8. Iteration: Strings

Topics:

Using Methods from the string class

Iterating through a string with `for`

Iterating Through a String

Two problems we cannot easily solve:

1. Given a string `s`, assign to `t` the "reversed" string. `'abcd'` → `'dcba'`

2. Given a string `s`, how many digit characters does it contain? `'1or2or3'` → `3`

The Reverse String Problem

```
s =  'abcd'
t = ''
for c in s:
    t = c + t
```

s -> 'abcd'

t -> 'dcba'

How does the `for` loop work?

The Number-of-Digits Problem

```
s =   '2x78y'
n = 0
for c in s:
    if c.isdigit():
        n=n+1
```

s -> '2x78y'

n -> 3

How does the **for** loop work?

Using for to Traverse a String Character-by-Character

```
s = 'abcd'
for c in s:
    print c
```

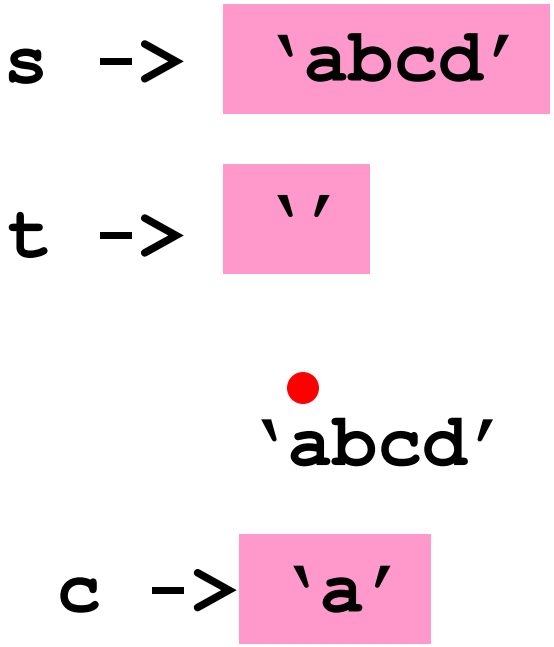
Output:

```
a
b
c
d
```

In this example, the "for-loop" variable is `c`. One at a time, it takes on the value of each character in s.

The Reverse String Problem

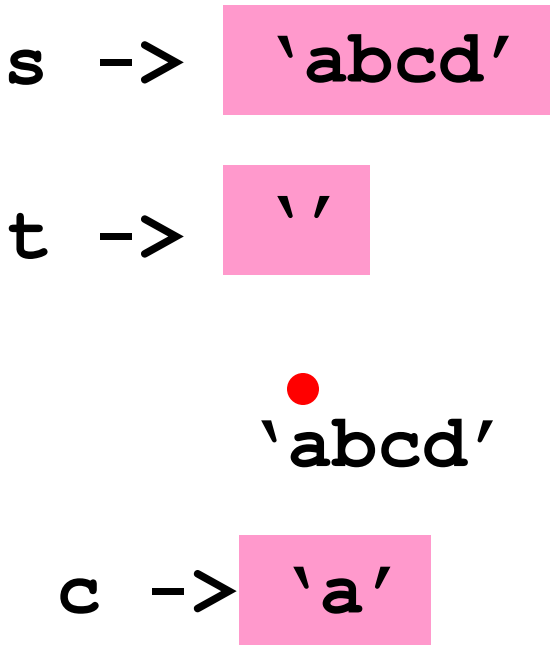
```
s =  'abcd'
t = ''
for c in s:
    t = c + t
print t
```



At the start of the loop, c is assigned the zeroth character in s.

The Reverse String Problem

```
s = 'abcd'
t = ''
for c in s:
    t = c + t
print t
```



The loop body is executed using that value in c.

The Reverse String Problem

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t = ''
for c in s:
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print t
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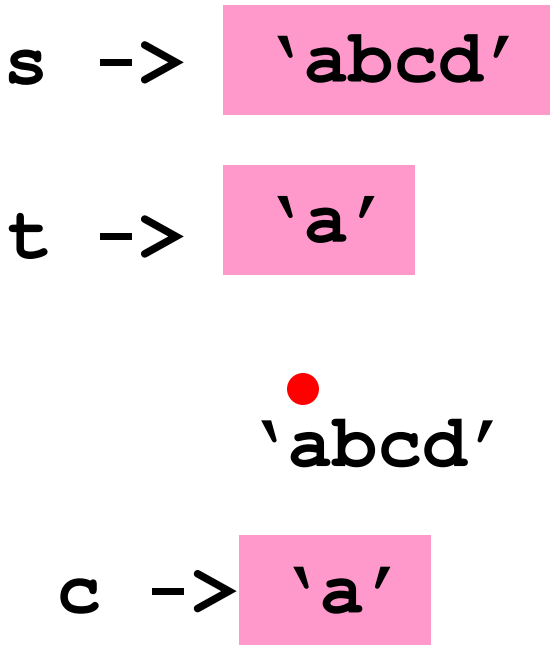

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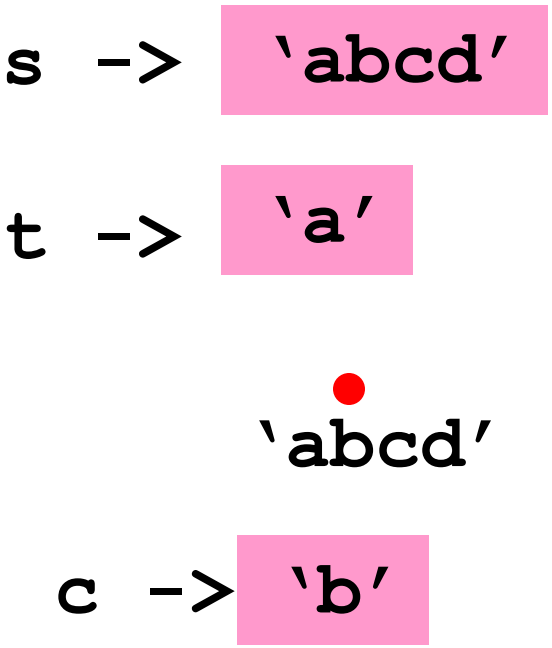
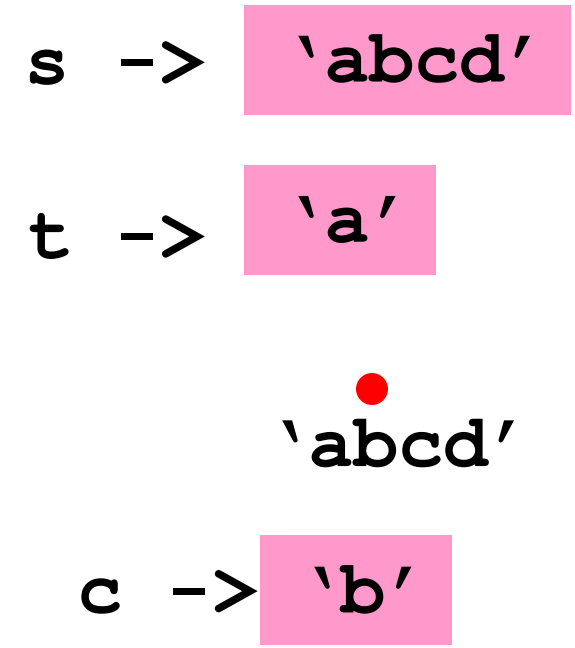


The next time through the loop, c is assigned the first character in s.

The Reverse String Problem

```
s = 'abcd'
t = ''
for c in s:
    t = c + t
print t
```



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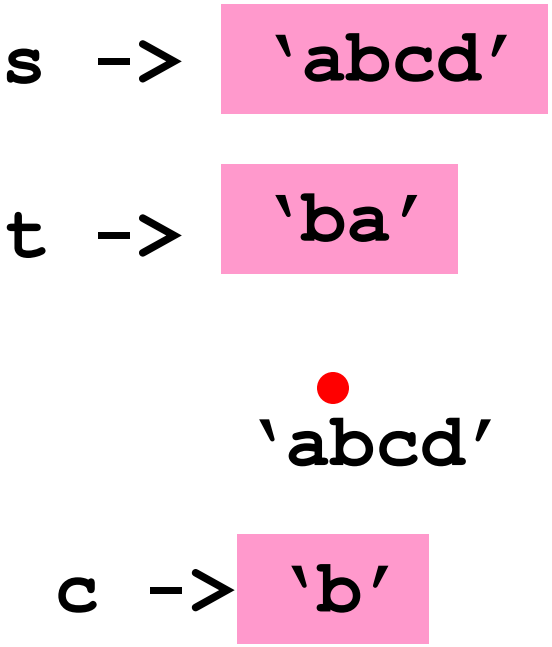

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print t
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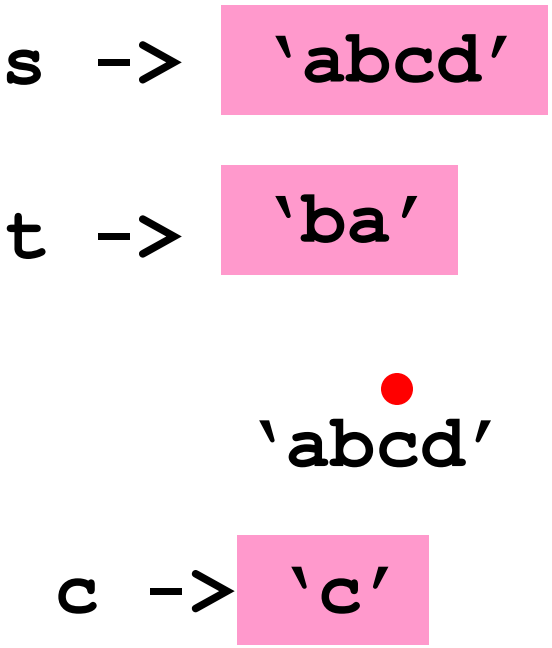
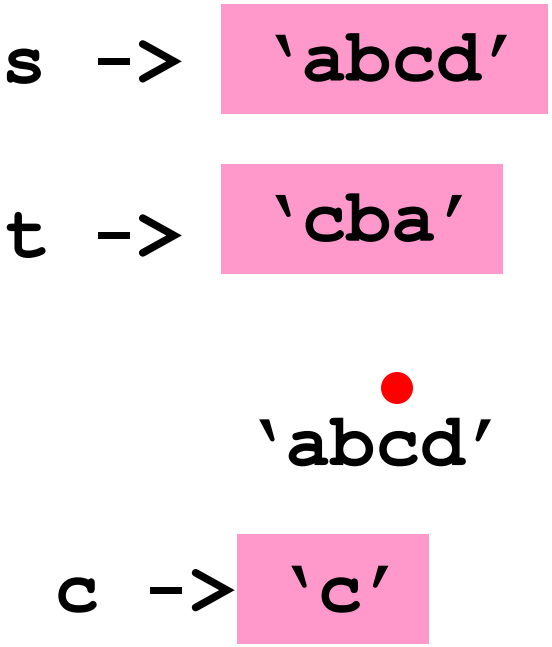


The next time through the loop, c is assigned the second character in s.

The Reverse String Problem

```
s = 'abcd'
t = ''
for c in s:
    t = c + t
print t
```



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The Reverse String Problem

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t = ''
for c in s:
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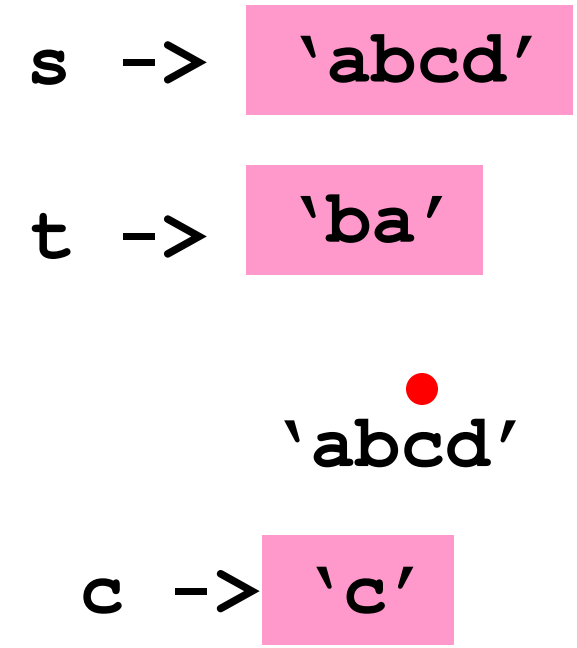
print t
```



The loop body is executed using that value in c.

The Reverse String Problem

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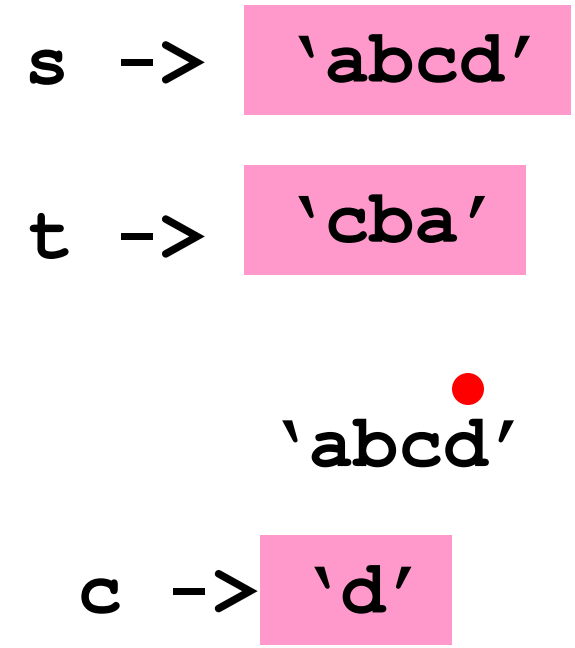
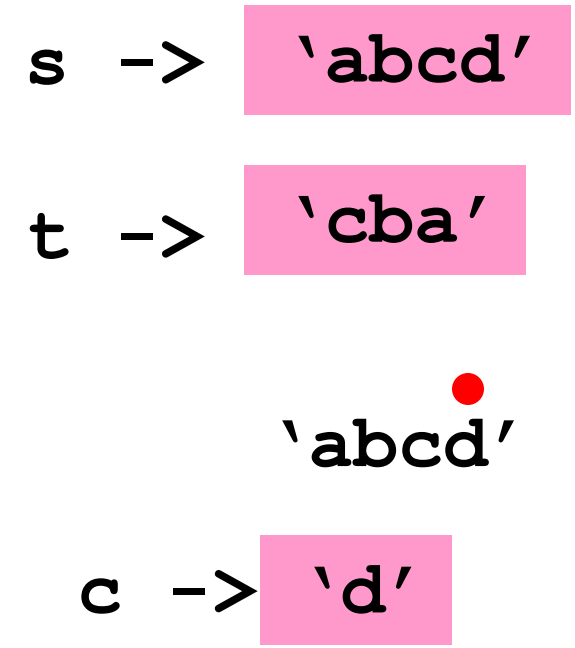
t = ''
for c in s:
    t = c + t
print t
```



The last time through the loop, c is assigned the third character in s.

The Reverse String Problem

```
s = 'abcd'
t = ''
for c in s:
    t = c + t
print t
```



The loop body is executed using that value in c.

The Reverse String Problem

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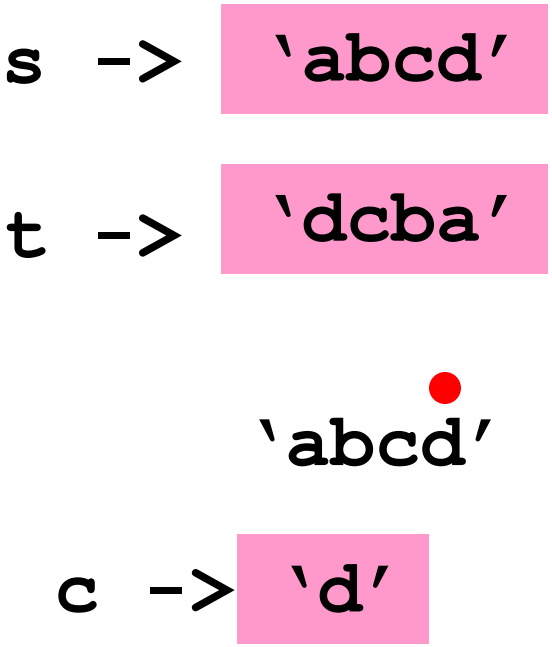
t = ''
for c in s:
    t = c + t
print t
```



The loop body is executed using that value in c.

The Reverse String Problem

```
s =  'abcd'
t = ''
for c in s:
    t = c + t
print t
```

s -> 'abcd'

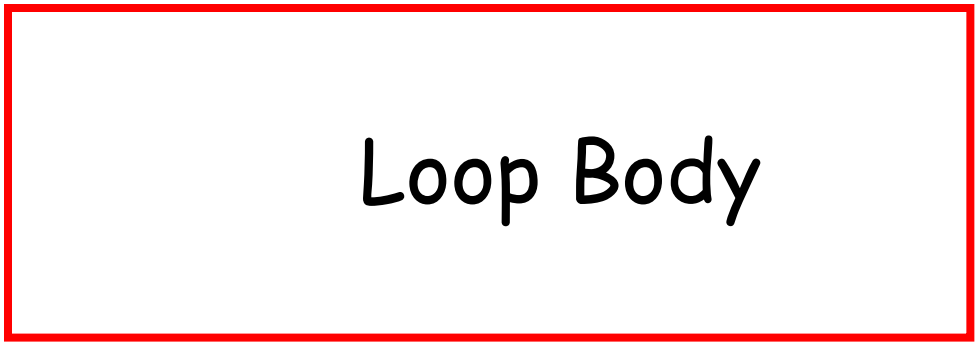
t -> 'dcba'

Output: dcba

The string has been traversed. The iteration ends. The next statement after the loop is executed. Indentation important.

for-loop Mechanics

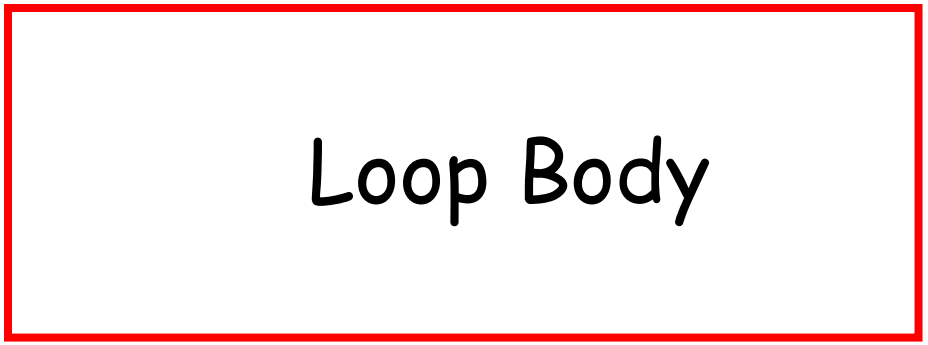
```
for <loop variable> in <string>:
```



If the string has length `n`, then the loop body is executed `n` times.

for-loop Mechanics

```
for x in y:
```



Let `x = y[0]` and then execute the loop body.
Let `x = y[1]` and then execute the loop body.
Let `x = y[2]` and then execute the loop body.
etc
Let `x = y[n-1]` and then execute the loop body.

Function for Reversing Strings

```
def Reverse(s):
    """ Returns a string that is obtained
    from s by reversing the order of its
    characters.

    Precondition: s is a string."""

    t = ''          # The empty string
    for c in s:
        t = c+t     # Repeated concatenation
    return t
```

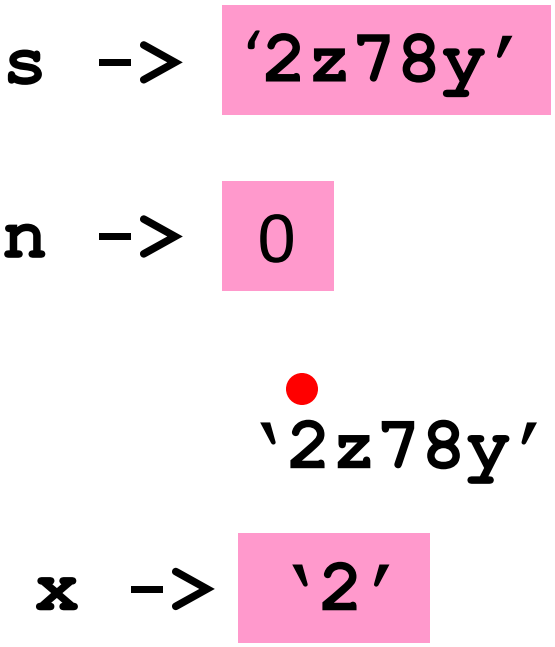
The Number-of-Digits Problem

Given a string s, how many of its characters are digit characters?

`'a10b20c30d40'` → `8`

The Number-of-Digits Problem

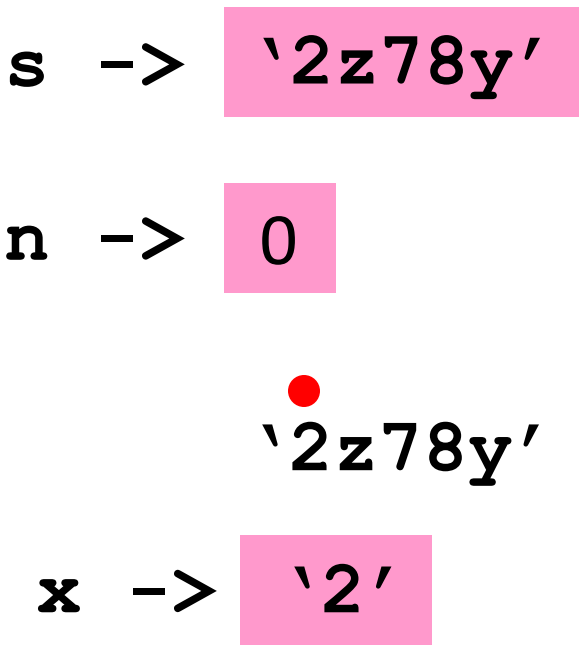
```
s =  '2z78y'
n = 0
for x in s:
    if x.isdigit():
        n=n+1
print n
```



At the start of the loop, **x** is assigned the zeroth character in **s**.

The Number-of-Digits Problem

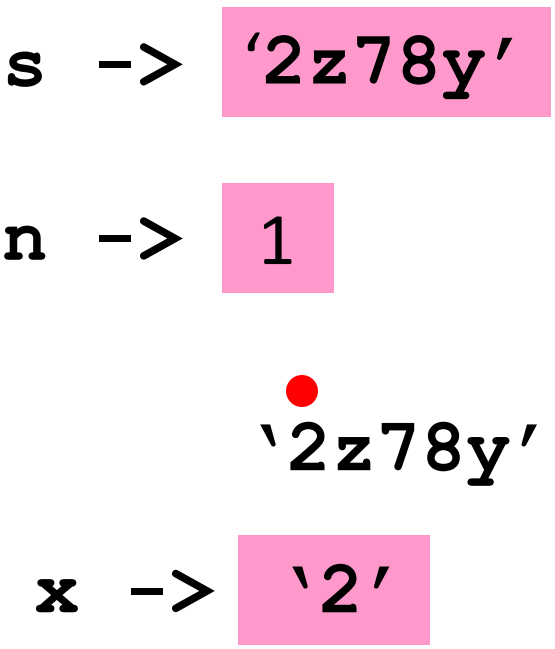
```
s =  '2z78y'
n = 0
for x in s:
    if x.isdigit():
        n=n+1
print n
```



The loop body is executed using that value in **x**.

The Number-of-Digits Problem

```
s =  '2z78y'
n = 0
for x in s:
    if x.isdigit():
        n=n+1
print n
```



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The Number-of-Digits Problem

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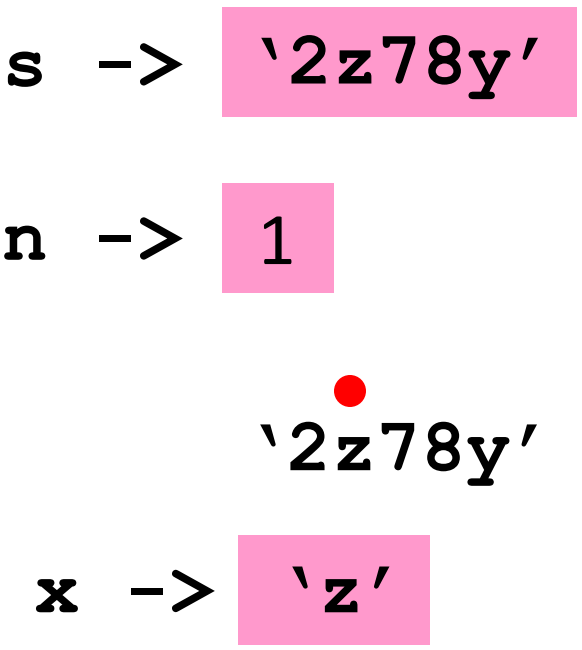
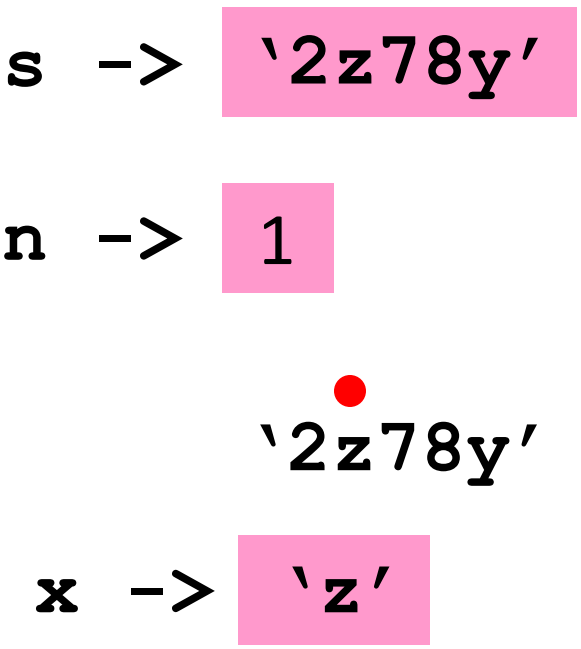
s =  '2z78y'
n = 0
for x in s:
    if x.isdigit():
        n=n+1
print n
```



The next time through the loop, **x** is assigned the first character in **s**.

The Number-of-Digits Problem

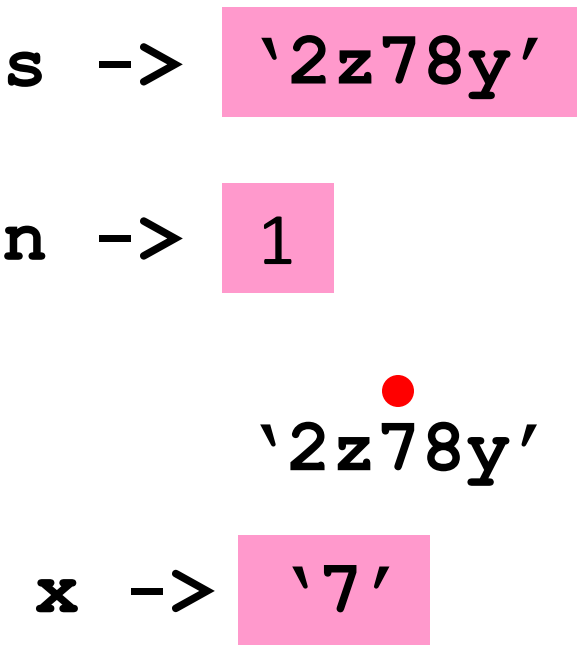
```
s =  '2z78y'
n = 0
for x in s:
    if x.isdigit():
        n=n+1
print n
```



The loop body is executed using that value in **x**.

The Number-of-Digits Problem

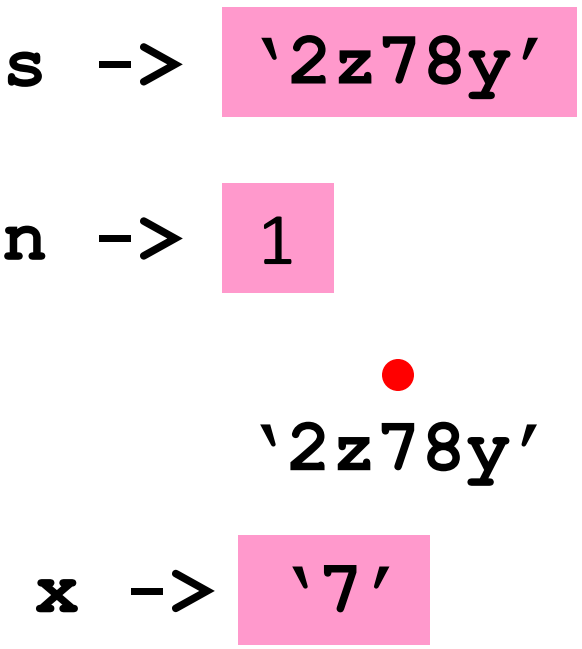
```
s =  '2z78y'
n = 0
for x in s:
    if x.isdigit():
        n=n+1
print n
```



The next time through the loop, **x** is assigned the second character in **s**.

The Number-of-Digits Problem

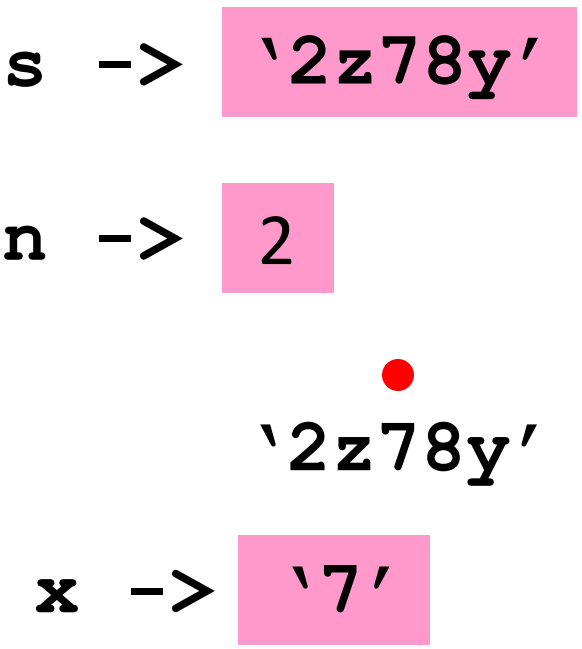
```
s =  '2z78y'
n = 0
for x in s:
    if x.isdigit():
        n=n+1
print n
```



The loop body is executed using that value in **x**.

The Number-of-Digits Problem

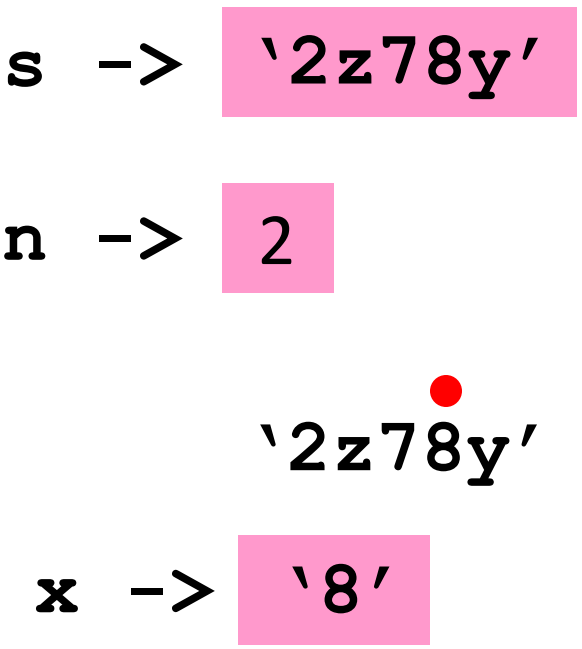
```
s =  '2z78y'
n = 0
for x in s:
    if x.isdigit():
        n=n+1
print n
```



The loop body is executed using that value in **x**.

The Number-of-Digits Problem

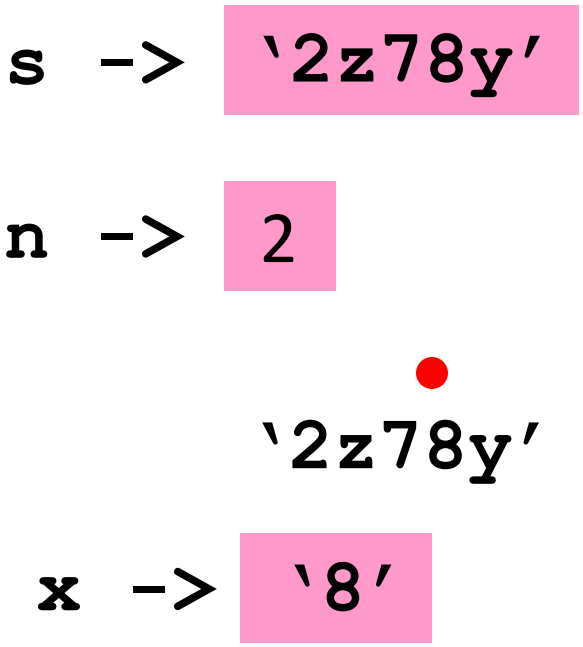
```
s =  '2z78y'
n = 0
for x in s:
    if x.isdigit():
        n=n+1
print n
```



The next time through the loop, **x** is assigned the third character in **s**.

The Number-of-Digits Problem

```
s =  '2z78y'
n = 0
for x in s:
    if x.isdigit():
        n=n+1
print n
```



The loop body is executed using that value in **x**.

The Number-of-Digits Problem

```
s =  '2z78y'
n = 0
for x in s:
    if x.isdigit():
        n=n+1
print n
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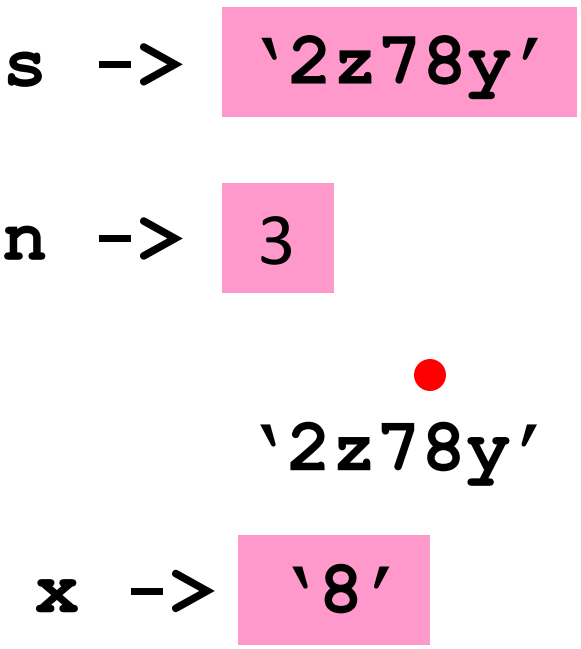
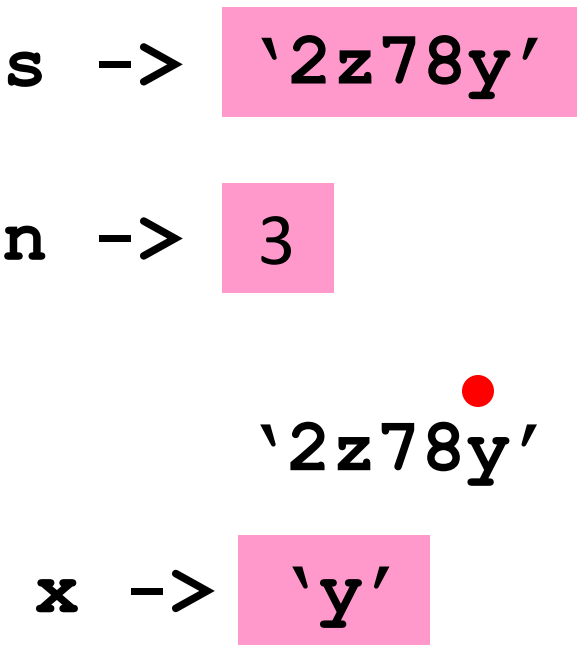


The loop body is executed using that value in **x**.

The Number-of-Digits Problem

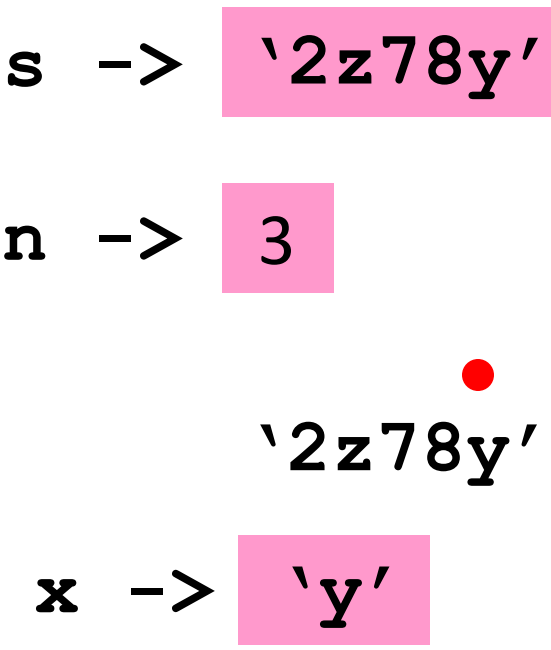
```
s =  '2z78y'
n = 0
for x in s:
    if x.isdigit():
        n=n+1
print n
```



The next time through the loop, **x** is assigned the fourth character in **s**.

The Number-of-Digits Problem

```
s =  '2z78y'
n = 0
for x in s:
    if x.isdigit():
        n=n+1
print n
```



The loop body is executed using that value in **x**.

The Number-of-Digits Problem

```
s =   '2z78y'
n = 0
for x in s:
    if x.isdigit():
        n=n+1

print n
```

s -> '2z78y'

n -> 3

Output:

3

The string has been traversed. The iteration ends. The next statement after the loop is executed. Indentation important.

Function for Counting Digits

```
def nDigits(s):
    """ Returns an int whose value is the
    number of digit characters that are in
    s.

    Precondition: s is a string."""
    n = 0;
    for c in s:
        # Increment n if c is a digit
        if c.isdigit():
            n=n+1
    return n
```