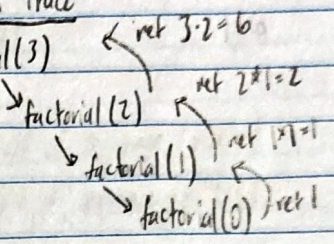
Chapter 4 Recursion

→ Recursive Implementation of a Factorial Function

```
def factorial(n):
    if n == 0:
        return 1
    else:
        return n * factorial(n-1)
```

Recursion Trace



→ Recursive Approach to Drawing a Ruler

- An interval with central tick length $L \geq 1$ is composed of:
  1.) an interval w/ central tick length $L-1$
  2.) single tick of length L
  3.) interval w/ central tick length $L-1$

→ base case: $L=0$, no lines drawn

for $L \geq 1$, first and last steps are performed recursively

```
// draw one line w/ given tick length
def draw_line(tick_length, tick_label=''):
    line = '-' * tick_length
    print(line)

// draw tick interval based on central tick length
def draw_interval(center_length):
    if center_length > 0:
        draw_interval(center_length-1)
        draw_line(center_length)
        draw_interval(center_length-1)

def draw_ruler(num_inch, major_len)
    draw_line(major_len, '0')
    for j in range(1, 1+num_inch):
        draw_interval(major_len-1)
        draw_line(major_len, str(j))
```

Recursion Trace