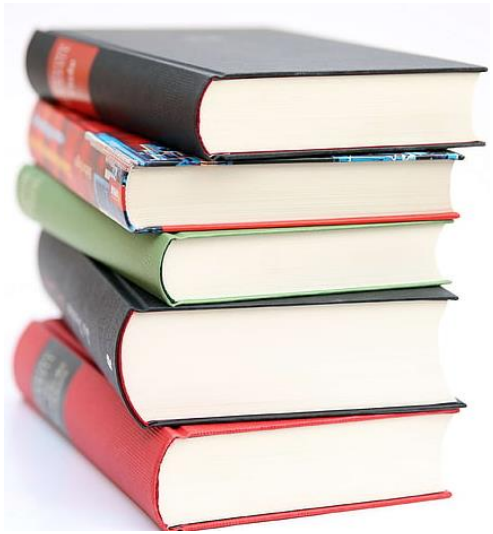
자료 구조 (STACK) 발표

홍정완

- 목 차 -

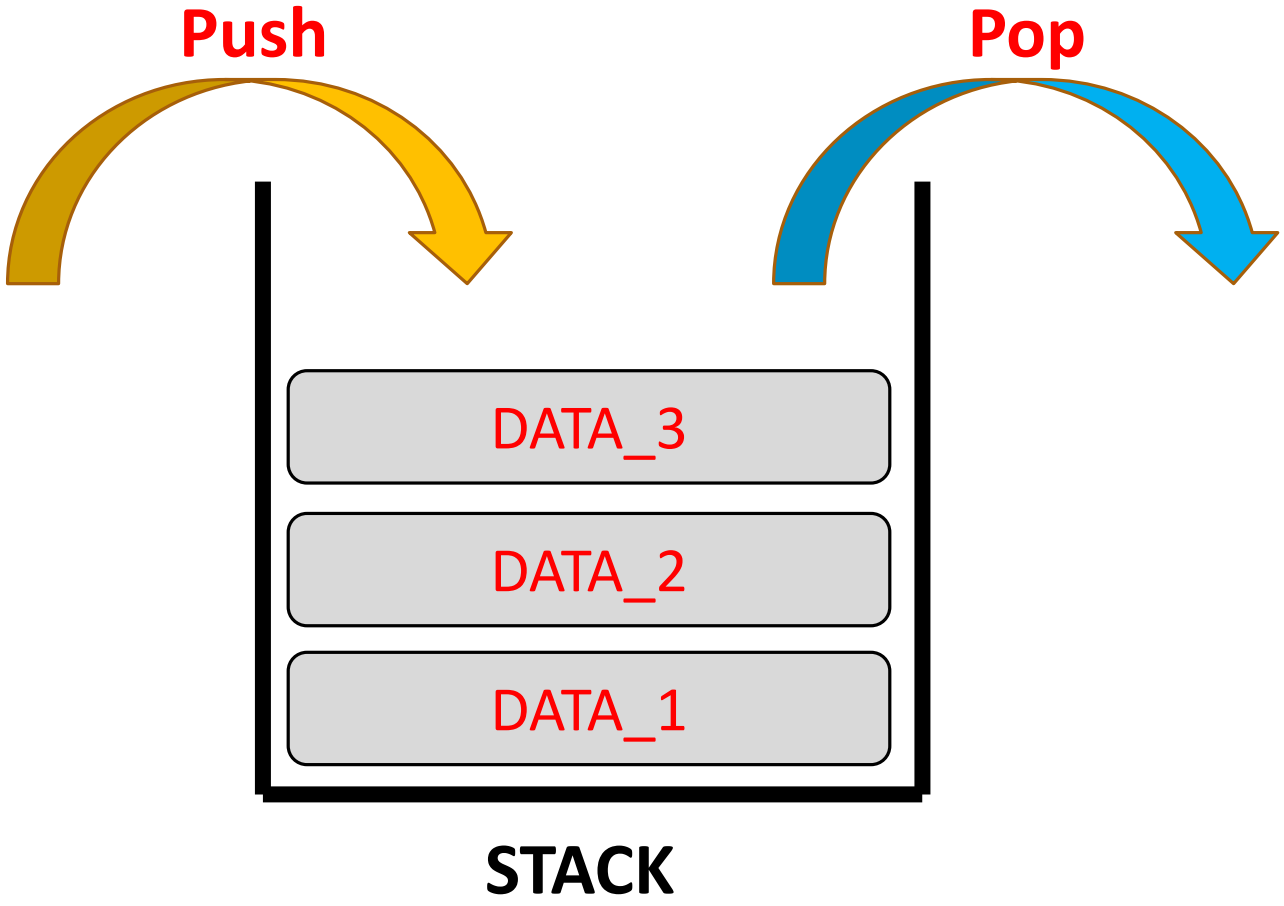
1. 스택(STACK)이란?



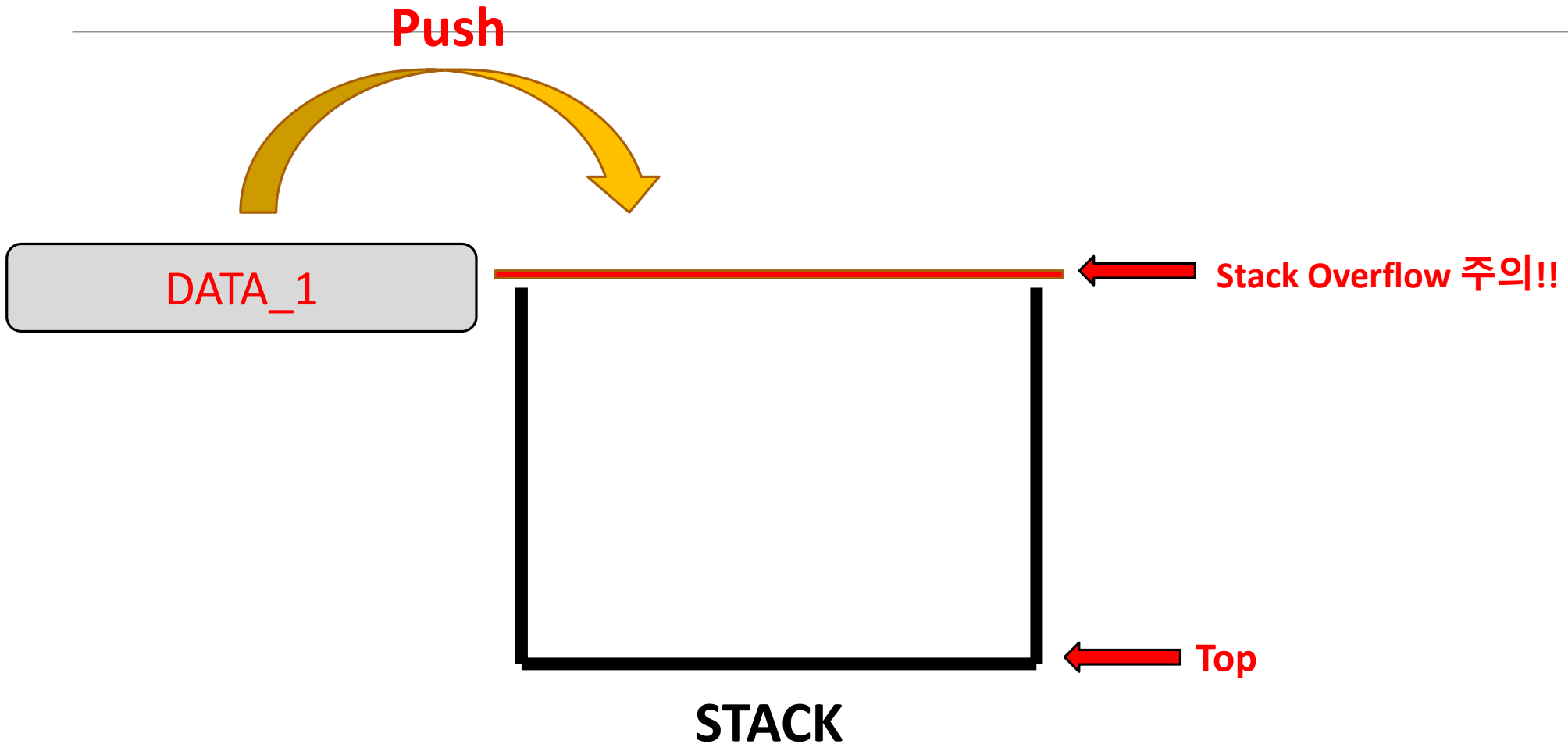
· 스택(STACK)
⇒ 쌓여 있는 것.

· LIFO(후입 선출)방식의 자료구조

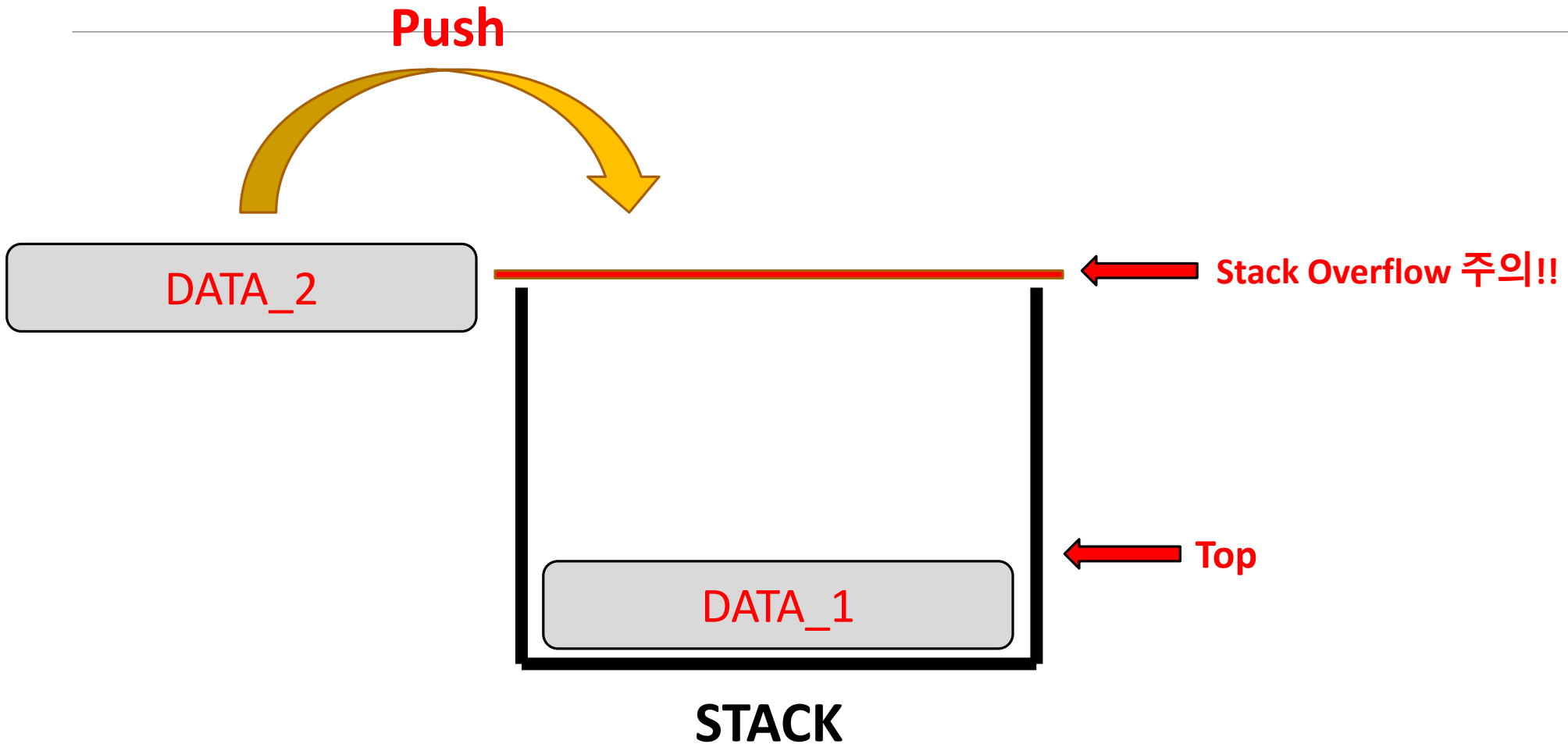
1. 스택(STACK)이란?



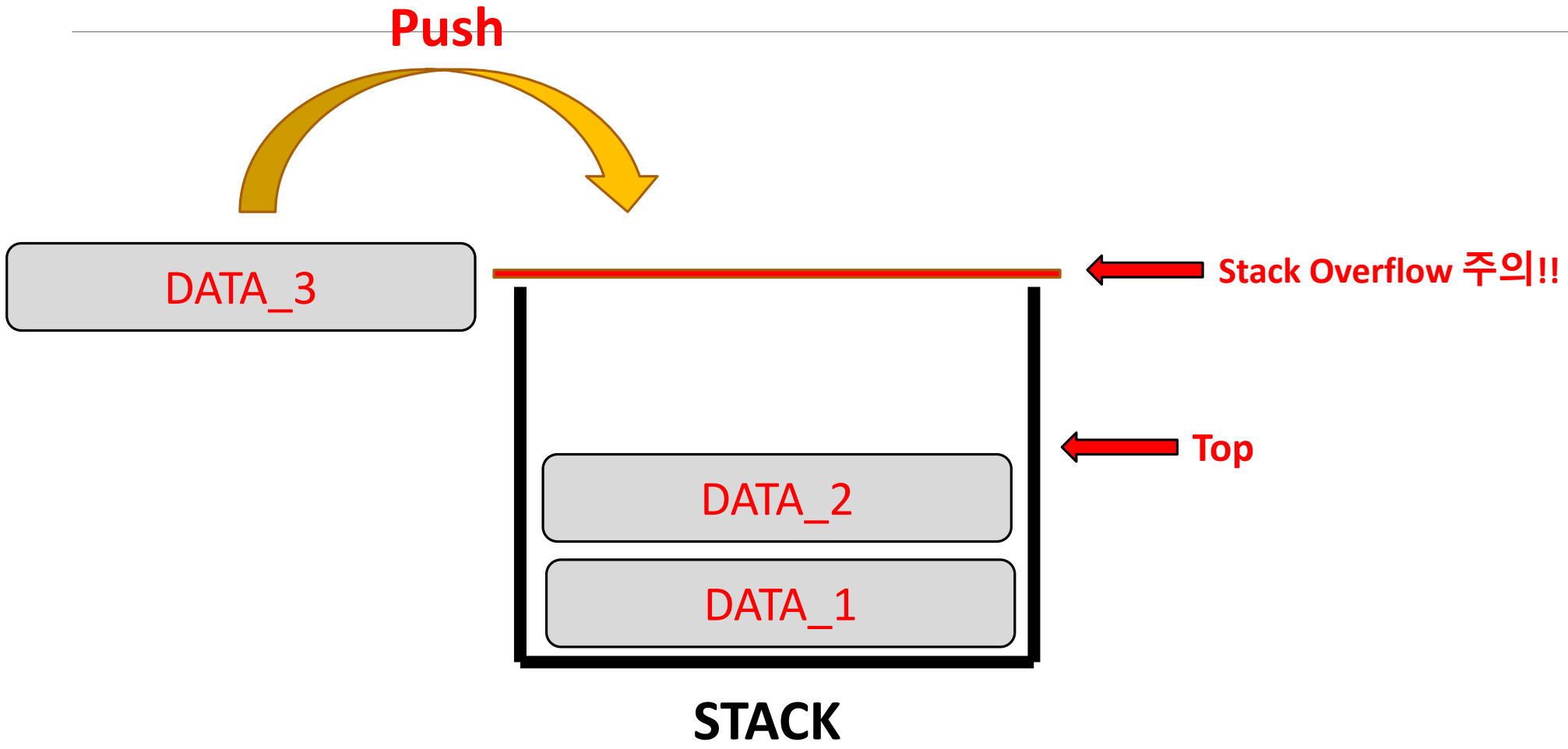
1. Push



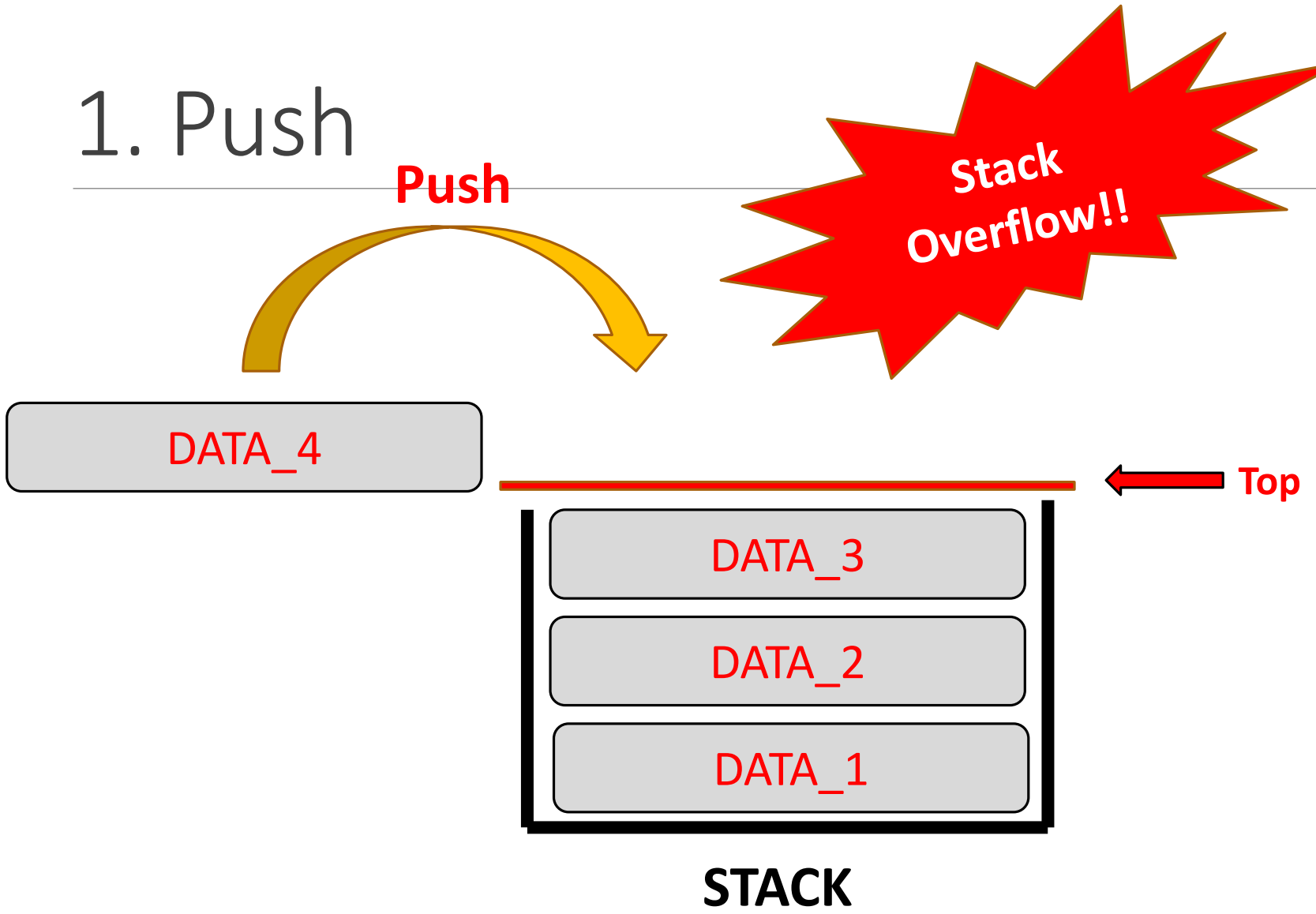
1. Push



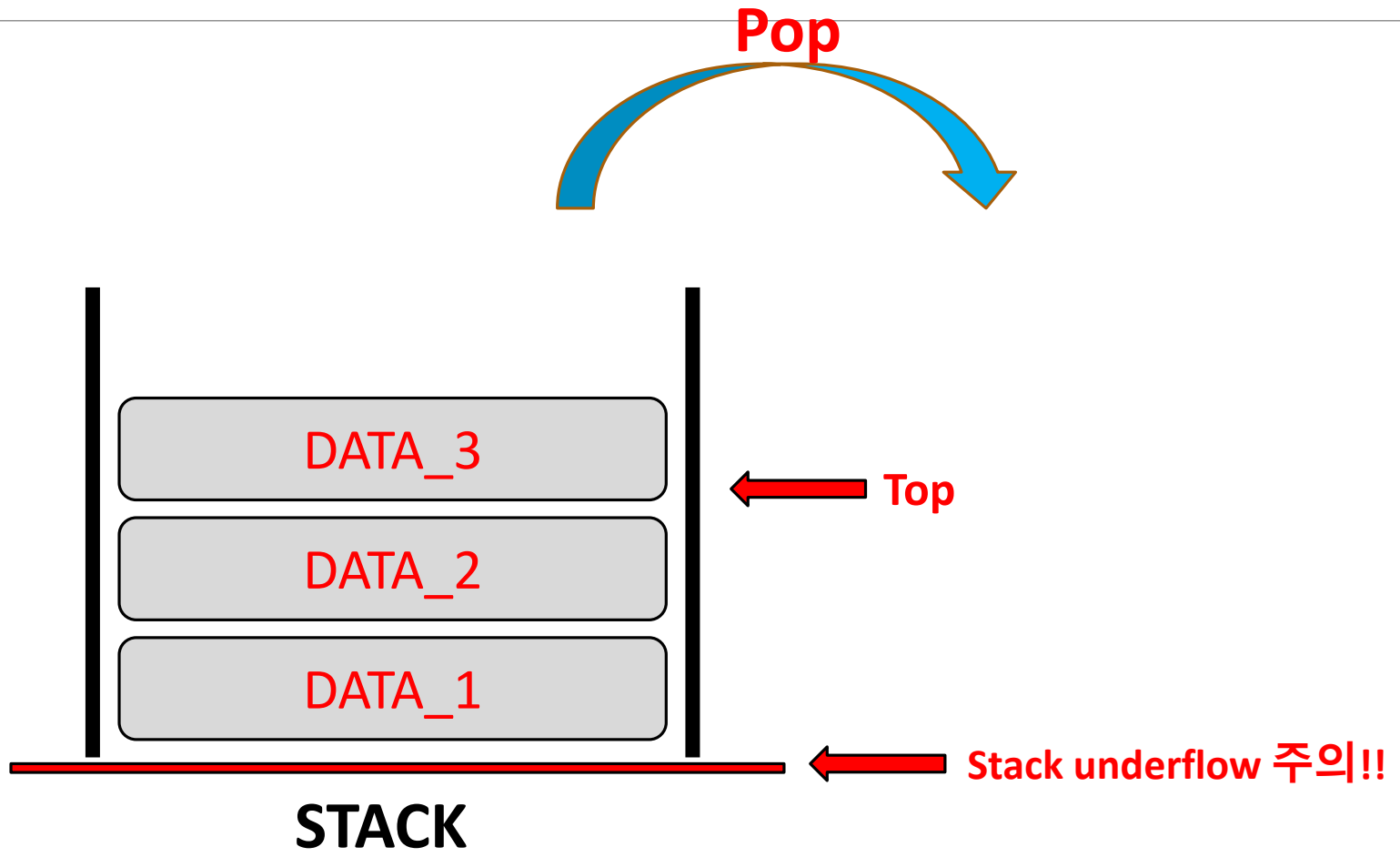
1. Push



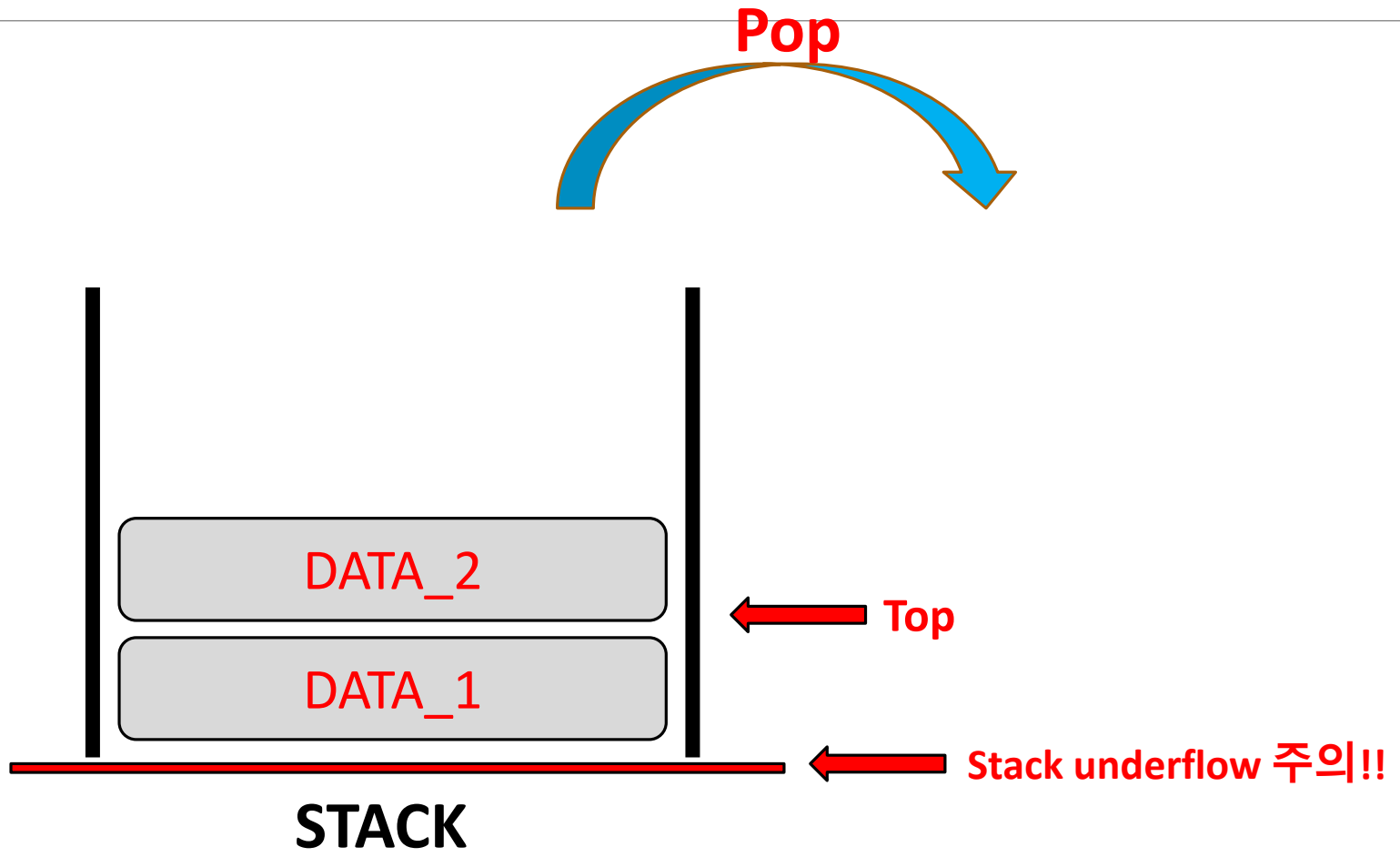
1. Push



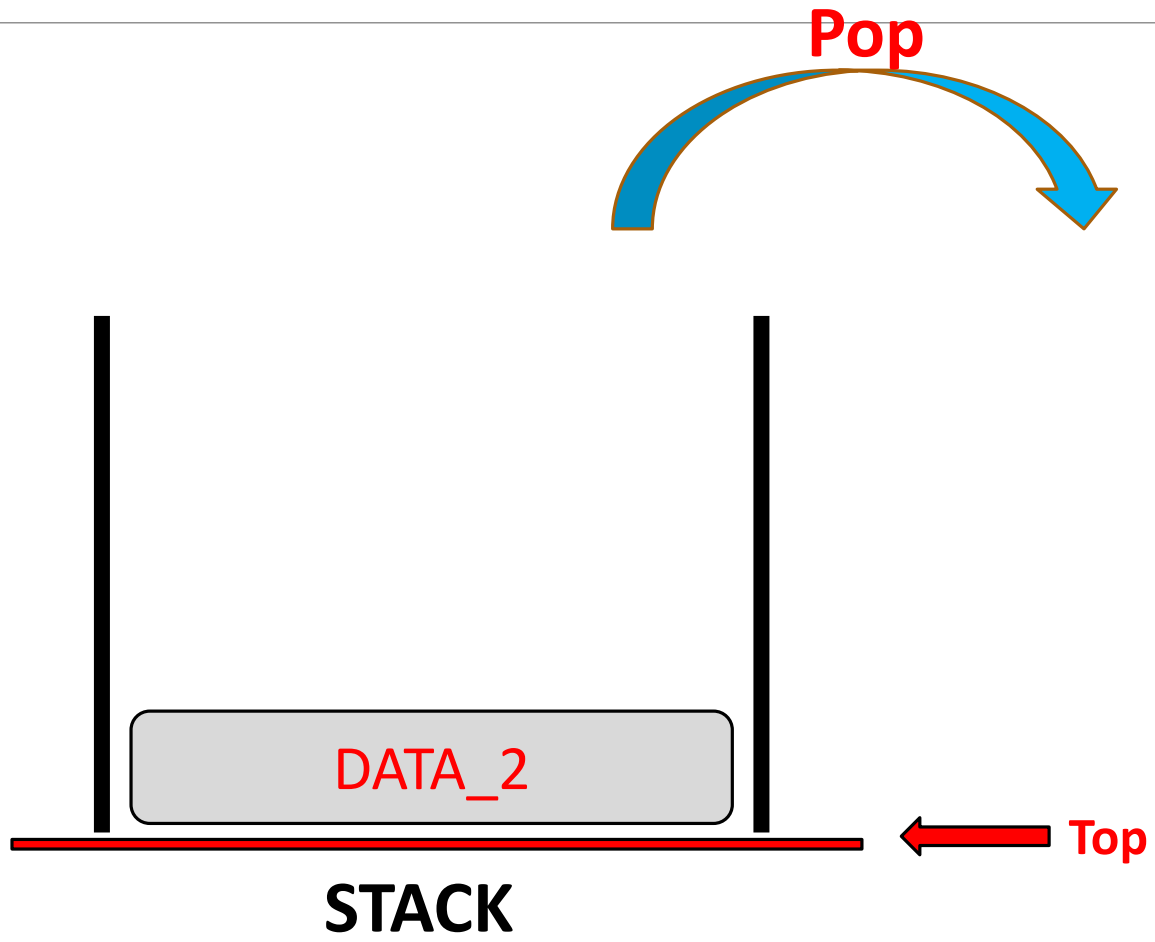
1. Pop



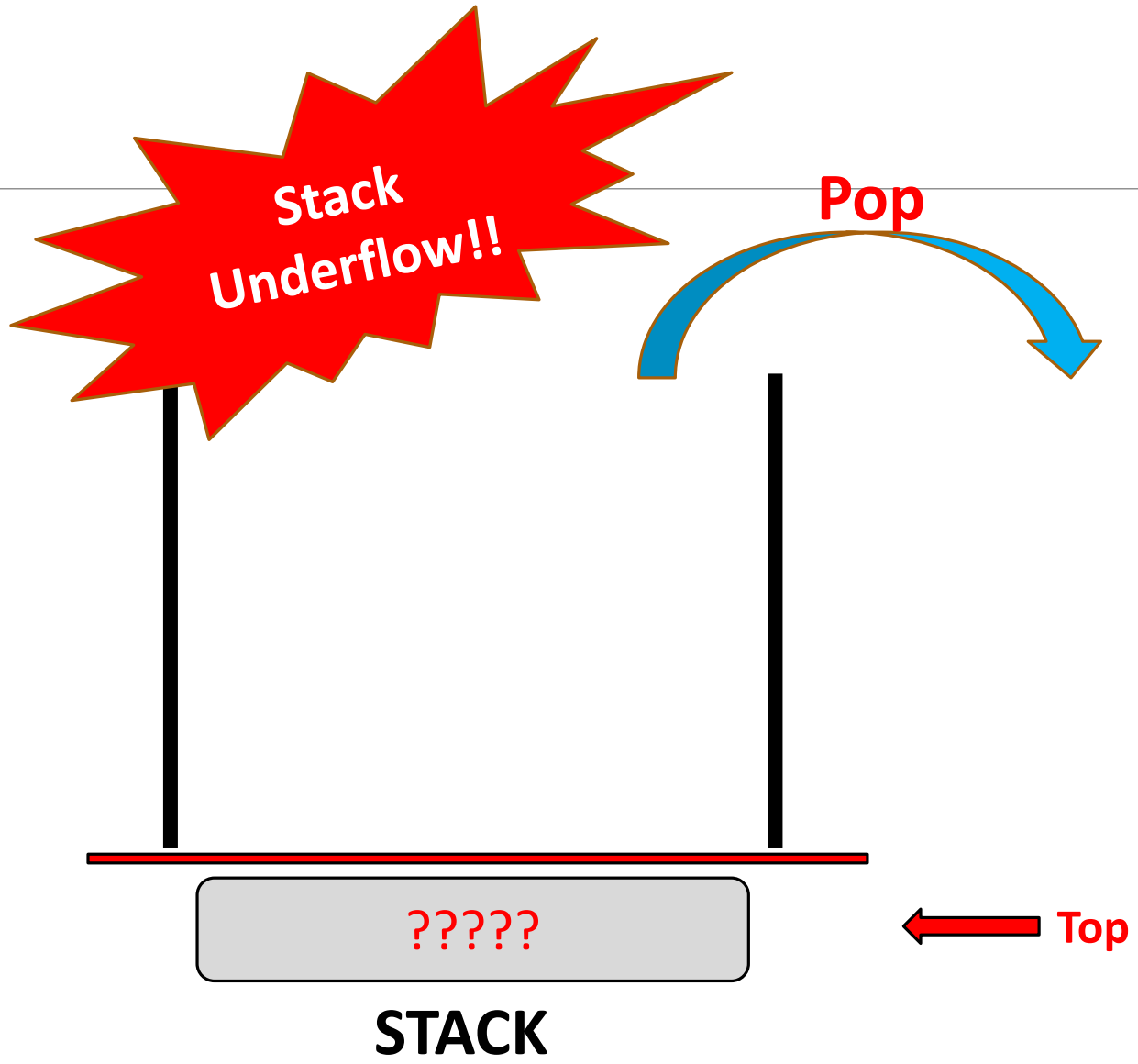
1. Pop



1. Pop

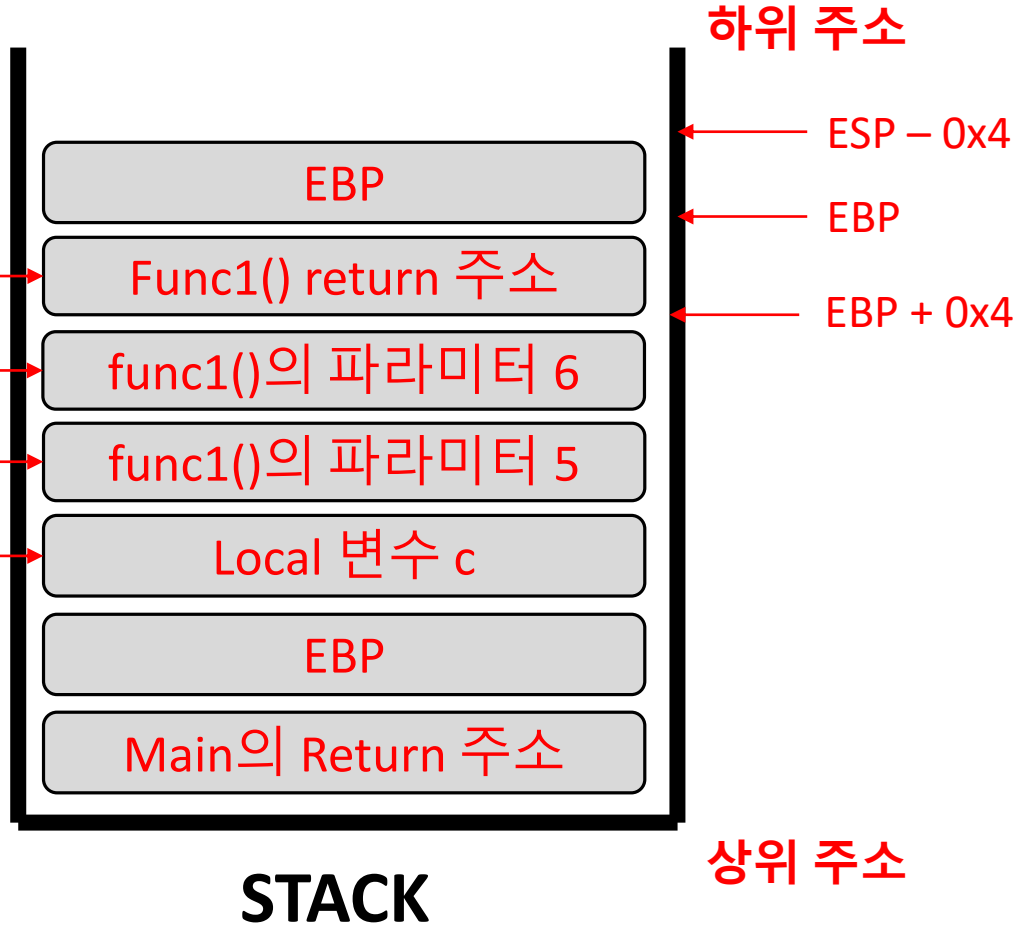


1. Pop



2. 시스템 스택(STACK)이란?

```
1   #include <stdio.h>
2
3   int func1(int, int);
4
5   int main()
6   {
7       int c;
8       c = func1(6, 5);
9       printf("%d", c);
10
11      return 0;
12  }
13
14  int func1(int a, int b)
15  {
16      return a+b;
17  }
```



3. 스택 추상 자료형(ADT)

- create() :: = 스택을 생성
- is_empty(s) :: = 스택이 비어 있는지를 검사
- is_full(s) ::= 스택이 가득 찼는가를 검사
- push(s, e) ::= 스택의 맨 위에 요소 e를 추가
- pop(s) ::= 스택의 맨 위에 있는 요소를 삭제
- peek(s) ::= 스택의 맨 위에 있는 요소를 삭제하지 않고 반환

4. 스택 – 배열 (초기화 / 검사)

```
1   #include <stdio.h>
2
3   #define MAX_STACK_SIZE 5
4   typedef int element;
5   element stack[MAX_STACK_SIZE];
6
7   int top = -1;
8
9   int is_empty()
10  {
11      return (top == -1);
12  }
13
14  int is_full()
15  {
16      return (top == (MAX_STACK_SIZE - 1));
17  }
```

① stack 크기

② stack 배열

③ top 위치 : -1 부터 시작

④ Underflow 검사

⑤ Overflow 검사

메모리 2

주소: 0x0077A5A0 열: 자동

```
0x0077A5A0  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  ....................
0x0077A5B0  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  ....................
```

Stack 메모리

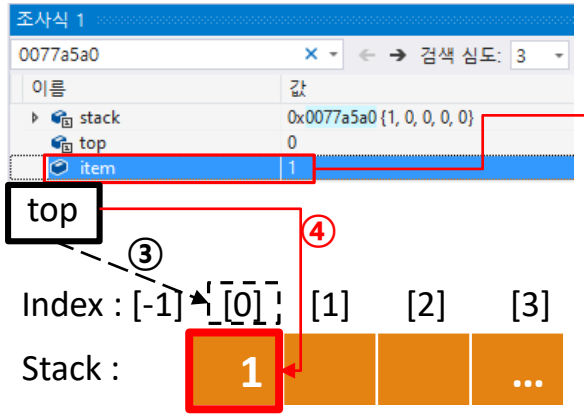
조사식 1

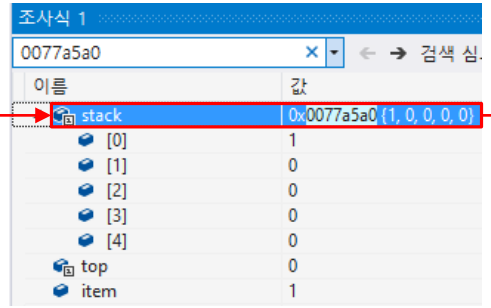
0077a000 검색 심도: 3

이름	값	형식
stack	0x0077a5a0 {0, 0, 0, 0, 0}	int[5]
top	-1	int
감시할 항목 추가		

4. 스택 – 배열(push)

```
19  void push(element item)   ①
20  {  경과 시간 1ms 이하
21      if (is_full())  ②
22      {
23          fprintf(stderr, "스택 포화 에러₩n");
24          return;
25      }
26      else stack[++top] = item;   ③ ④
27  }
49  void main()
50  {
51      push(1);
52      push(2);
53      push(3);
```



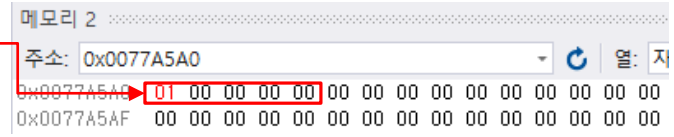


① push

② Overflow 검사

③ top 위치 1 증가

④ 매개변수 (item) **'1'** 입력



4. 스택 – 배열(push)

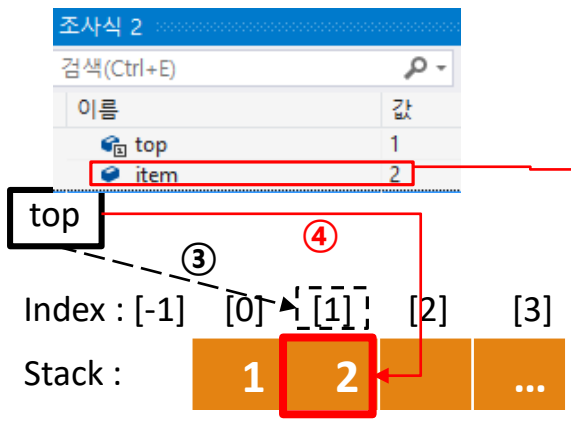
```
19  void push(element item)   ①
20  {  경과 시간 1ms 이하
21      if (is_full())  ②
22      {
23          fprintf(stderr, "스택 포화 에러₩n");
24          return;
25      }                ③        ④
26      else stack[++top] = item;
27  }
49  void main()
50  {
51      push(1);
52      push(2);
53      push(3);
```

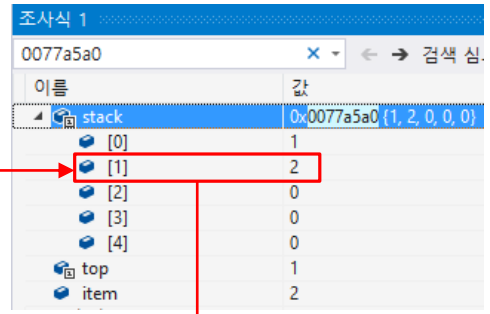
① push

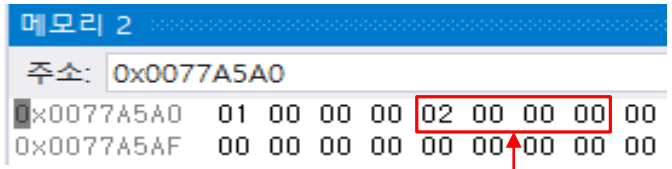
② Overflow 검사

③ top 위치 1 증가

④ 매개변수 (item) 입력
[1 -> **'2'**]







4. 스택 – 배열(push)

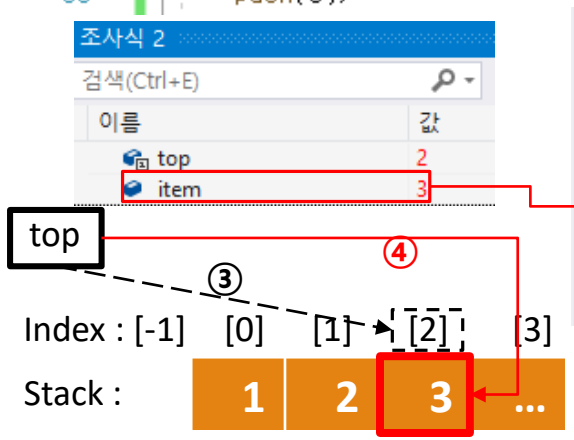
```
19  void push(element item)   ①
20  {  경과 시간 1ms 이하
21      if (is_full())  ②
22      {
23          fprintf(stderr, "스택 포화 에러₩n");
24          return;
25      }                ③        ④
26      else stack[++top] = item;
27  }
49  void main()
50  {
51      push(1);
52      push(2);
53      push(3);
```

① push

② Overflow 검사

③ top 위치 1 증가

④ 매개변수 (item) 입력
[1 -> 2 -> **'3'**]



조사식 2

검색(Ctrl+E)

이름	값
top	2
item	3

조사식 1

0077a5a0

이름	값
stack	0x0077a5a0 {1, 2, 3, 0, 0}
[0]	1
[1]	2
[2]	3
[3]	0
[4]	0
top	2
item	3

메모리 2

주소: 0x0077A5A0

```
0x0077A5A0  01 00 00 00 02 00 00 00 03 00 00 00
0x0077A5AF  00 00 00 00 00 00 00 00 00 00 00 00
```

4. 스택 – 배열(pop)

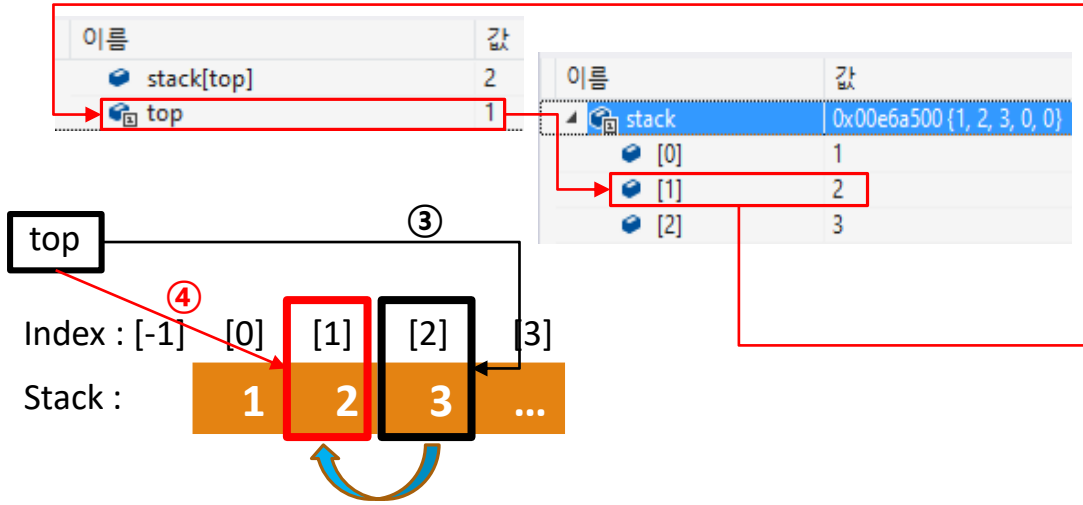
```
29  element pop( )    ①
30  {
31      if (is_empty( ))   ②
32      {
33          fprintf(stderr, "스택 공백 에러₩n");
34          exit(1);
35      }                          ④
36      else return stack[top--]; ③
37  }
```

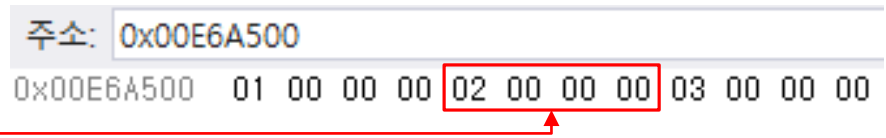
① pop

② Underflow 검사

③ stack 데이터 **'3'**출력

④ top 위치 1 감소





4. 스택 – 배열(pop)

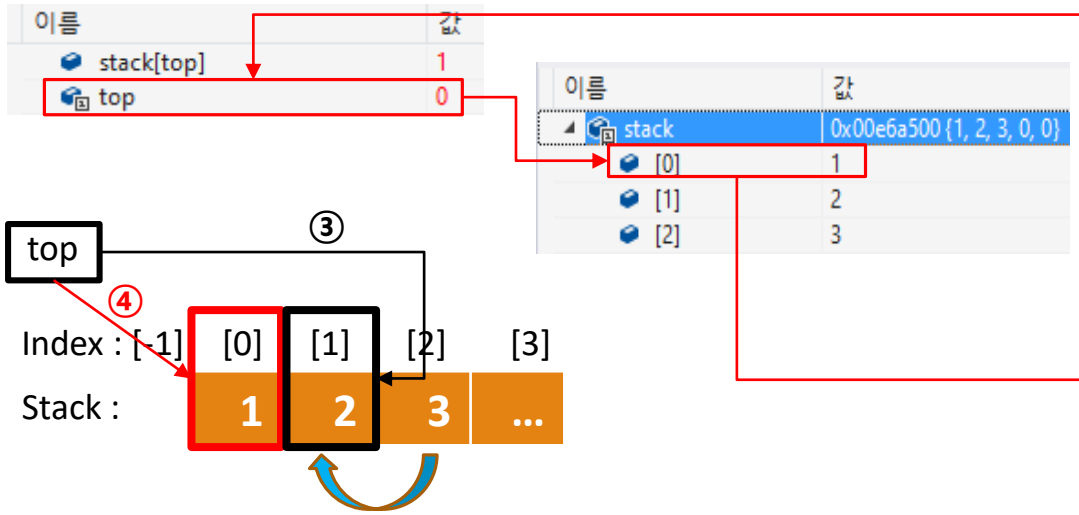
```
29  element pop( )    ①
30  {
31      if (is_empty( ))   ②
32      {
33          fprintf(stderr, "스택 공백 에러₩n");
34          exit(1);
35      }                          ④
36      else return stack[top--]; ③
37  }
```

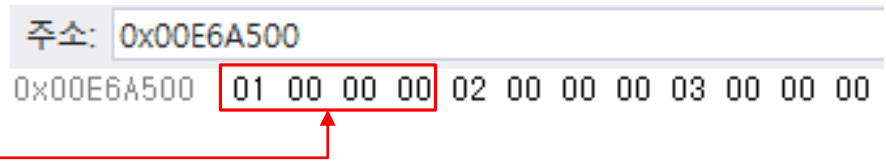
① pop

② Underflow 검사

③ stack 데이터 **'2'**출력

④ top 위치 1 감소





4. 스택 – 배열(pop)

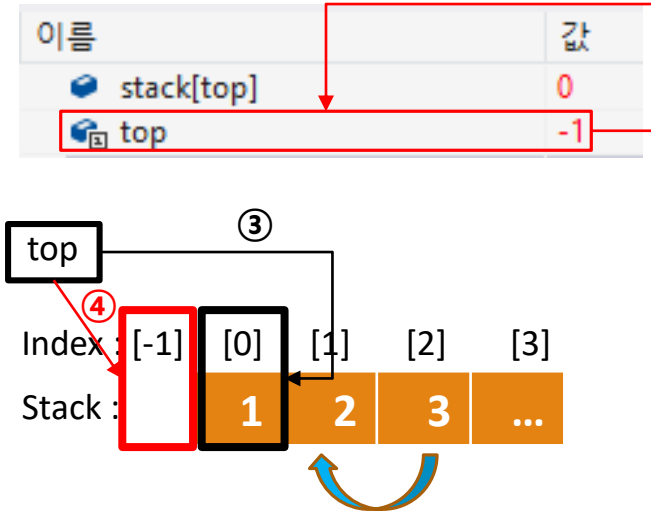
```
29  element pop( )    ①
30  {
31      if (is_empty( ))   ②
32      {
33          fprintf(stderr, "스택 공백 에러₩n");
34          exit(1);
35      }                          ④
36      else return stack[top--]; ③
37  }
```

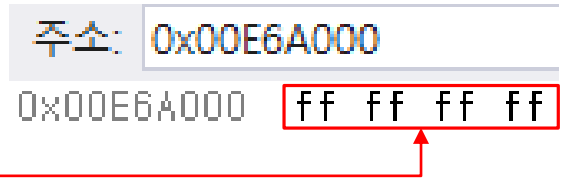
① pop 총 3회

② Underflow 검사

③ stack 데이터 **'1'**출력

④ top 위치 1 감소

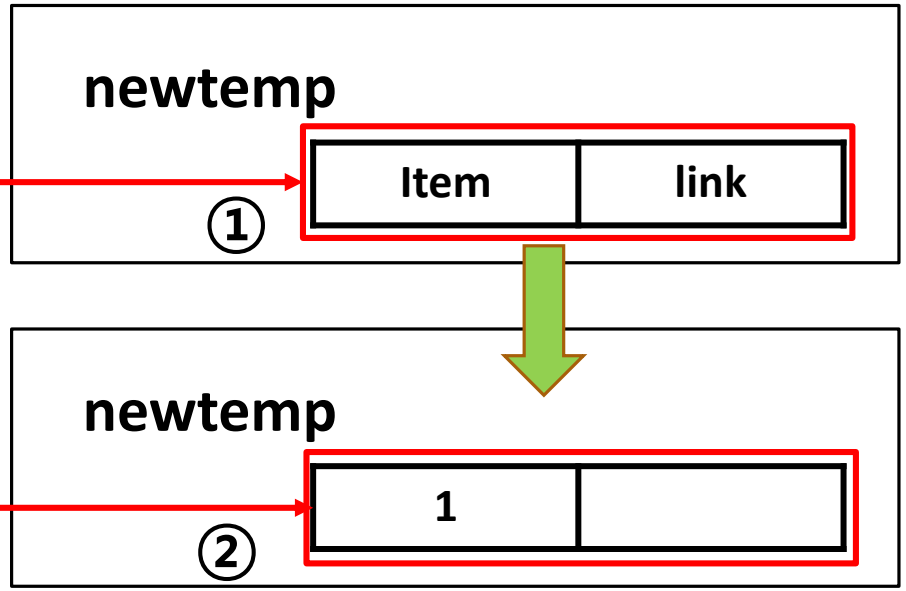


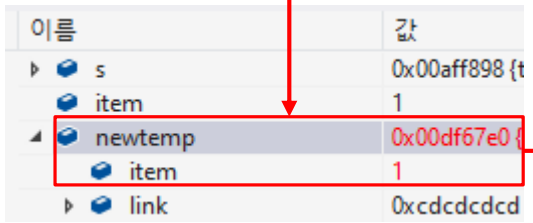


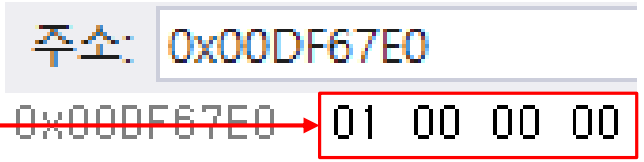
4. 스택 – 연결 리스트(push)

```
// 삽입 함수
void push(LinkedStackType* s, element item)
{
    StackNode* newtemp = (StackNode*)malloc(sizeof(StackNode));

    if (newtemp == NULL)
    {
        fprintf(stderr, "메모리 할당에러₩n");
        return;
    }
    else
    {
        newtemp->item = item;
        newtemp->link = s->top;
        s->top = newtemp;
    }
}
```







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void push(LinkedStackType* s, element item)
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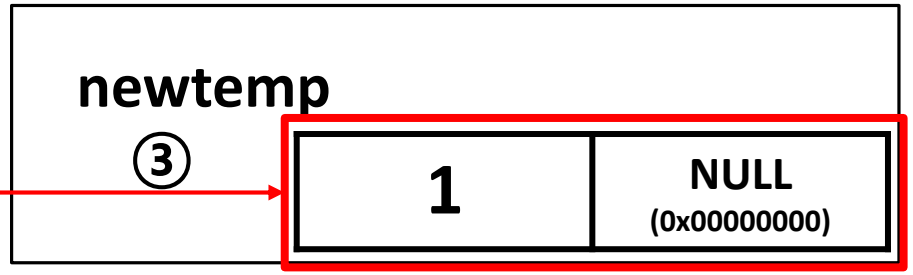
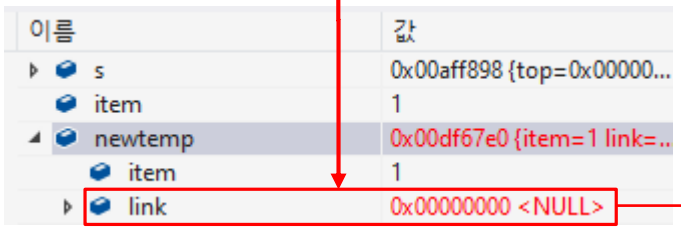
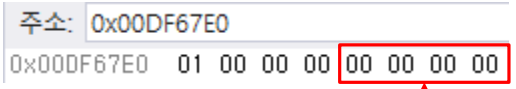
    if (newtemp == NULL)
    {
        fprintf(stderr, "메모리 할당에러₩n");
        return;
    }
    else
    {
        newtemp->item = item;
        newtemp->link = s->top;
        s->top = newtemp;
    }
}
```





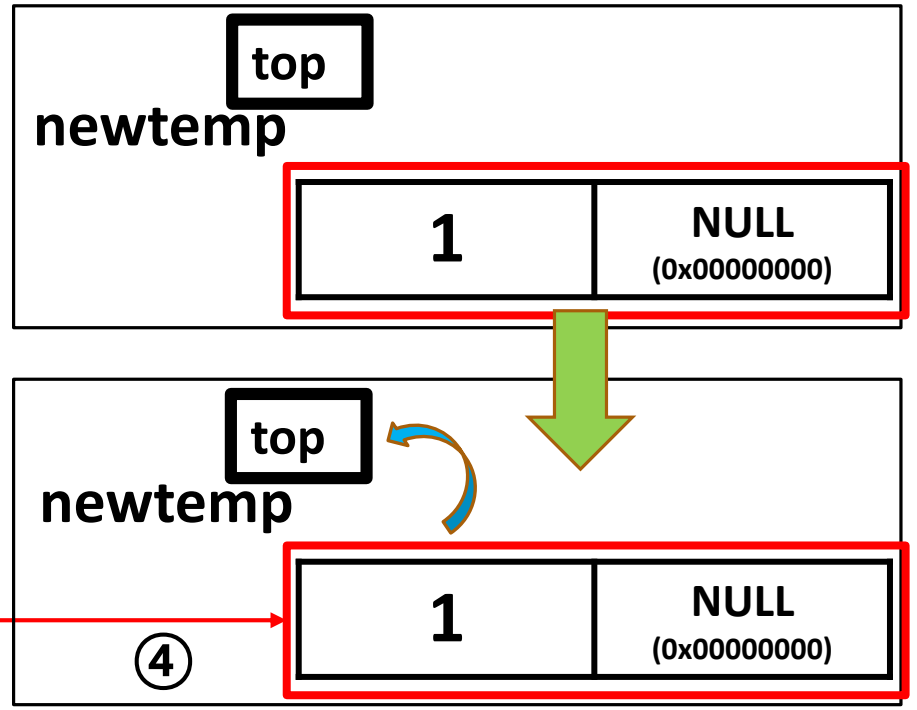


4. 스택 – 연결 리스트(push)

```
// 삽입 함수
void push(LinkedStackType* s, element item)
{
    StackNode* newtemp = (StackNode*)malloc(sizeof(StackNode));

    if (newtemp == NULL)
    {
        fprintf(stderr, "메모리 할당에러₩n");
        return;
    }
    else
    {
        newtemp->item = item;
        newtemp->link = s->top;
        s->top = newtemp;
    }
}
```

이름	값
s	0x00aff898 {top=0x00d
s->top	0x00df67e0 {item=1 lin
item	1
link	0x00000000 <NULL>



주소: 0x00AFF898

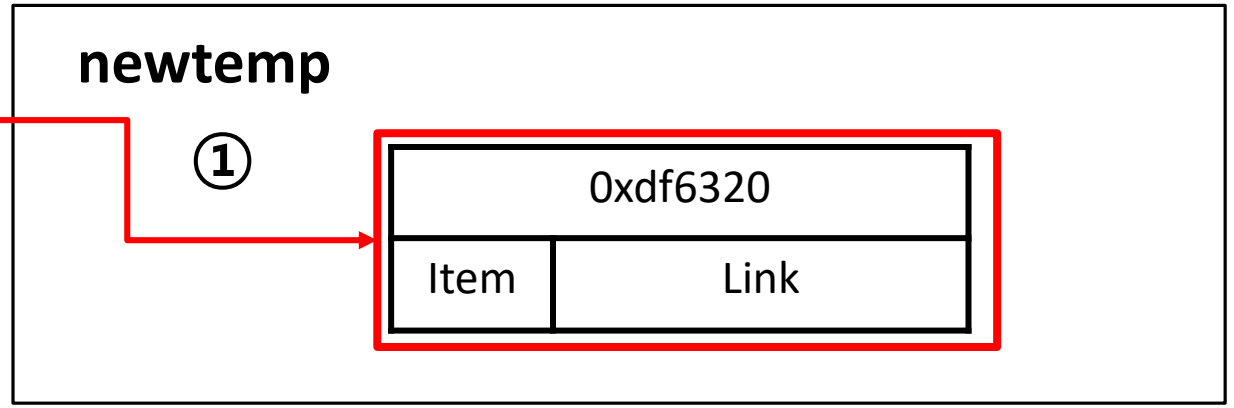
0x00AFF898 e0 67 df 00 cc cc cc cc

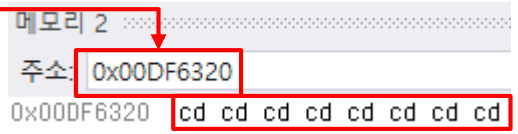
4. 스택 – 연결 리스트(push)

```
push(&s, 1);
push(&s, 2);
push(&s, 3);
```

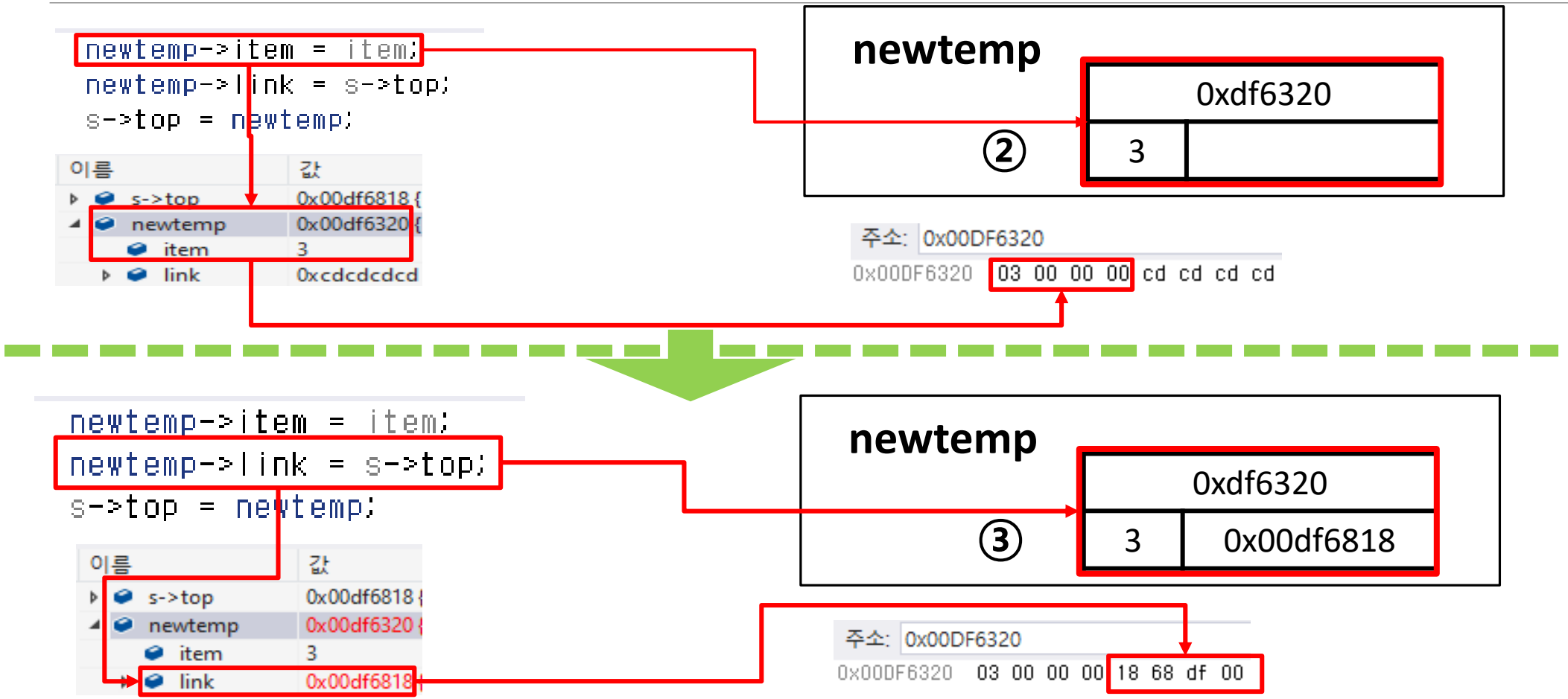

```
// 삽입 함수
void push(LinkedStackType* s, element item)
{
    StackNode* newtemp = (StackNode*)malloc(sizeof(StackNode));

    if (newtemp == NULL)
    {
        fprintf(stderr, "메모리 할당에러₩n");
        return;
    }
```

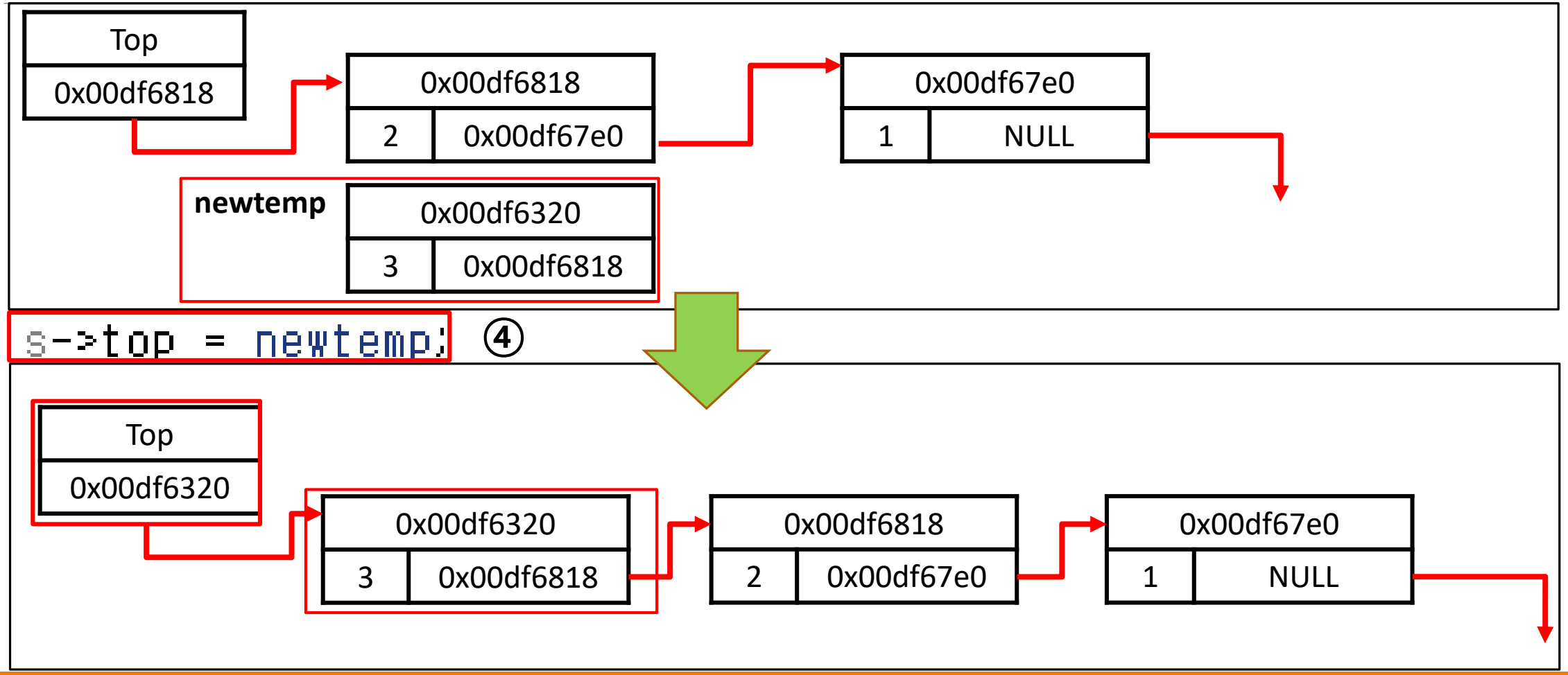




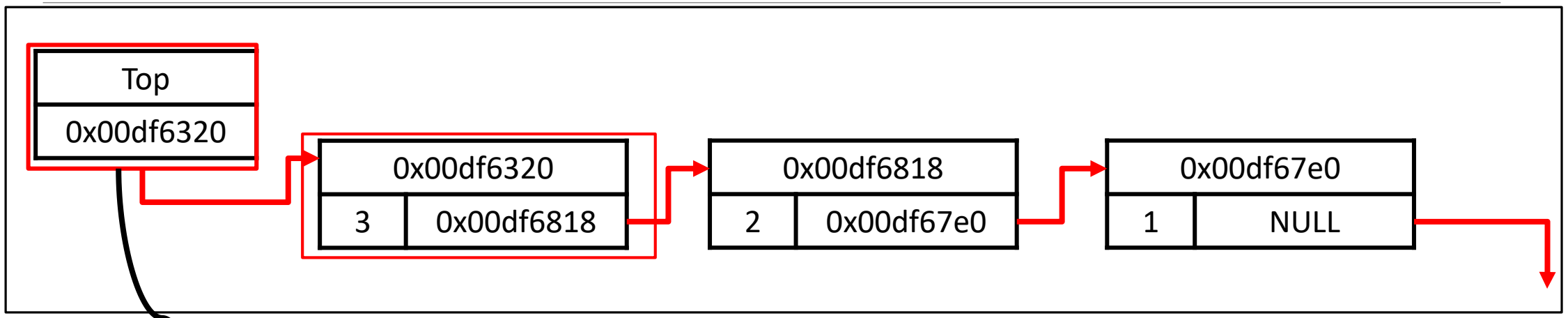
4. 스택 – 연결 리스트(push)

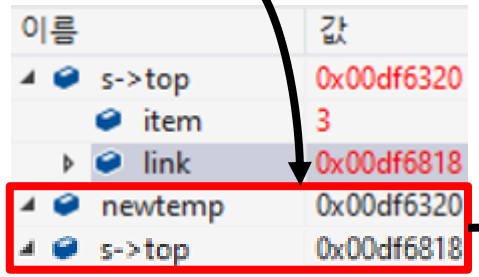


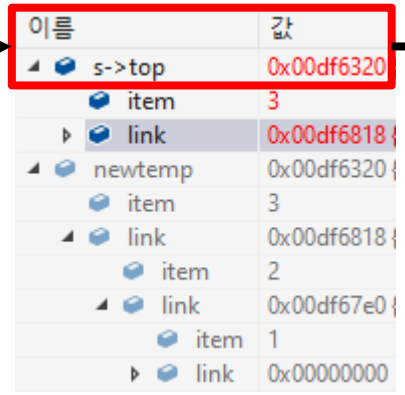
4. 스택 – 연결 리스트(push)



4. 스택 – 연결 리스트(push)

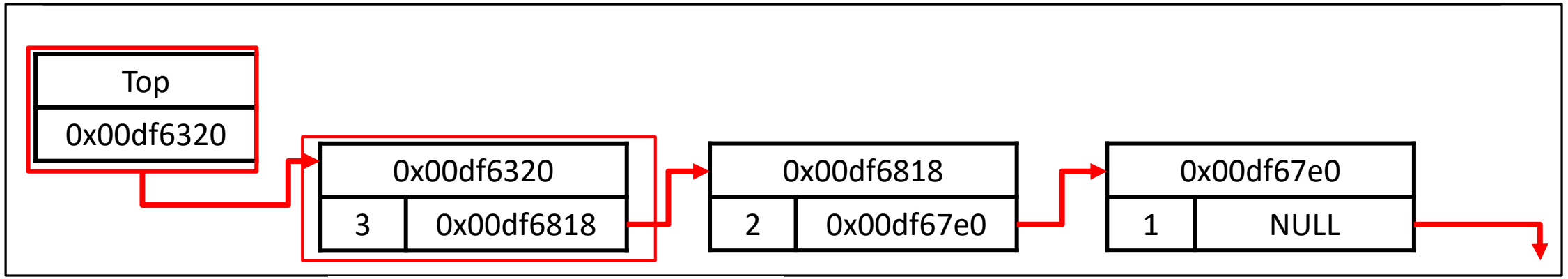






Push 연산을 하는 동안 top은
1 -> 2 -> '3'.
즉, 최종적으로 newtemp를
가리킨다.

4. 스택 – 연결 리스트(pop)




```
// 삭제 함수
element pop(LinkedStackType* s) ①
{  경과 시간 1ms 이하
    if (is_empty(s))②
    {
        fprintf(stderr, "스택이 비어있음₩n");
        exit(1);
    }
    else
    {
        StackNode* deltemp = s->top; ③
        int item = deltemp->item;

        s->top = s->top->link; ④
        free(deltemp); ⑤

        return item;
    }
}
```

① pop 총 3회

② Underflow 검사

③ stack 데이터 **'1'**출력

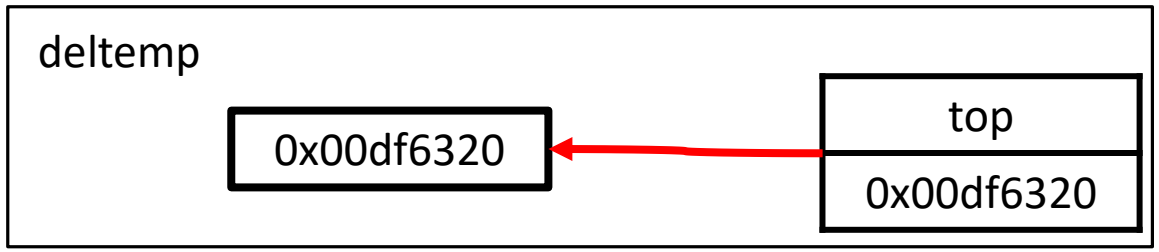
④ top 위치 1 감소

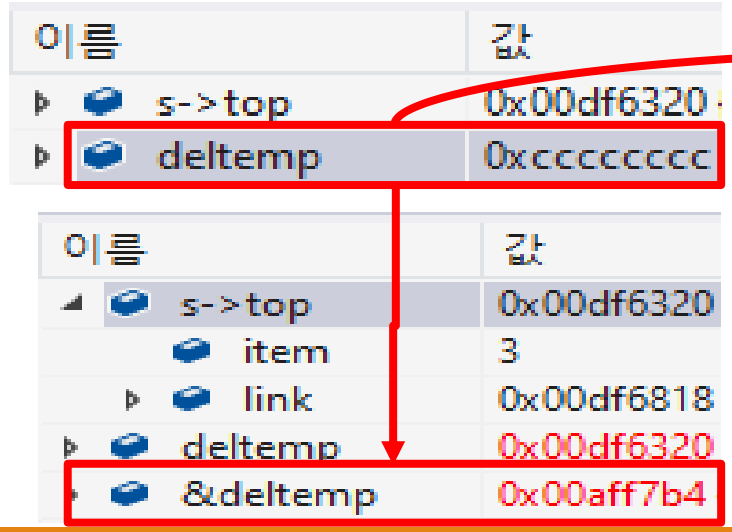
⑤ 기존 top 동적 메모리 해제

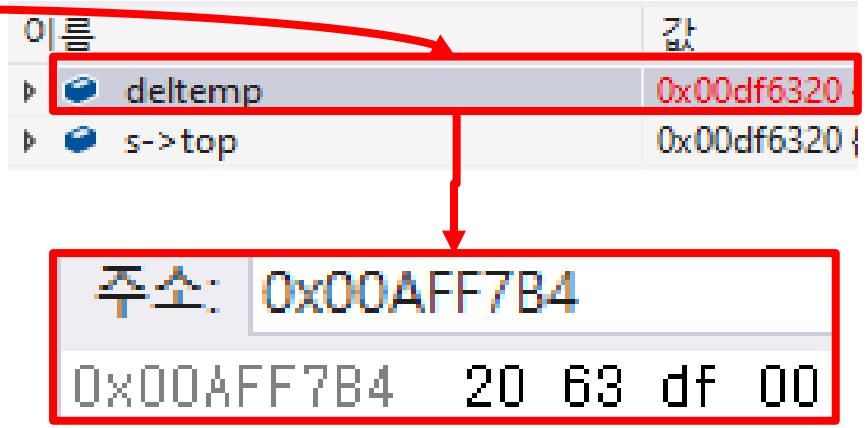
4. 스택 – 연결 리스트(pop)

```
StackNode* deltemp = s->top;
```

③ top의 메모리 주소 백업

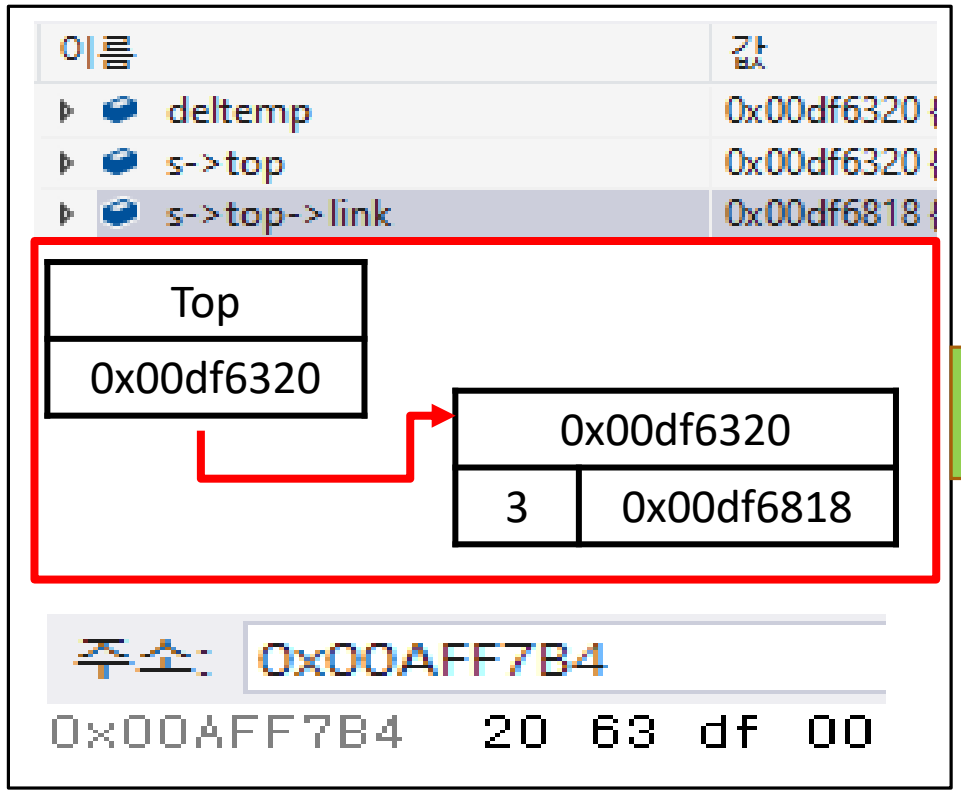




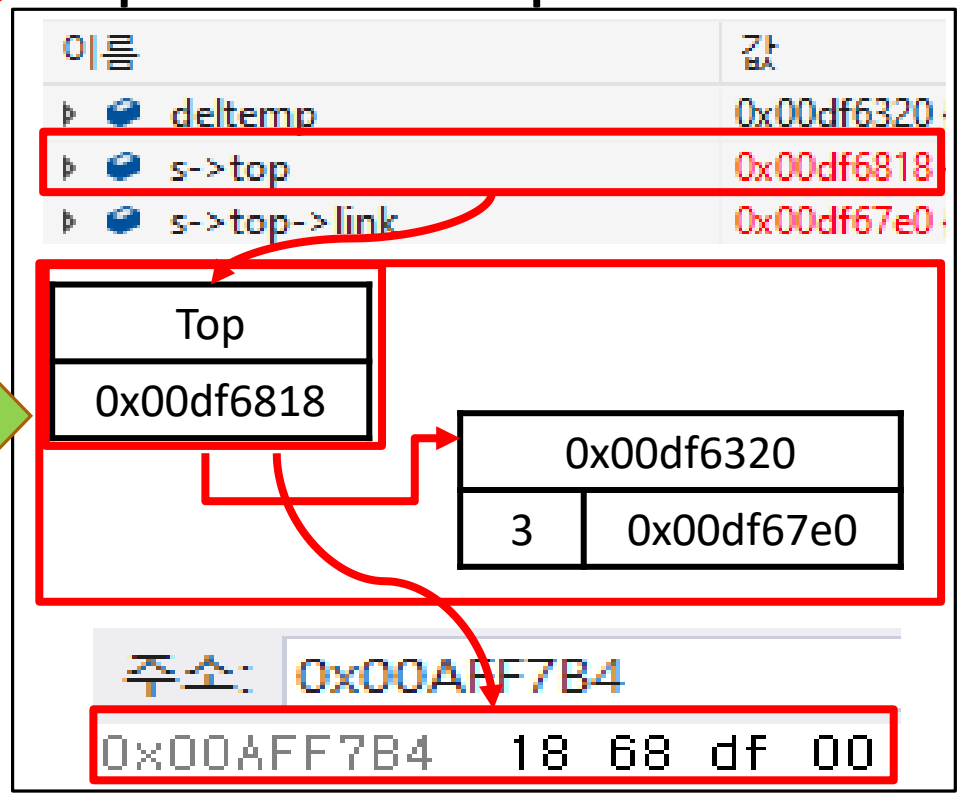


4. 스택 – 연결 리스트(pop)

```
s->top = s->top->link;④
```



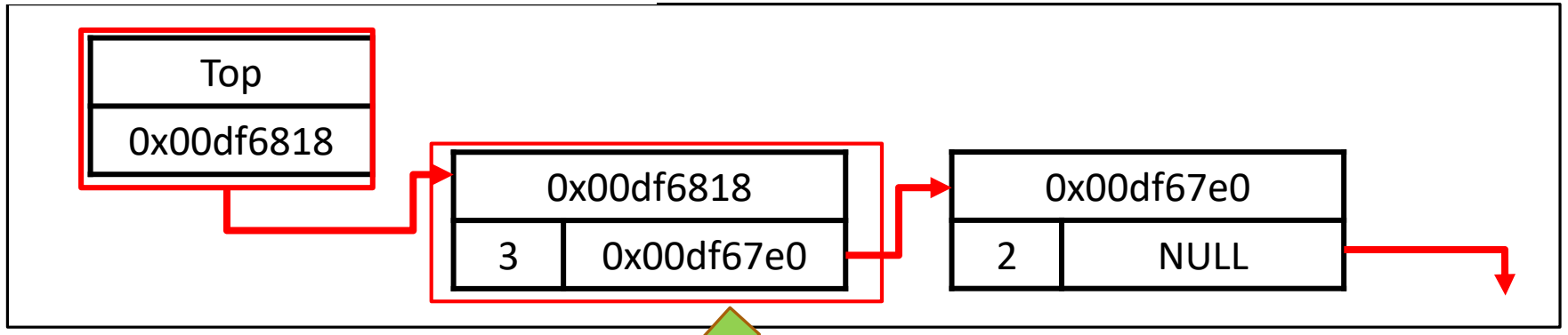
④ top의 값을 top->link로 변경



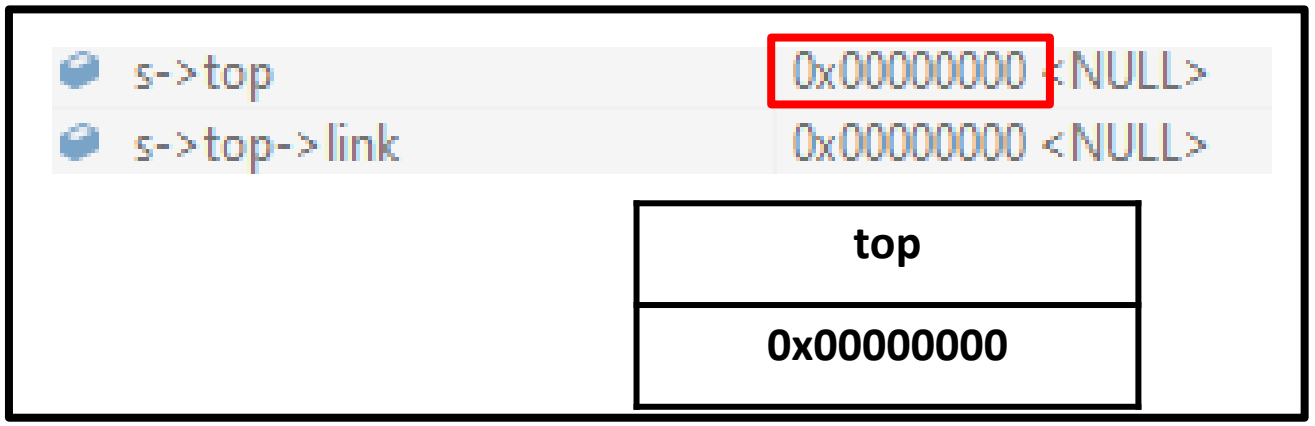
4. 스택 – 연결 리스트(pop)

```
free(deltemp);
```
⑤

⑤기존 top 동적 메모리 해제




```
printf("%d₩n", pop(&s));
printf("%d₩n", pop(&s));
printf("%d₩n", pop(&s));
```



- ***총 pop() 연산 3회 수행하여 결과는 3 -> 2 -> 1 순으로 데이터를 pop 한다.***

5. 구현

구현 환경

OS : Windows 10 / 64 bit

IDE : Visual Studio 2019