



THE SWAPPING PROBLEM

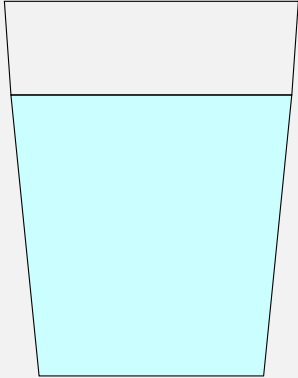
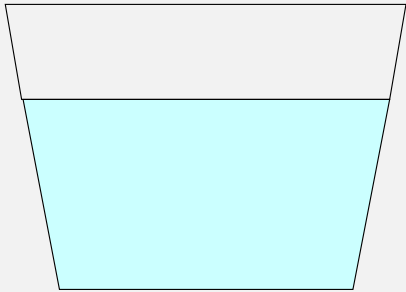
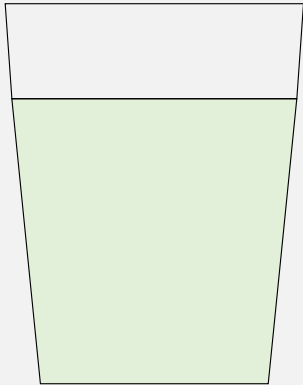
Version 3

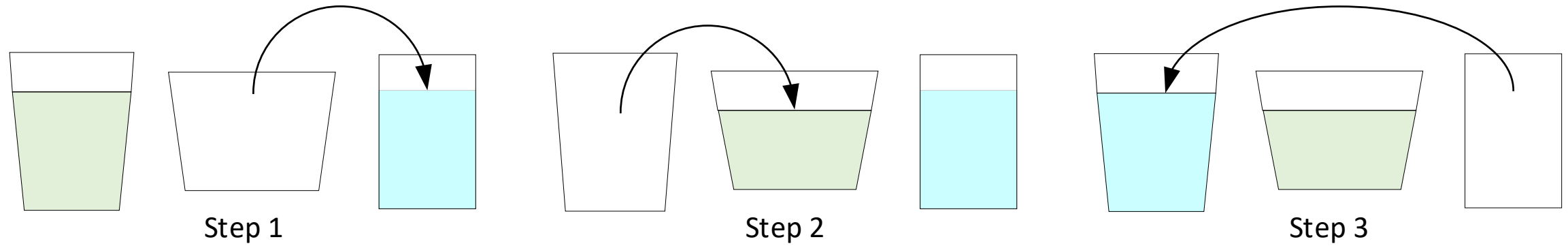


THE PROBLEM

INITIAL STATE

GOAL (SOLUTION) STATE





THE SOLUTION



PROGRAMMING THE SOLUTION

GENERAL SOLUTION

- `T temp = x1; // step 1`
- `x1 = x2; // step 2`
- `x2 = temp; // step 3`

EXAMPLE

```
struct student
{
    int    id;
    string name;
    double gpa;
};
```

```
student temp = s2;
s2 = s1;
s1 = temp;
```



PASSING FUNCTION ARGUMENTS

CHOICES

- Pass-by-value
- Pass-by-pointer
- Pass-by-reference



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REASONING

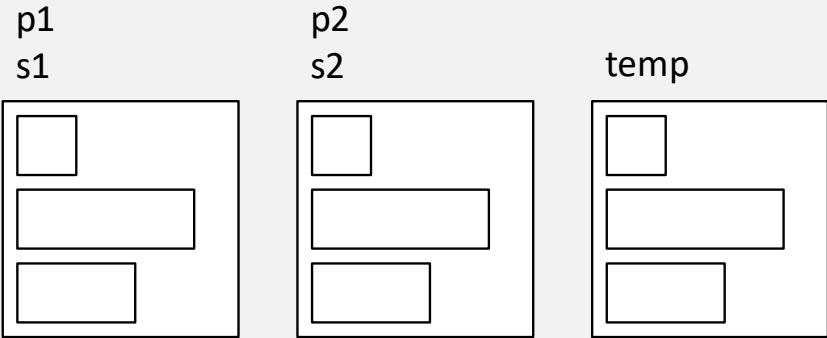
- Function must change two arguments
 - Argument passing must be INOUT
- Pass-by-value: IN only
- Pass-by-reference: INOUT
- Pass-by-pointer: INOUT



PASS-BY-REFERENCE

```
void swap(student& p1, student& p2)
{
    student temp = p2;
    p2 = p1;
    p1 = temp;
}
```

```
student s1 = { 123, "dilbert", 3.0 };
student s2 = { 987, "alice", 4.0 };
swap(s1, s2);
```

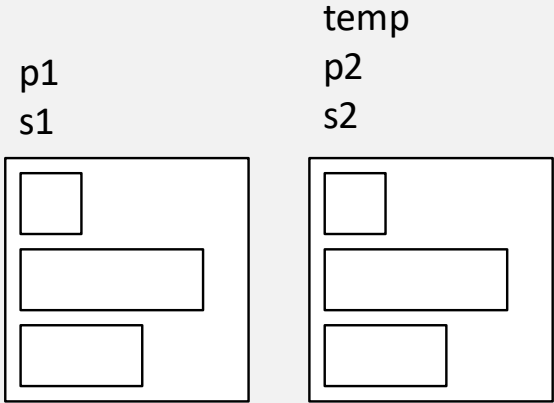




PASS-BY-REFERENCE: FAIL

```
void swap(student& p1, student& p2)
{
    student& temp = p2;
    p2 = p1;
    p1 = temp;
}
```

```
student s1 = { 123, "dilbert", 3.0 };
student s2 = { 987, "alice", 4.0 };
swap(s1, s2);
```



PASS-BY-POINTER (I)

```
void swap(student* p1, student* p2)
{
    student temp = *p2;
    *p2 = *p1;
    *p1 = temp;
}
```

```
student s1 = { 123, "dilbert", 3.0 };
student s2 = { 987, "alice", 4.0 };
swap(&s1, &s2);
```

