Pointers

Pointer Program

```
int* a = new int[5]{0, 8, 7, 2, -1};
int* ptr = a;                      // pointer assignment
++ptr;                             // shift to the right
int my_int = *ptr;                 // read target
ptr += 2;                          // shift by 2 elements
*ptr = 18;                         // overwrite target
int* past = a+5;
std::cout << (ptr < past) << "\n"; // compare pointers
```

Pointer Program

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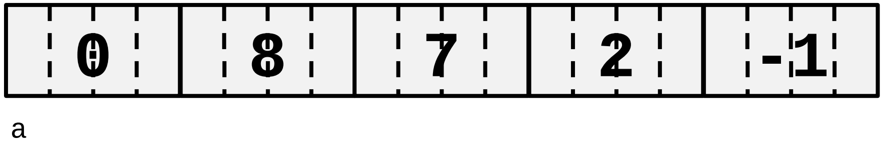

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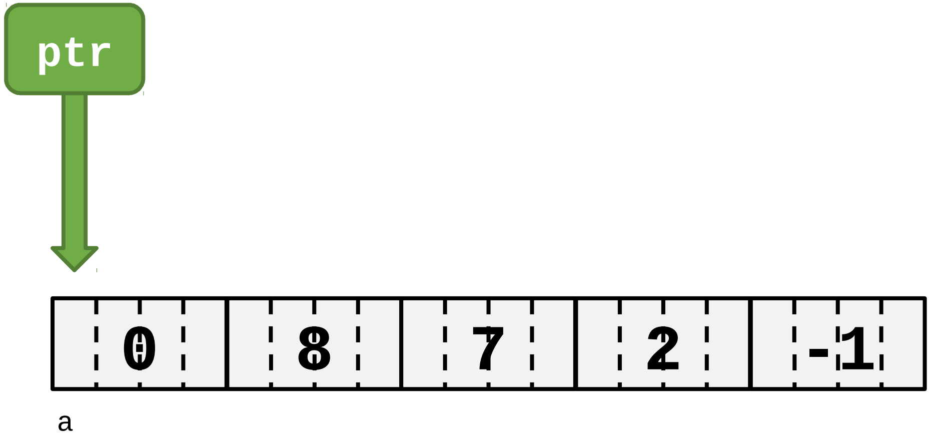

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int* ptr = a;                       // pointer assignment
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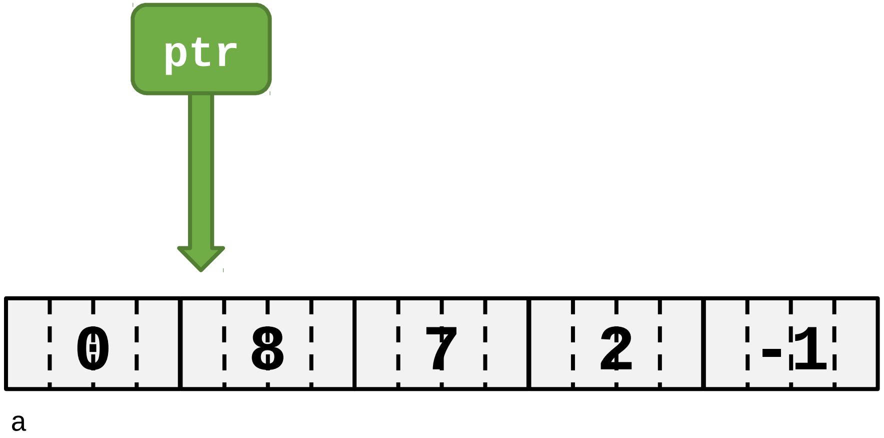

ptr

0	8	7	2	-1

a

Pointer Program

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int* a = new int[5]{0, 8, 7, 2, -1};
int* ptr = a;                       // pointer assignment
++ptr;                              // shift to the right
int my_int = *ptr;                  // read target
ptr += 2;                           // shift by 2 elements
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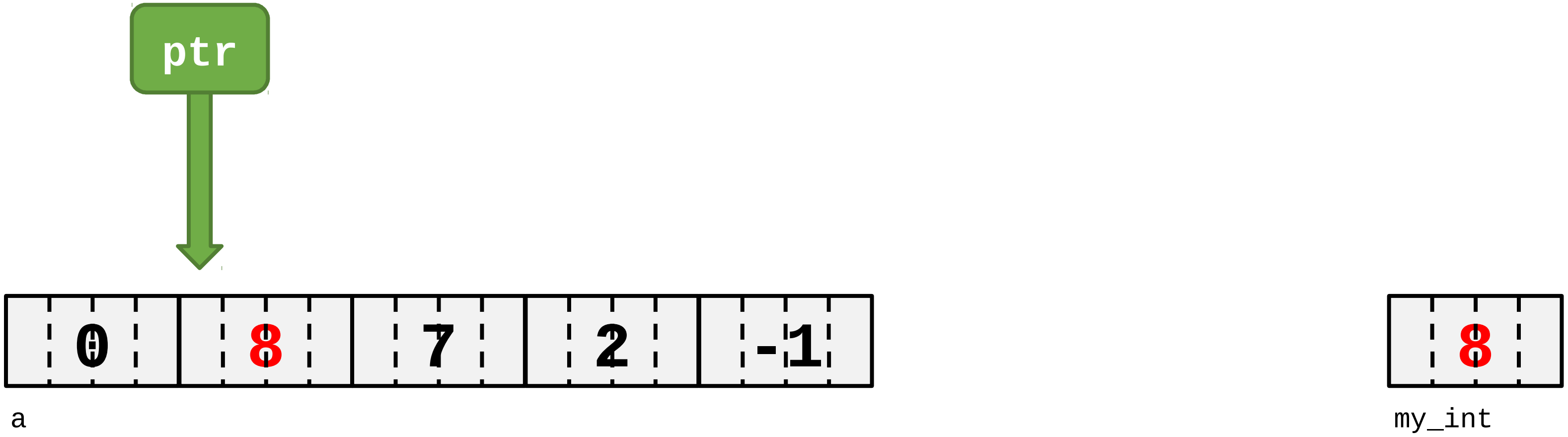

ptr

0 8 7 2 -1

a

8

my_int

Pointer Program

```
int* a = new int[5]{0, 8, 7, 2, -1};
int* ptr = a;                             // pointer assignment
++ptr;                                    // shift to the right
int my_int = *ptr;                        // read target
ptr += 2;                                 // shift by 2 elements
*ptr = 18;                                // overwrite target
int* past = a+5;
std::cout << (ptr < past) << "\n"; // compare pointers
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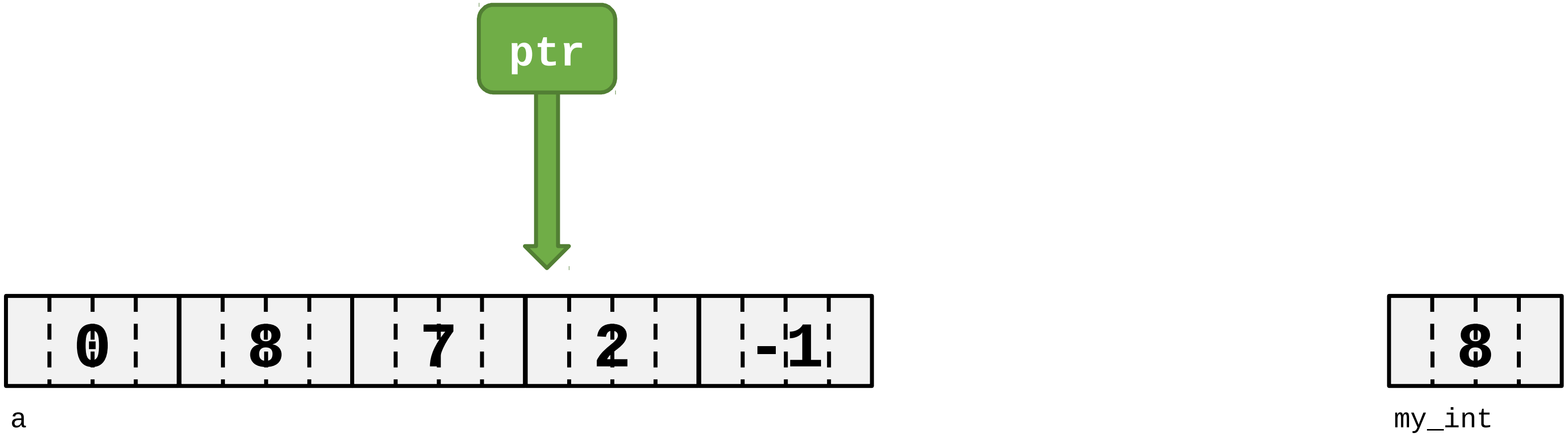

Pointer Program

```
int* a = new int[5]{0, 8, 7, 2, -1};
int* ptr = a;                      // pointer assignment
++ptr;                             // shift to the right
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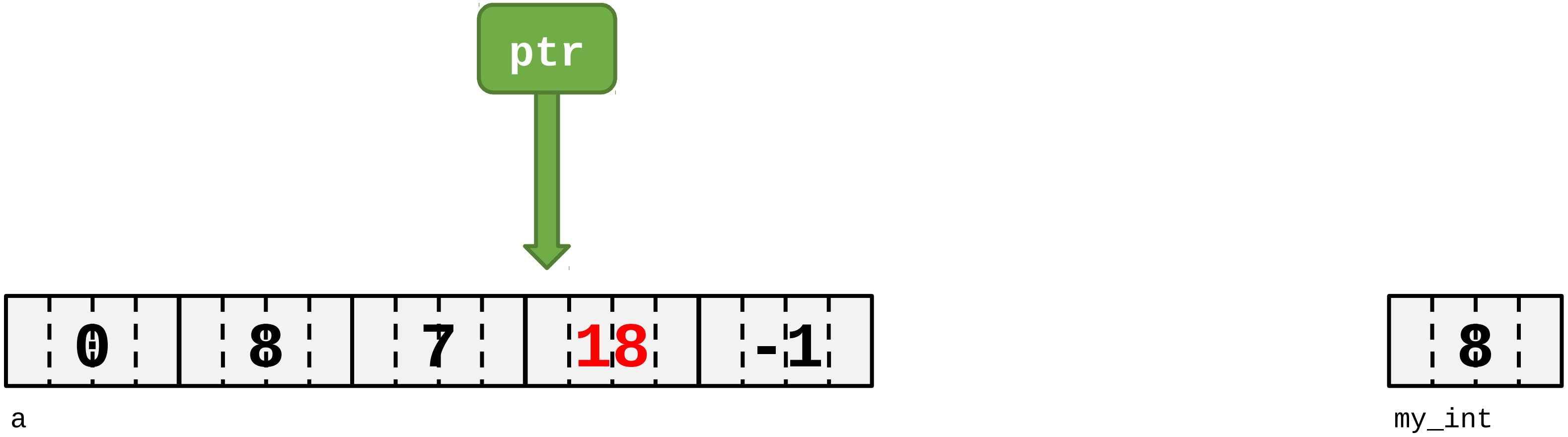

Pointer Program

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int* ptr = a;                       // pointer assignment
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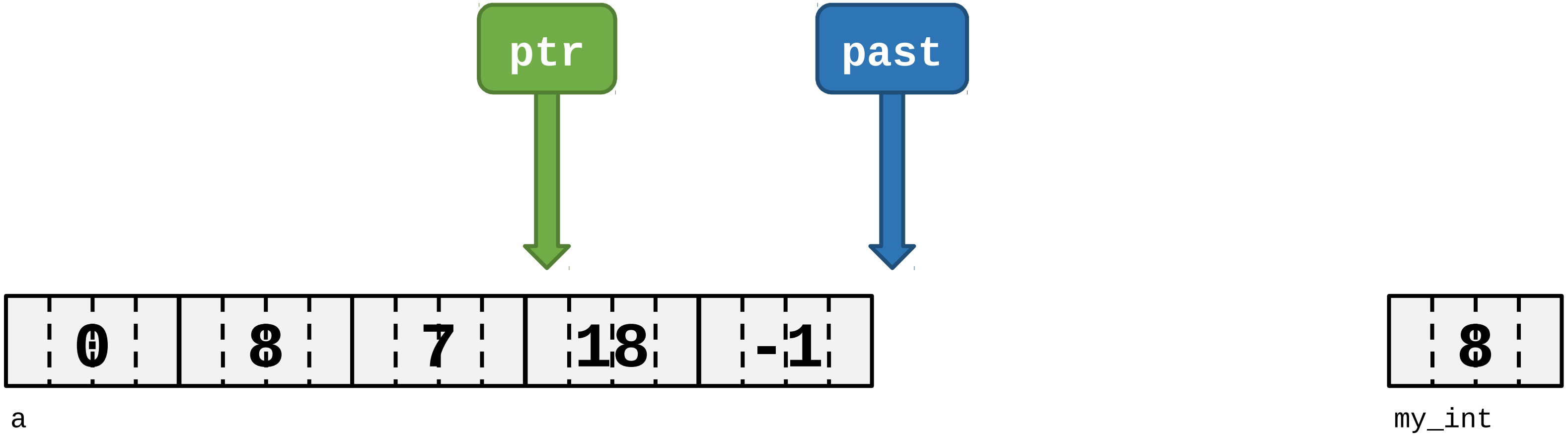
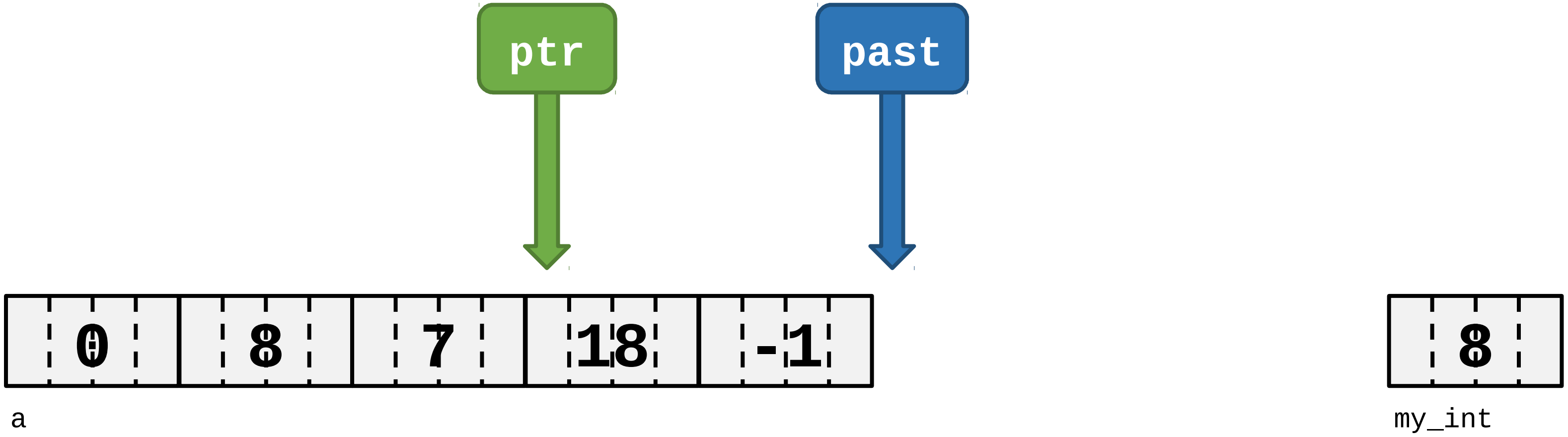


Pointer Program

```
int* a = new int[5]{0, 8, 7, 2, -1};
int* ptr = a;                              // poi
++ptr;                                     // shi
int my_int = *ptr;                         // read
ptr += 2;                                  // shift
*ptr = 18;                                 // overwr
int* past = a+5;
std::cout << (ptr < past) << "\n"; // compare pointers
```

Output: true

Because ptr is "to the left" of past.



Pointer Program

```
int* a = new int[5]{0, 8, 7, 2, -1};
int* ptr = a;                             // pointer assignment
++ptr;                                    // shift to the right
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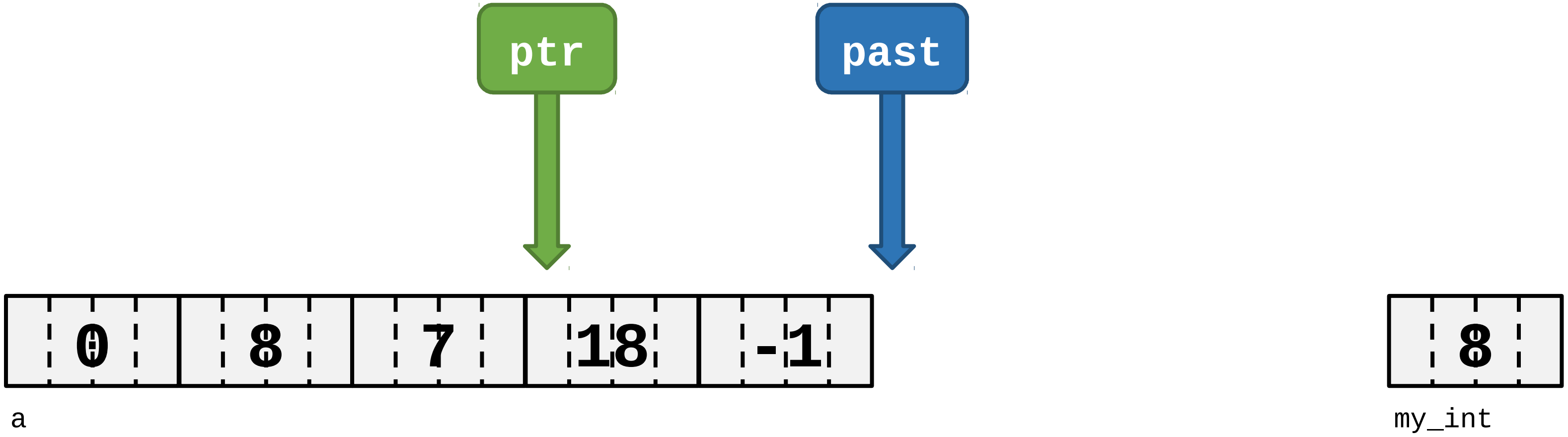

Exercise!

Pointer Program

Find and fix at least 3 problems in the following program.

```cpp
#include <iostream>
int main () {
    int* a = new int[7]{0, 6, 5, 3, 2, 4, 1};
    int* b = new int[7];
    int* c = b;

    // copy a into b using pointers
    for (int* p = a; p <= a+7; ++p)
        *c++ = *p;

    // cross-check with random access
    for (int i = 0; i <= 7; ++i)
        if (a[i] != c[i])
            std::cout << "Oops, copy error...\n";

    return 0;
}
```

(From: Script Exercise 117)

Pointer Program

```
#include <iostream>
int main () {
    int* a = new int[7]{0, 6, 5, 3, 2, 4, 1};
    int* b = new int[7];
    int* c = b;

    // copy a into b using pointers
    for (int* p = a; p <= a+7; ++p)
        *c++ = *p;

    // cross-check with random access
    for (int i = 0; i <= 7; ++i)
        if (a[i] != c[i])
            std::cout << "Oops, copy error...\n";

    return 0;
}
```

p = a+7 is dereferenced

Solution:
Use < instead of <=

(From: Script Exercise 117)

Pointer Program

```
#include <iostream>
int main () {
    int* a = new int[7]{0, 6, 5, 3, 2, 4, 1};
    int* b = new int[7];
    int* c = b;

    // copy a into b using pointers
    for (int* p = a; p <= a+7; ++p)
        *c++ = *p;

    // cross-check with random access
    for (int i = 0; i <= 7; ++i)
        if (a[i] != c[i])
            std::cout << "Oops, copy er

    return 0;
}
```

p = a+7 is dereferenced

Solution:
Use < instead of <=

Same problem as above

(From: Script Exercise 117)

Pointer Program

```
#include <iostream>
int main () {
    int* a = new int[7]{0, 6, 5, 3, 2, 4, 1};
    int* b = new int[7];
    int* c = b;

    // copy a into b using pointers
    for (int* p = a; p <= a+7; ++p)
        *c++ = *p;

    // cross-check with random access
    for (int i = 0; i <= 7; ++i)
        if (a[i] != c[i])
            std::cout << "Oops, copy er

    return 0;
}
```

`c` doesn’t point to `b[0]` anymore.

Solution:
Use `b` instead of `c`

`p = a+7` is dereferenced

Solution:
Use `<` instead of `<=`

Same problem as above

(From: Script Exercise 117)