

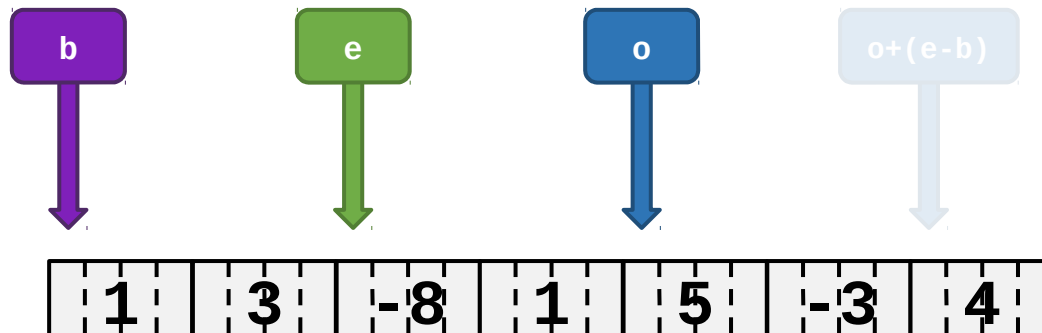
# Exercise - Applying Pointers

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- Apply this function...

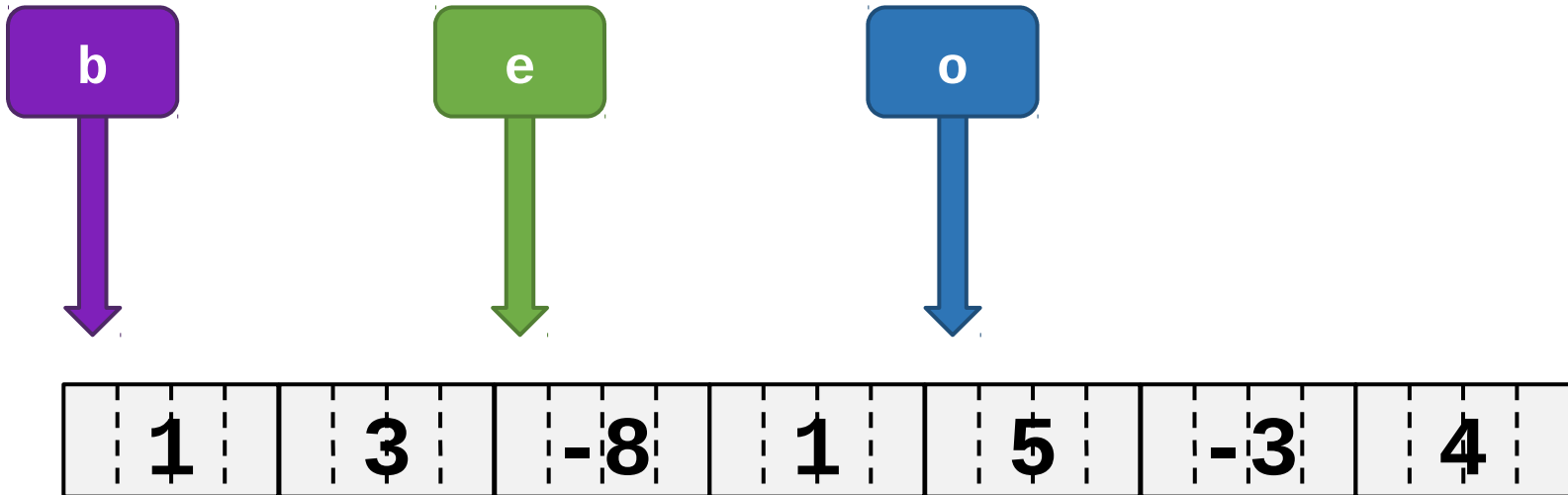
```
// PRE: [b, e) and [o, o+(e-b)) are disjoint
//       valid ranges
void f (int* b, int* e, int* o) {
    while (b != e) {
        --e;
        *o = *e;
        ++o;
    }
}
```

- ... to this example-array:



# Exercise - Applying Pointers

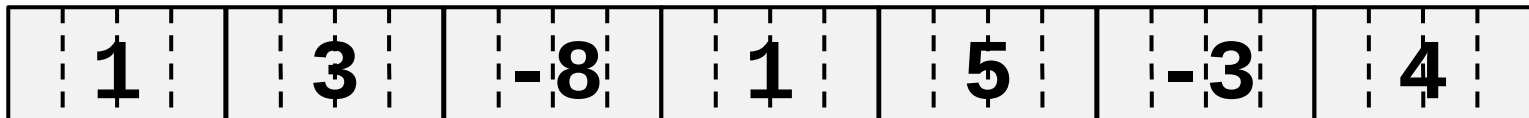
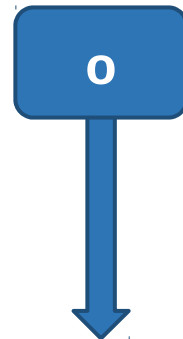
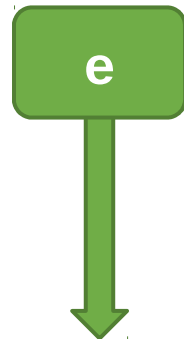
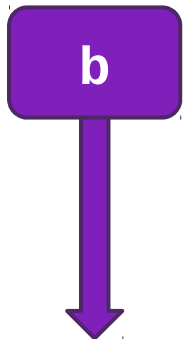
```
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    while (b != e) {  
        --e;  
        *o = *e;  
        ++o;  
    }  
}
```



# Exercise - Applying Pointers

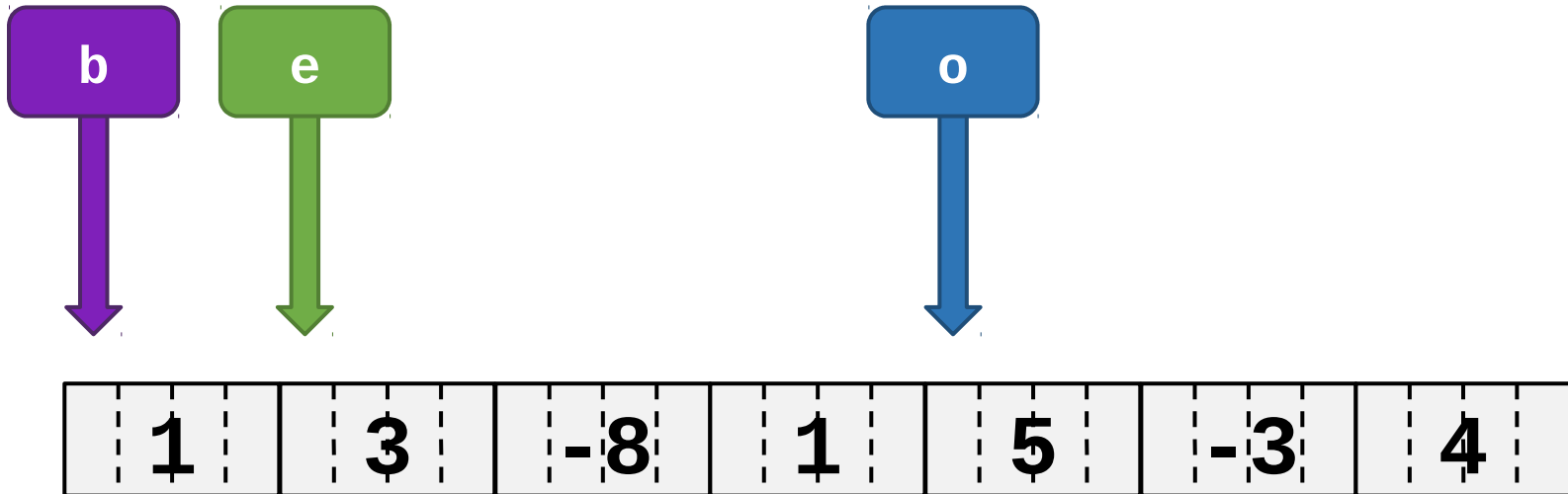
true

```
void f (int* b, int e, int* o) {  
    while (b != e) {  
        --e;  
        *o = *e;  
        ++o;  
    }  
}
```



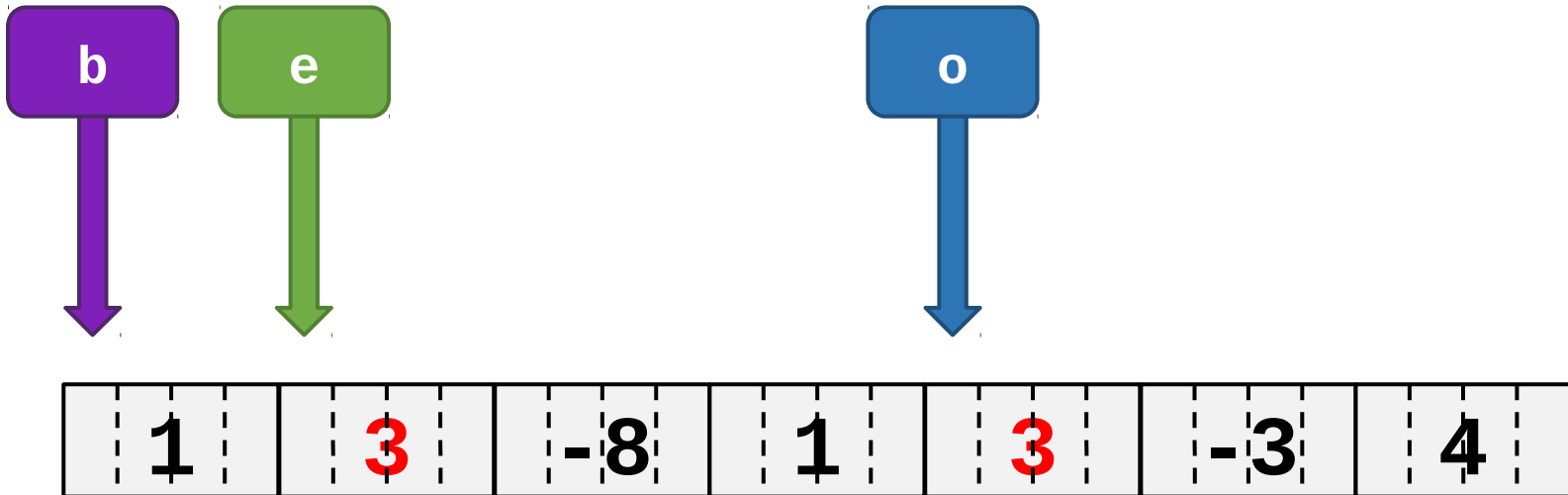
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        --e;  
        *o = *e;  
        ++o;  
    }  
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```



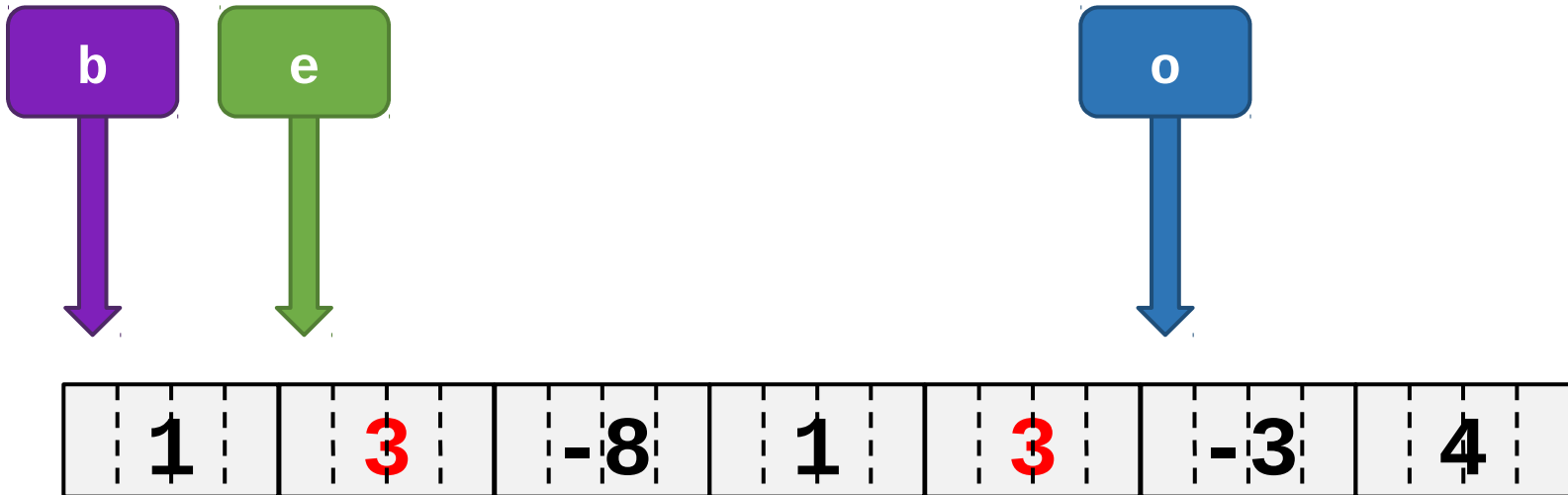
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# Exercise - Applying Pointers

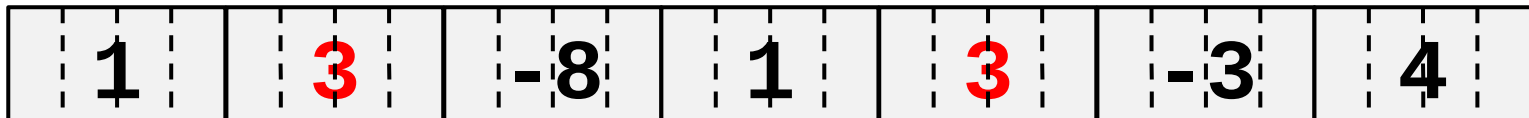
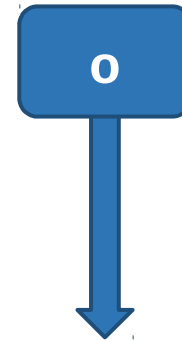
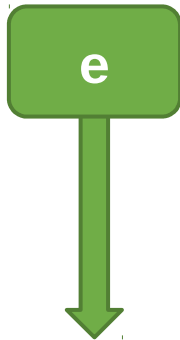
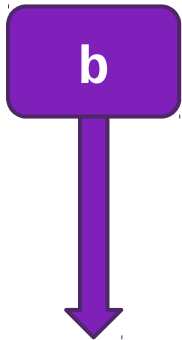
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        --e;  
        *o = *e;  
        ++o;  
    }  
}
```



# Exercise - Applying Pointers

true

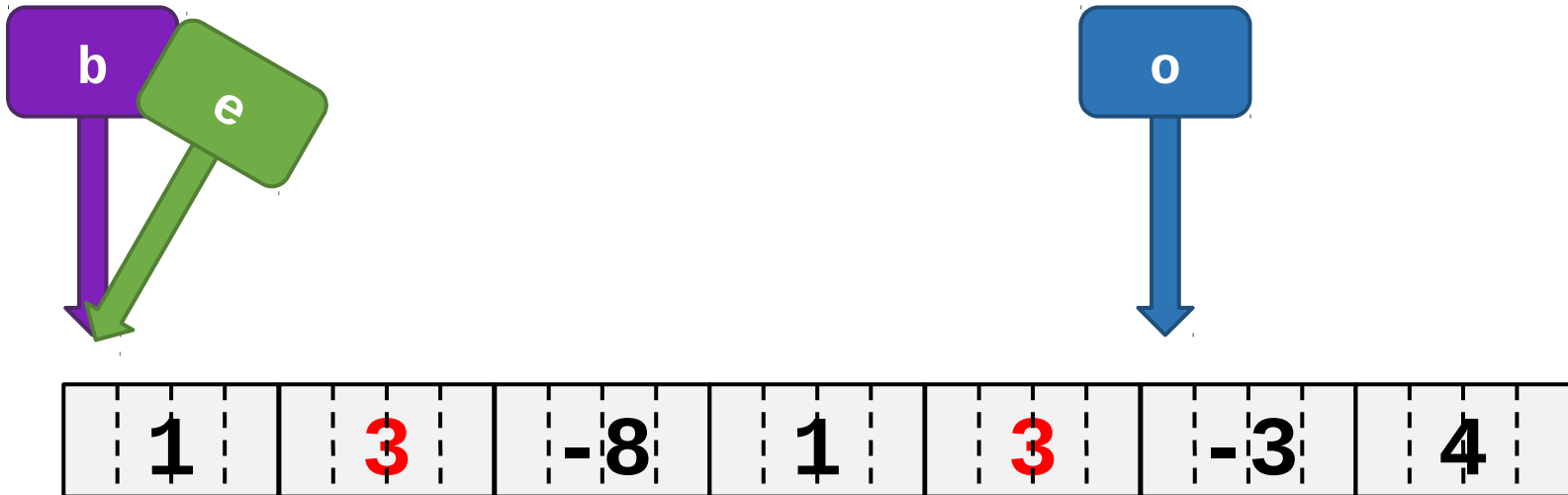
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    while (b != e) {  
        --e;  
        *o = *e;  
        ++o;  
    }  
}
```





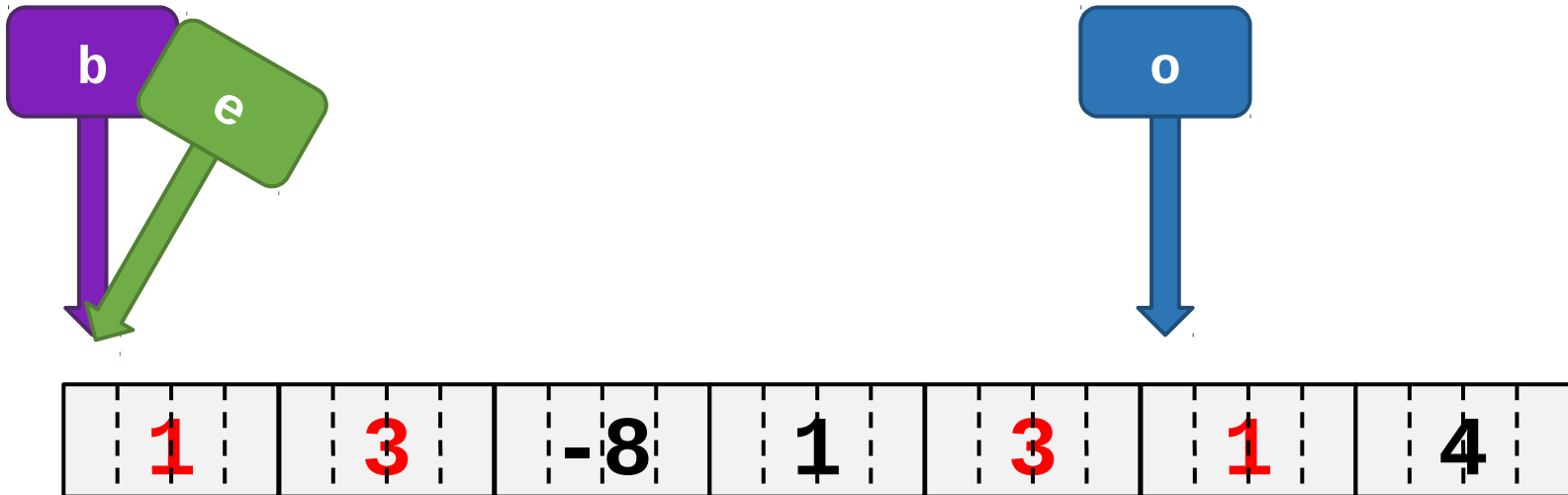
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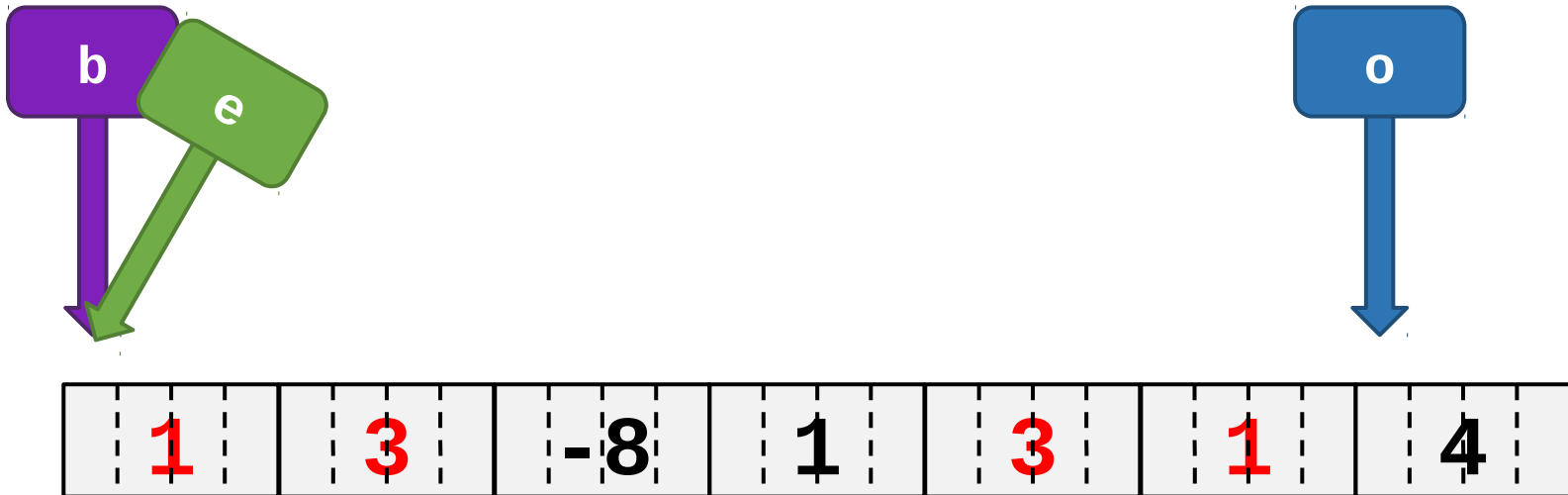
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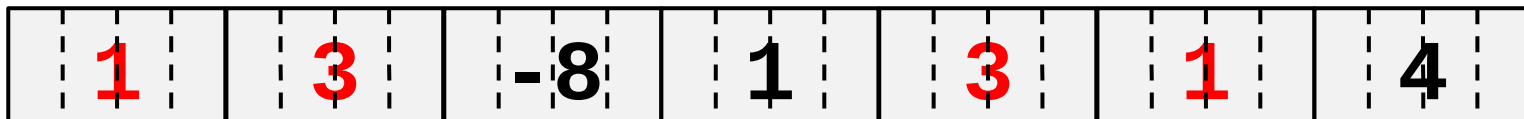
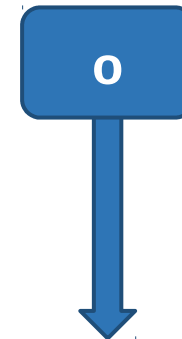
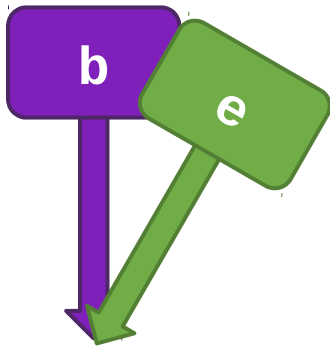
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    while (b != e) {  
        --e;  
        *o = *e;  
        ++o;  
    }  
}
```



# Exercise - Applying Pointers

false

```
void f (int* b, int e, int* o) {  
    while (b != e) {  
        --e;  
        *o = *e;  
        ++o;  
    }  
}
```



# Exercise - Applying Pointers

- Now determine a POST-condition for the function.

```
// PRE: [b, e) and [o, o+(e-b)) are disjoint
//      valid ranges
void f (int* b, int* e, int* o) {
    while (b != e) {
        --e;
        *o = *e;
        ++o;
    }
}
```

# Exercise - Applying Pointers

- Something like this:

```
// PRE: [b, e) and [o, o+(e-b)) are disjoint
//       valid ranges
// POST: The range [b, e) is copied in reverse
//       order into the range [o, o+(e-b))
void f (int* b, int* e, int* o) {
    while (b != e) {
        --e;
        *o = *e;
        ++o;
    }
}
```

# Exercise - Valid Inputs

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- Which of these inputs are valid?

```
int* a = new int[5];  
// Initialise a.  
a) f(a, a+5, a+5);  
b) f(a, a+2, a+3);  
c) f(a, a+3, a+2);
```

```
// PRE: [b, e) and [o, o+(e-b)) are disjoint  
//      valid ranges  
void f (int* b, int* e, int* o) {  
    while (b != e) {  
        --e;  
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        ++o;  
    }  
}
```



# Exercise – Valid Inputs

- Which of these inputs are valid?

```
int* a = new int[5];  
// Initialise a.  
a) f(a, a+5, a+5); X  
b) f(a, a+2, a+3);  
c) f(a, a+3, a+2);
```

$[o, o+(e-b))$   
is out of  
bounds

```
// PRE: [b, e) and [o, o+(e-b)) are disjoint  
//      valid ranges  
void f (int* b, int* e, int* o) {  
    while (b != e) {  
        --e;  
        *o = *e;  
        ++o;  
    }  
}
```

# Exercise – Valid Inputs

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```
int* a = new int[5];  
// Initialise a.
```

```
a) f(a, a+5, a+5); X
```

```
b) f(a, a+2, a+3); ✓
```

```
c) f(a, a+3, a+2);
```

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    while (b != e) {  
        --e;  
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        ++o;  
    }  
}
```

Ranges **not**  
**disjoint**

# Exercise - const Correctness

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- Make the function const-correct.

```
// PRE: [b, e) and [o, o+(e-b)) are disjoint
//      valid ranges
void f (int* b, int* e, int* o) {
    while (b != e) {
        --e;
        *o = *e;
        ++o;
    }
}
```

# Exercise – const Correctness

- Make the function const-correct.

```
// PRE: [b, e) and [o, o+(e-b)) are disjoint
//      valid ranges
void f (const int* const b, const int* e, int* o) {
    while (b != e) {
        --e;
        *o = *e;
        ++o;
    }
}
```