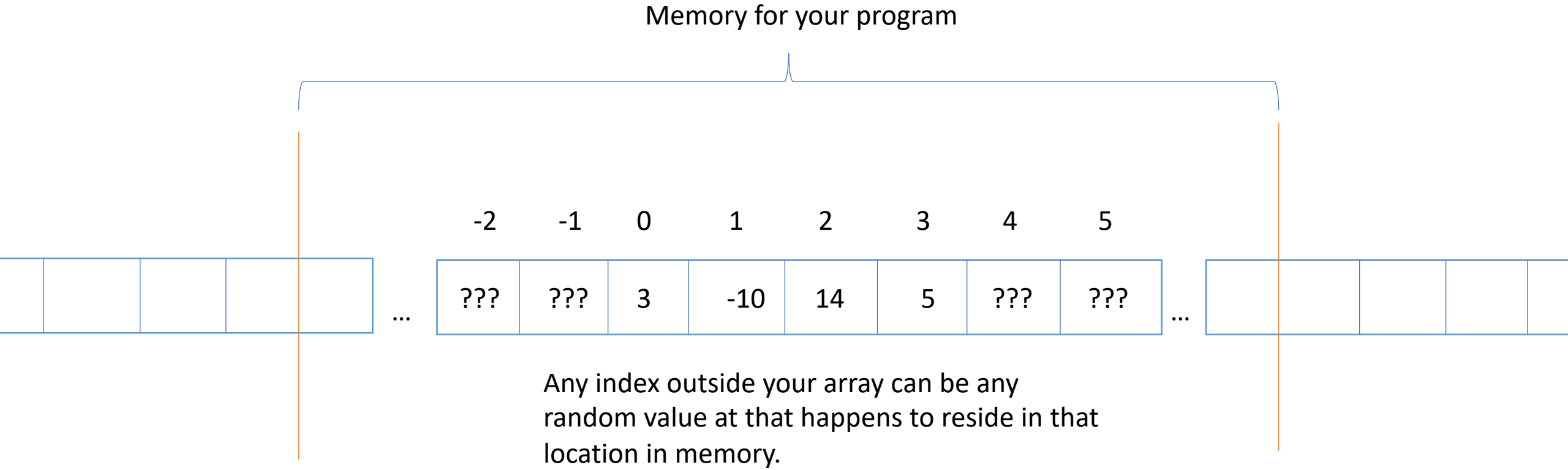
C does not do **ANY** checking to make sure an index is valid



Any index outside your array can be any random value at that happens to reside in that location in memory.

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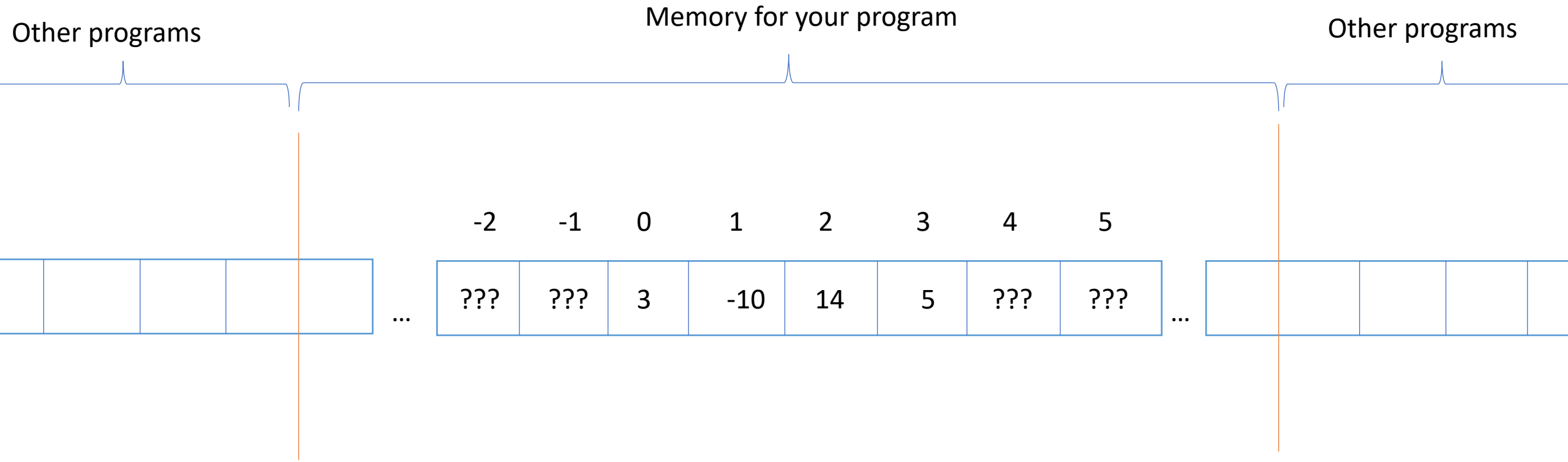

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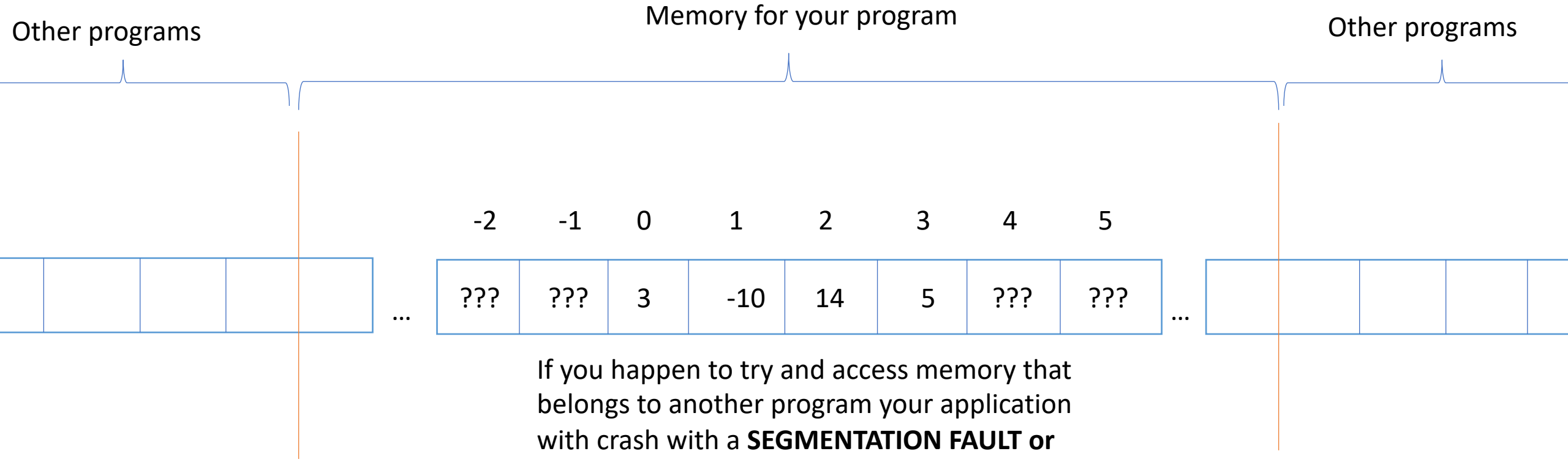

If you happen to try and access memory that belongs to another program your application with crash with a **SEGMENTATION FAULT or SEGFAULT**!