

# Implementing the Caesar Cipher

## Counting Loops

# Concept Review: Loops, Indexes

- You've used different loops in solving problems:
  - Finding Codons or Tags in a String
    - **`while(true) {... break ...}`**
  - Reading lines from a FileResource
    - **`for(String s : fr.lines()) {...}`**
- You've used indexes to access strings
  - **`"cgatga".indexOf("atg");`**
  - **`"cgatga".substring(1,4);`**



# Accessing Characters in a String

- The reverse of "CGATTA" is "ATTAGC"
  - Useful in genomics to process strand this way
- Palindromes can be source of fun
  - Нажал кабан на баклажан
  - Alli trota la tortilla
  - Eh, ça va, la vache?
  - Draw, O Caesar, erase a coward.
- How do we create the reverse of a string?

# Indexing a String

- Must understand for loop with three parts
  - Separated by semi-colons
  - Initialization (happens once, before guard)

```
public String reverse(String s){  
    String ret = "";  
    for(int k=0; k < s.length(); k += 1){  
        ret = s.charAt(k) + ret;  
    }  
    return ret;  
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```

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# Indexing a String

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  - Guard, evaluated before loop body
  - Increment, executed after loop body

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# For and While Compared

- For loop: "syntactic sugar" for while loop

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}
```

```
public String reverse(String s){  
    String ret = "";  
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    while (k < s.length()){  
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- initialize

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- loop guard

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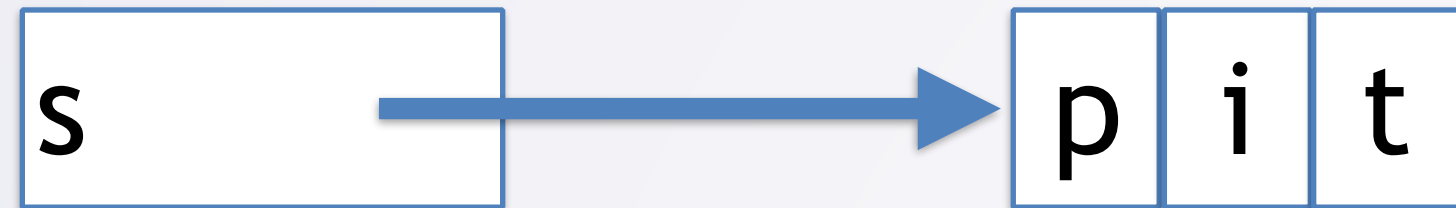
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# Anatomy of a For Loop

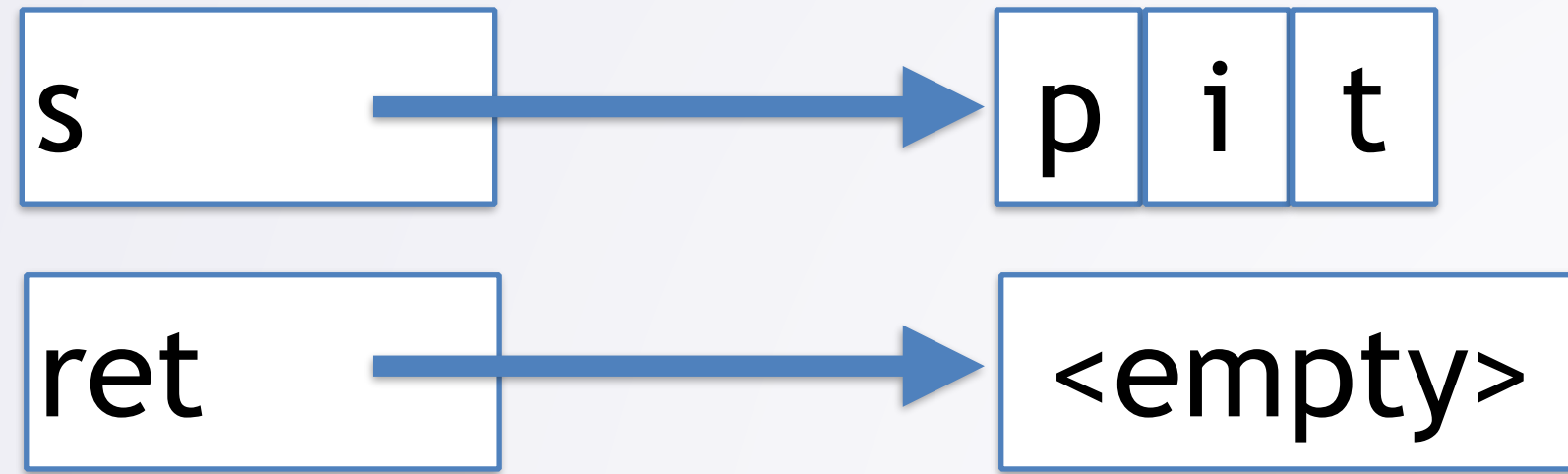
- Consider the call `reverse("pit")`



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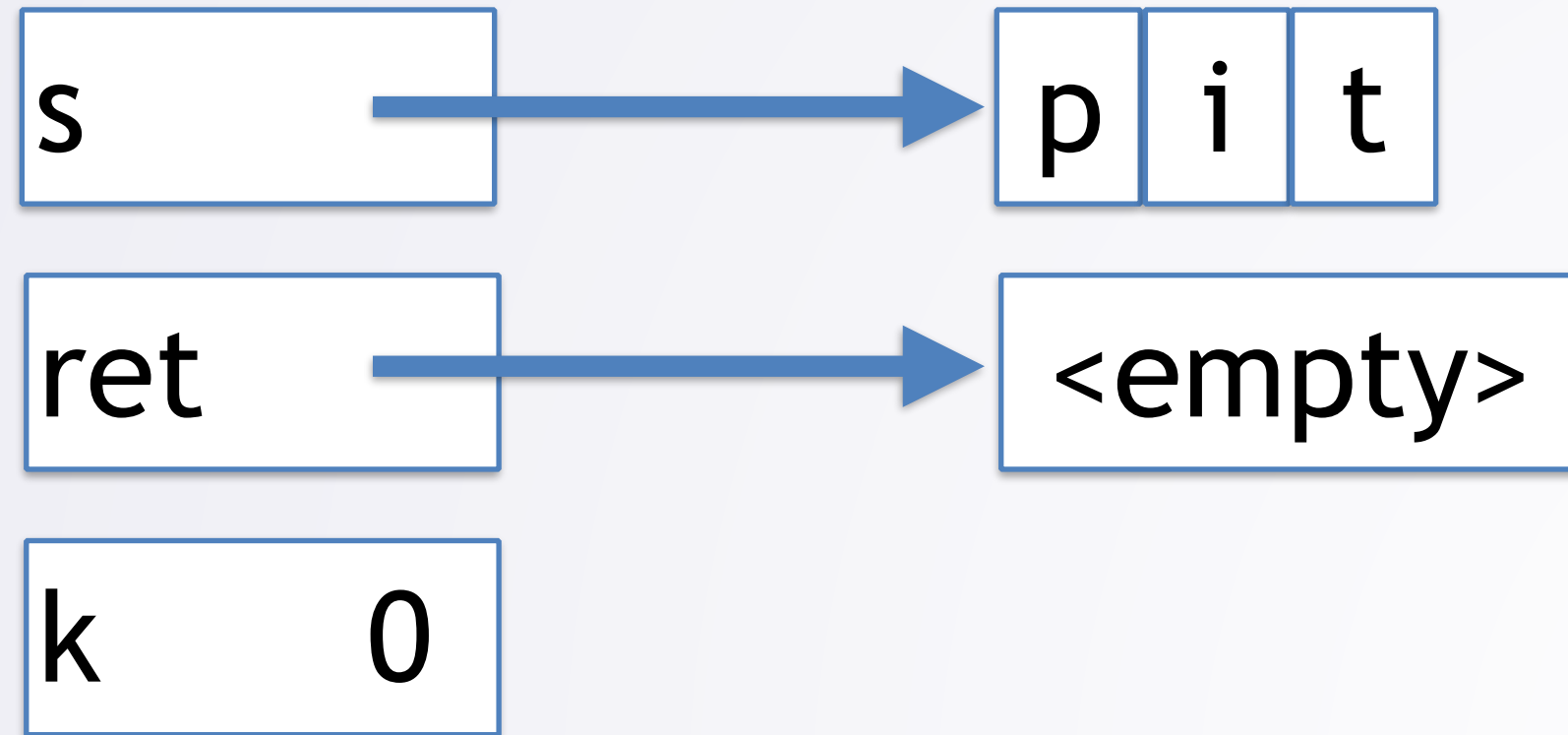
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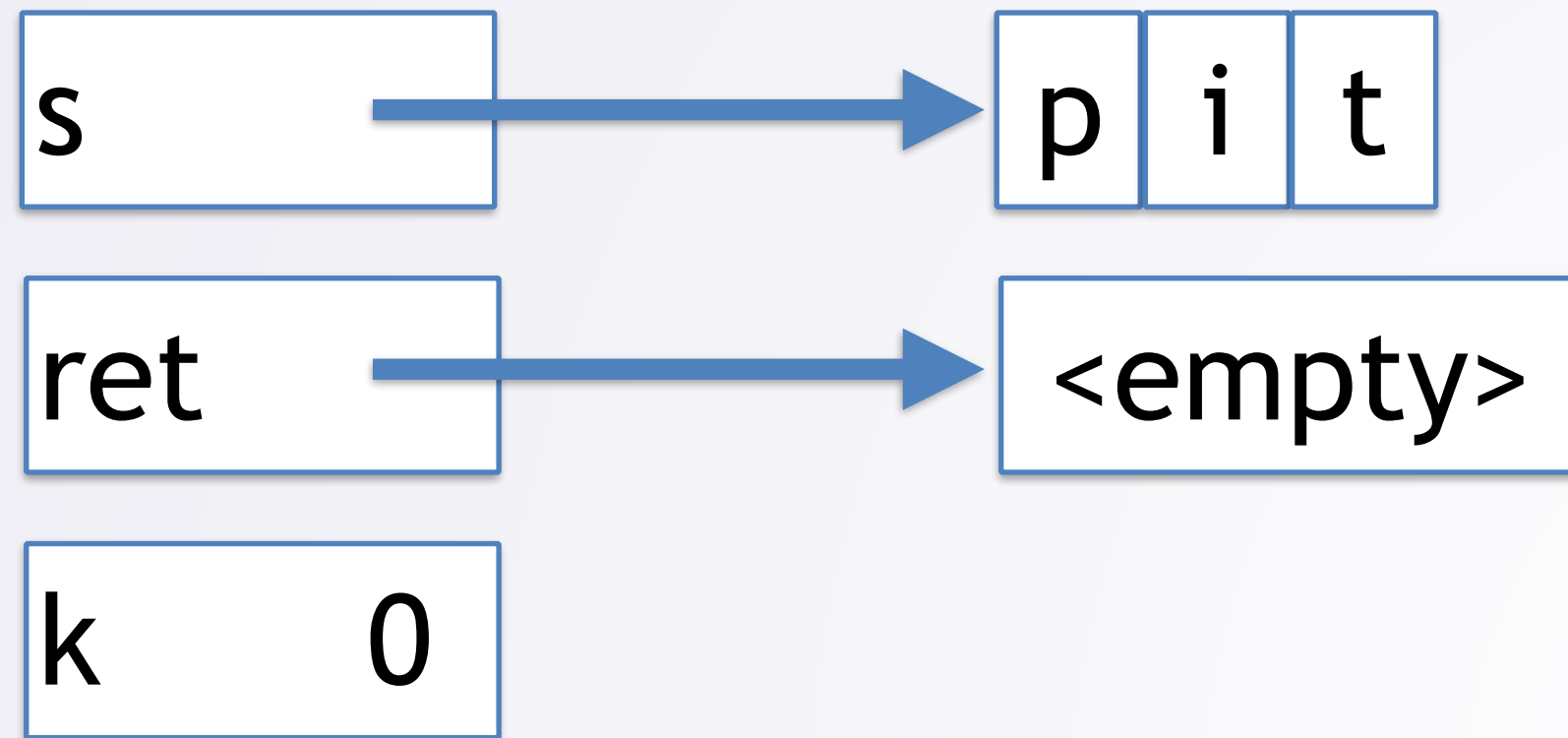


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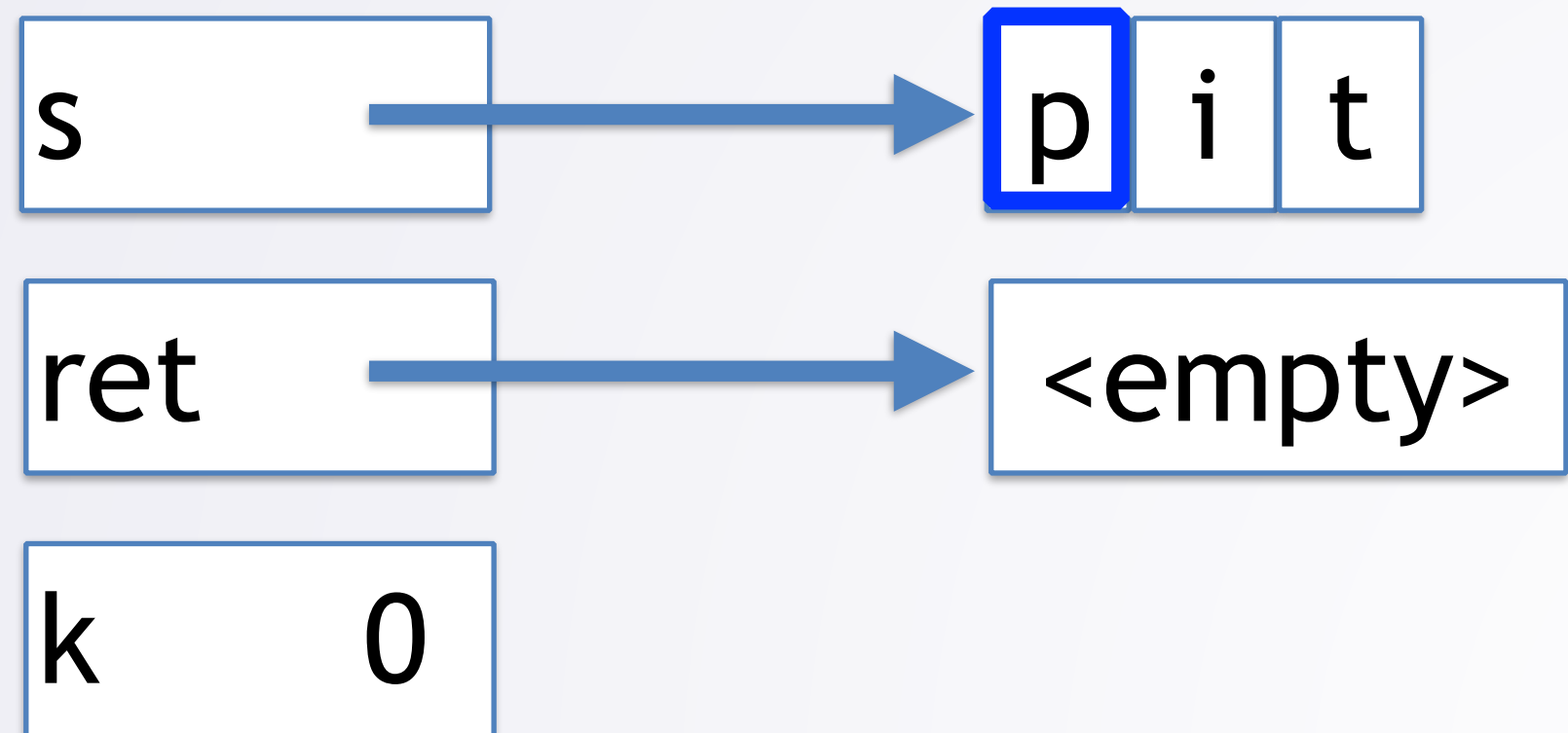
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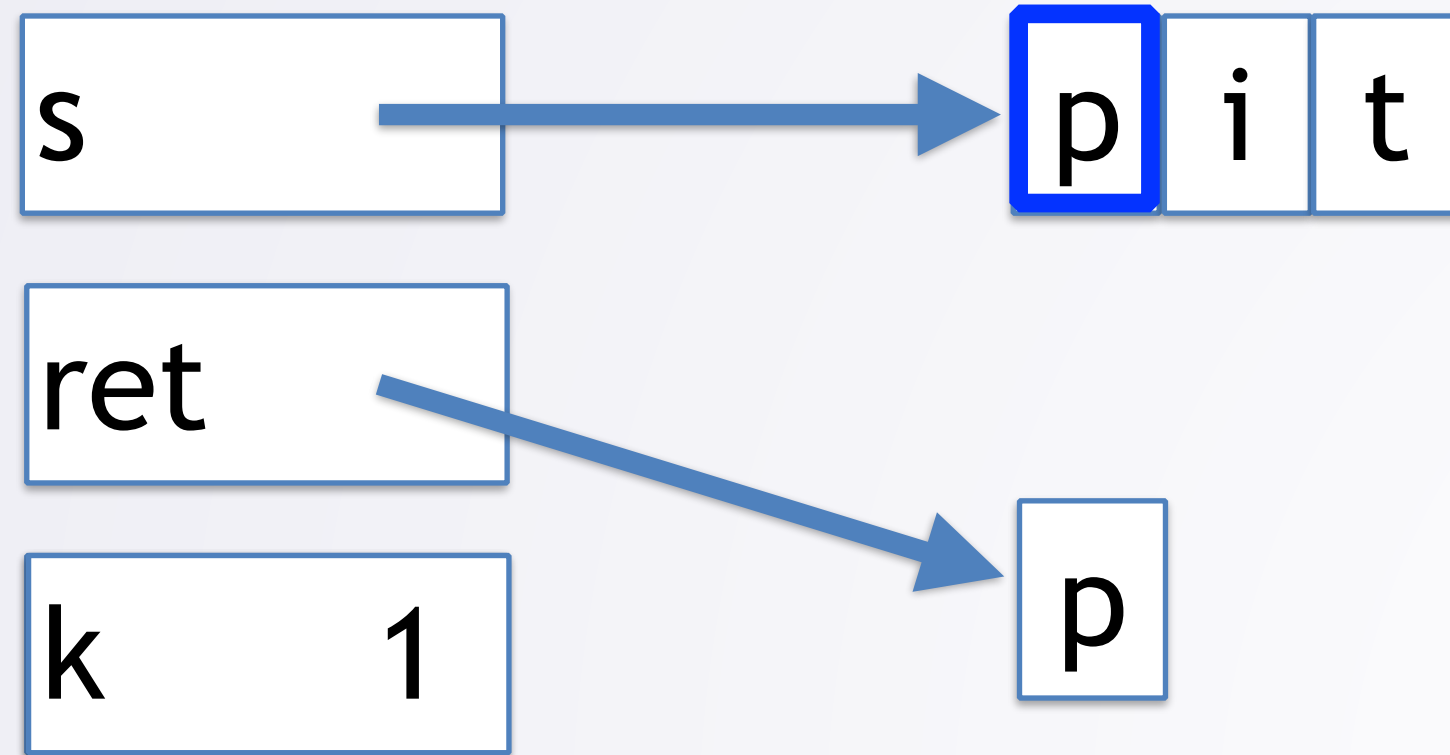


`'p' + "" = "p"`

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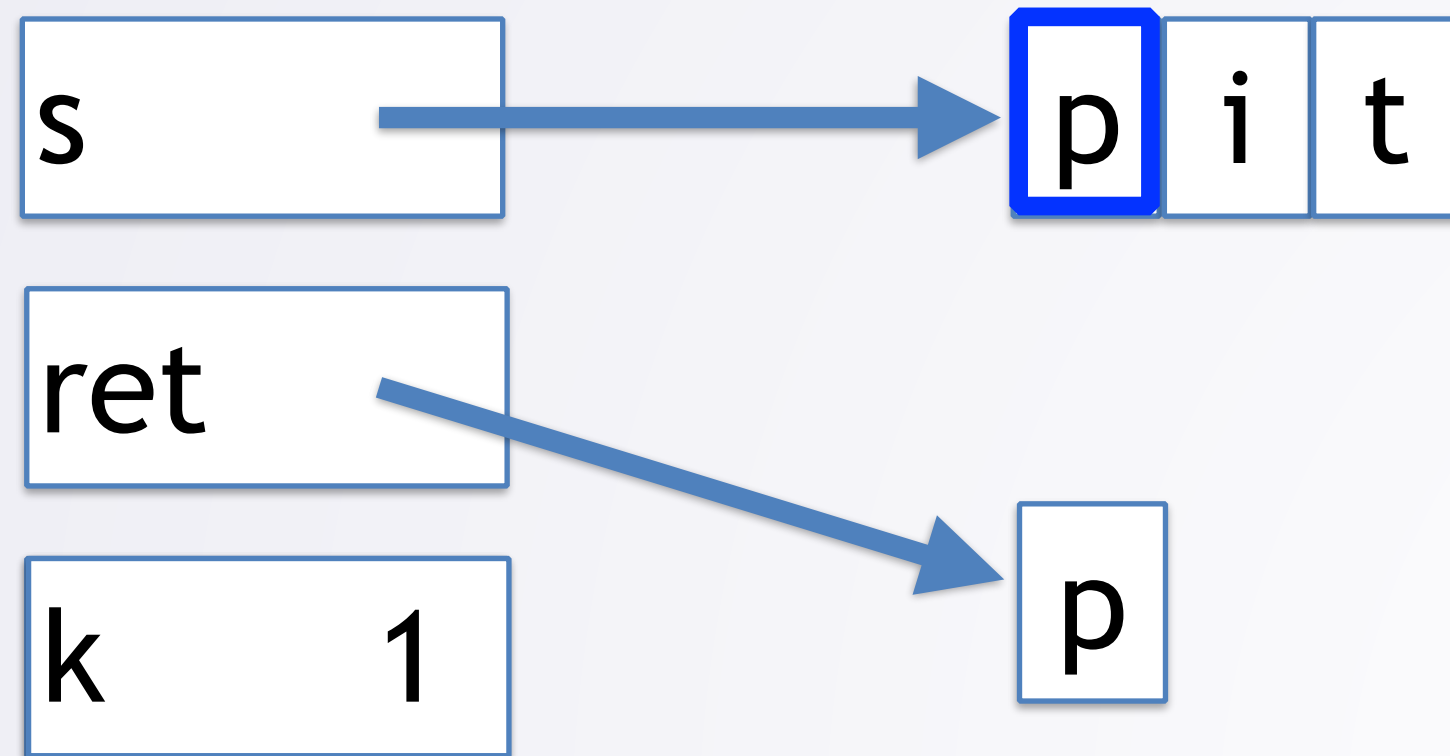
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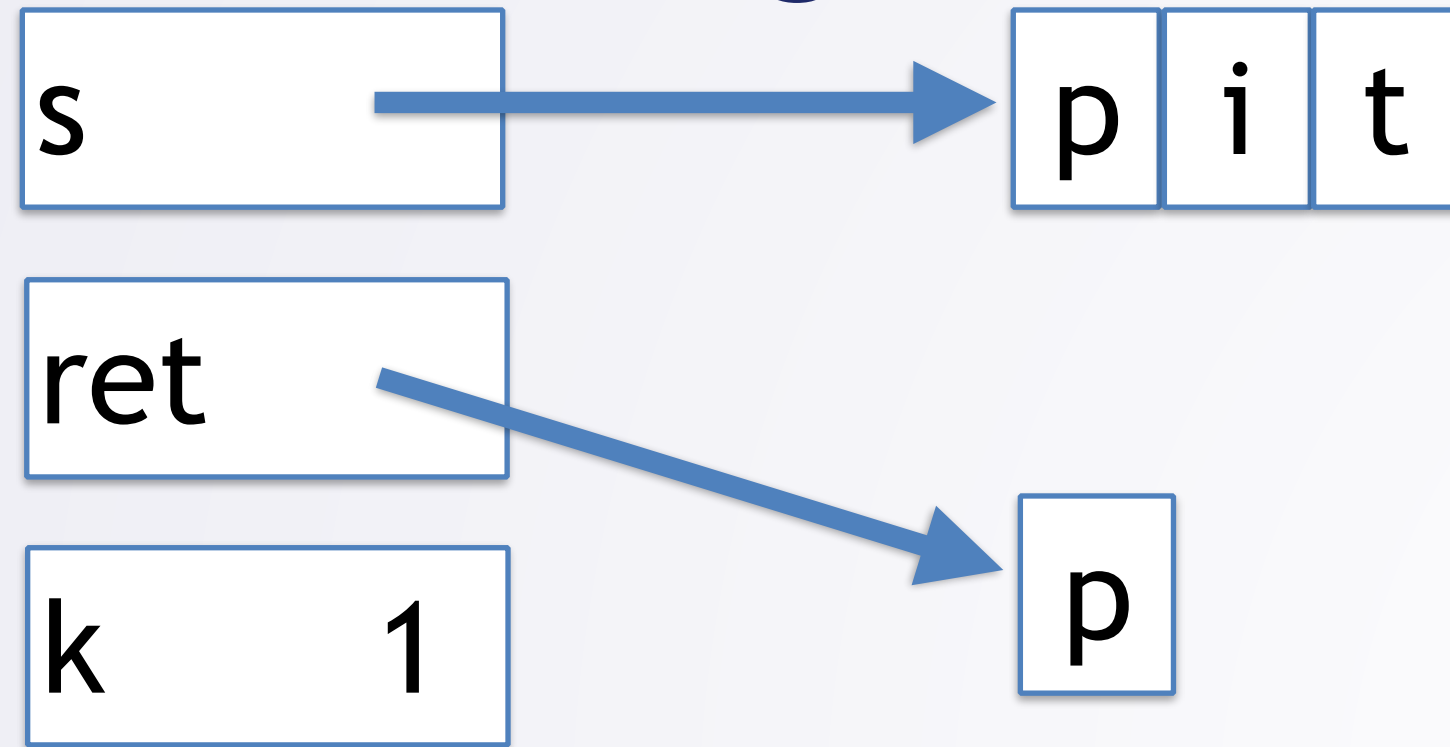
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# Continuing with Loop Tracing

- Continuing with tracing reverse("pit")



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s → p i t

ret

k 1

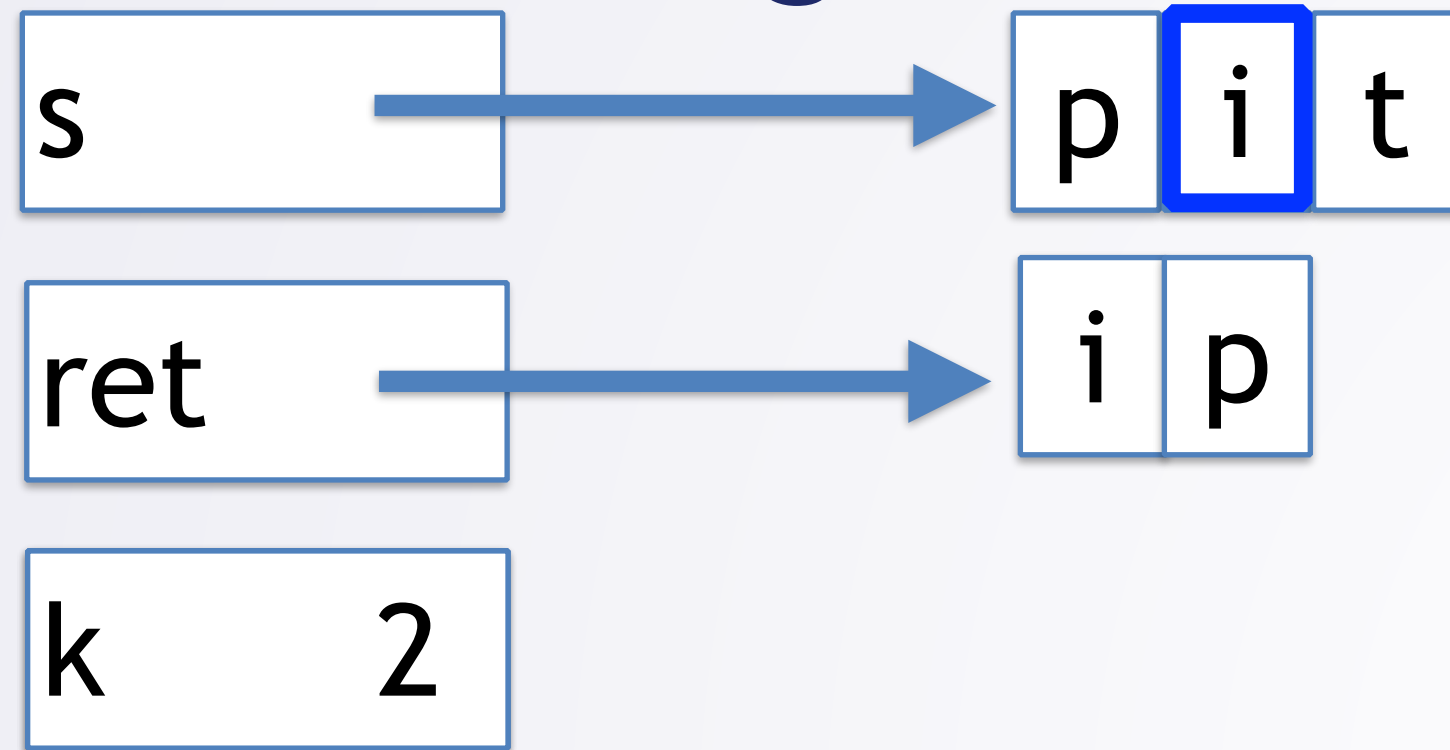
p

'i' + "p" = "ip"

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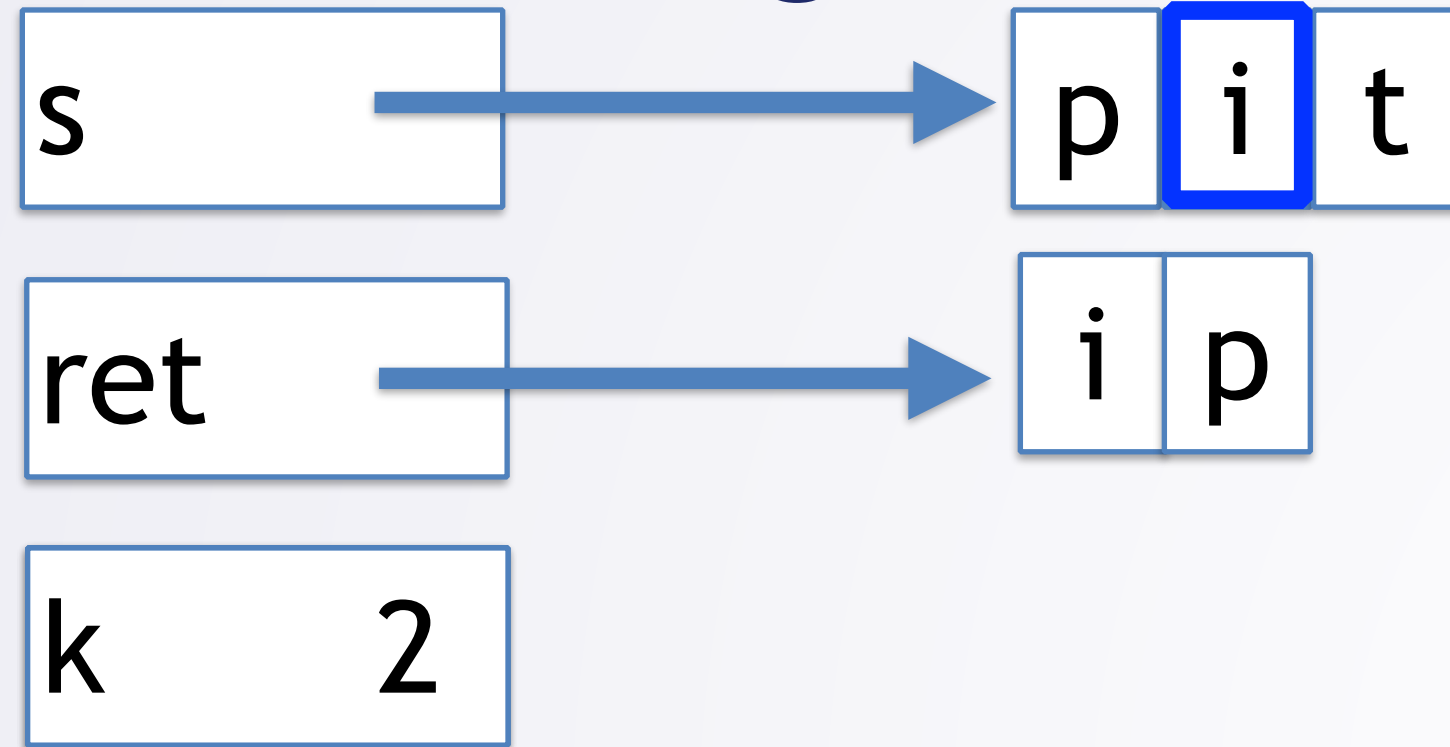
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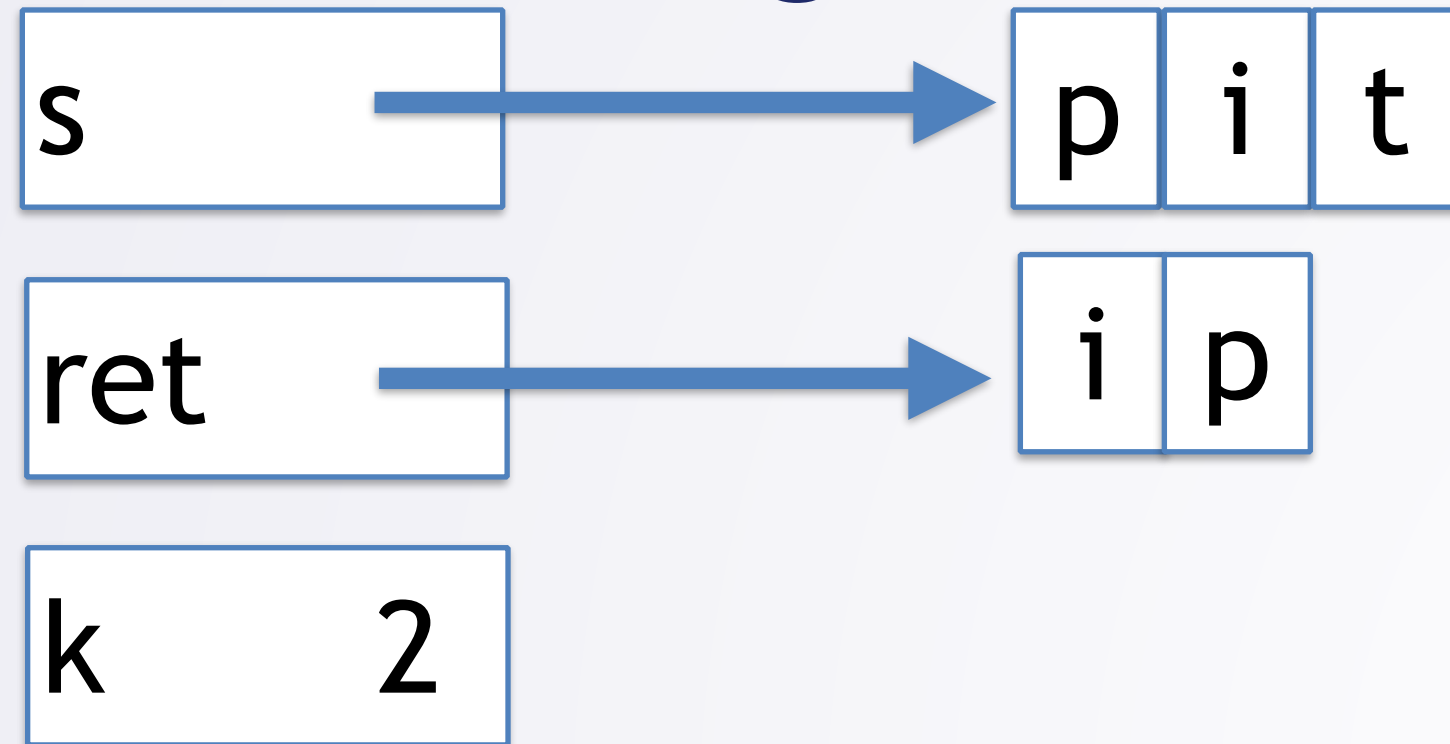
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s → p i t

ret → i p

k 2

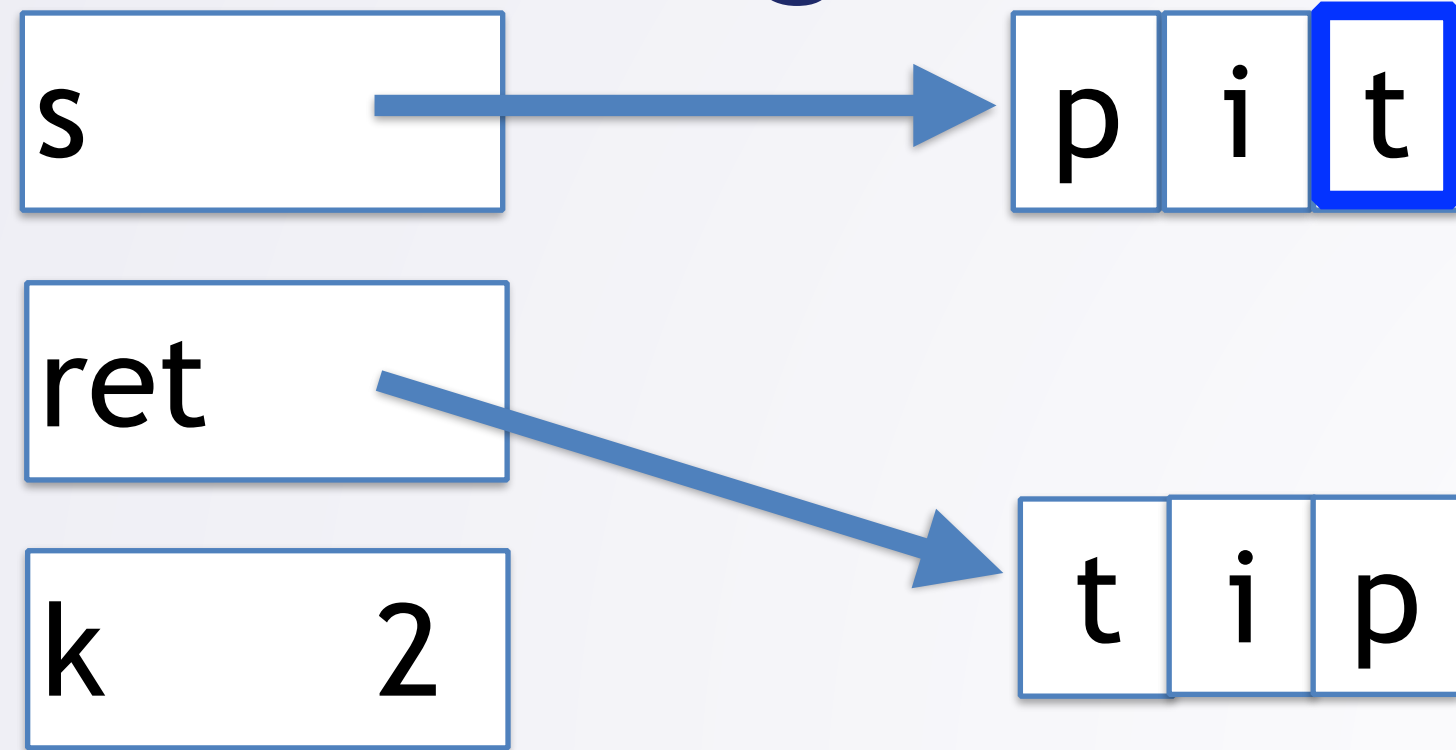
't' + "ip" = "tip"

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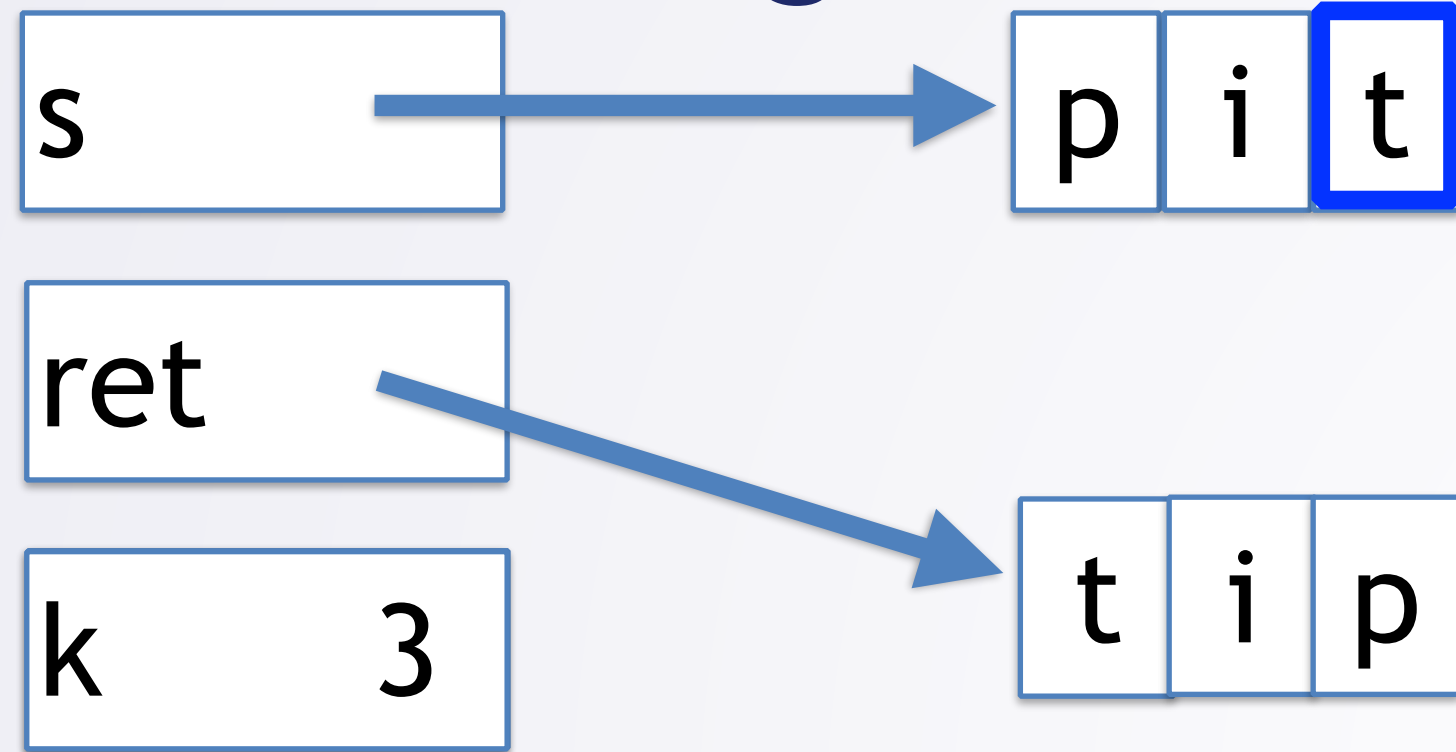
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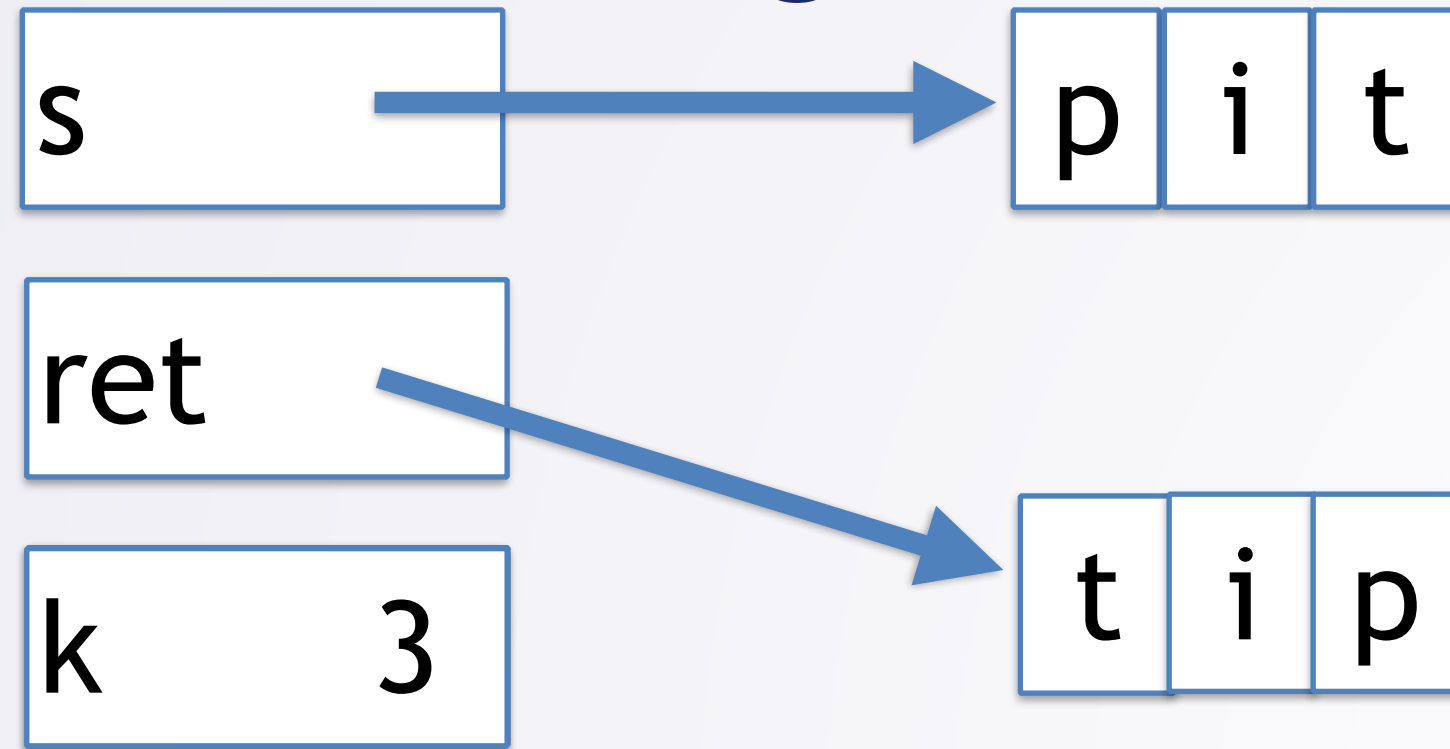
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ret

k 3

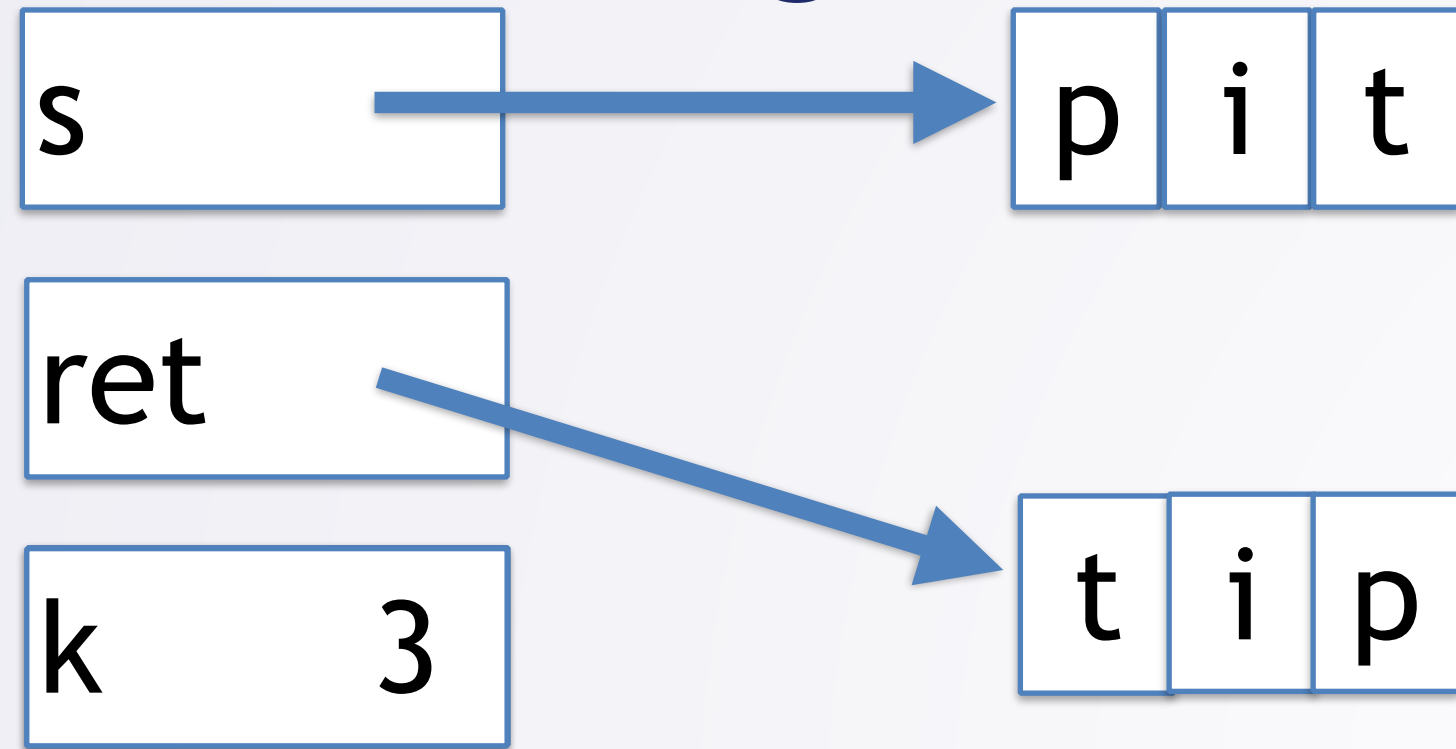
t i p

**3 < 3 is false**

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# Idiomatic For Loop

- Many programmers use `i` as index variable

```
for(int i=0; i < s.length(); i += 1)
```

- Many programmers use `i++`, not `i += 1`

```
for(int i=0; i < s.length(); i++)
```

- Sometimes declare variable before loop, so scope extends to after loop

```
int i;  
for(i=0; i < s.length(); i += 1){  
}  
// can reference value of i here
```