

CSC 141 / FALL 2026

Nested loops and the Loop Trails

CSC 141 · Class 15

Tuesday, October 20, 2026

Dr. Si Chen

Where we are

Class 14: while, for + range(), the accumulator and counting patterns.

Today: make those patterns automatic, then put a loop inside a loop.

Second half of class: PokéLab Phase V, The Loop Trails (missions 25–30).

Thursday: strings — loops over the characters of text.

Today's learning goals

Choose between while and for, and say why.

Trace any loop by hand with a table.

Write a nested loop and predict how many times the inner body runs.

Drive the Pokémon through missions 25–30 with your own loops.

Warm-up: predict the output

```
for i in range(3):  
    print(i)
```

```
n = 10  
while n > 0:  
    n -= 3  
print(n)
```

```
total = 0  
for k in range(1, 4):  
    total += k * k  
print(total)
```

Write all three answers before running.

Then run it in the Playground (Class 15, example 1).

Review: the four parts of a while loop

```
count = 1
while count <= 5:
    print(count)
    count += 1
print("done")
```

```
# 1. start
# 2. condition
# 3. body
# 4. update
```

Start, condition,
body, update.

The update must
move the
condition toward
False.

Missing update:
the loop never
ends.

Review: for + range()

call	values	passes
range(4)	0 1 2 3	4
range(1, 5)	1 2 3 4	4
range(2, 11, 3)	2 5 8	3
range(5, 1, -1)	5 4 3 2	4
range(0)	(nothing)	0

Review: which loop?

task	loop	why
print 10 lines	for	known count
ask until input is valid	while	not known
add $1 + 2 + \dots + n$	for	known count
weeks until savings goal	while	until done
walk exactly steps tiles	for	known count
walk until the berry tile	while	until done

Review: accumulator and counting

```
# accumulator: add every value
total = 0
for n in range(1, 6):
    total += n
print(total)                # 15
```

Start before the loop.

Change inside the loop.

```
# counting: +1 when the if is True
count = 0
for n in range(1, 21):
    if n % 3 == 0:
        count += 1
print(count)                # 6
```

Use after the loop.

Same three steps for both.

Bug hunt: three broken count_evens

```
def count_evens_a(n):  
    count = 0  
    for k in range(1, n):  
        if k % 2 == 0:  
            count += 1  
    return count
```

```
def count_evens_b(n):  
    for k in range(1, n + 1):  
        count = 0  
        if k % 2 == 0:  
            count += 1  
    return count
```

How many of
1..n are even?

Expected:
count_evens(6)
is 3.

Find each bug.

A loop inside a loop

```
for row in range(3):  
    for col in range(4):  
        print("*", end=" ")  
    print()
```

Outer loop: 3
passes.

Each outer pass
runs the inner
loop fully: 4
passes.

$3 \times 4 = 12$ stars.

print() ends a
row.

Trace the nested loop

row	col	printed
0	0	*
0	1	*
0	2	*
0	3	* then print() ends row 0
1	0	*
1	1	* ... row 1 and row 2 the same way

Nested loops: a multiplication table

```
for a in range(1, 4):  
    for b in range(1, 4):  
        print(a * b, end="\t")  
    print()
```

Output:

```
1 2 3  
2 4 6  
3 6 9
```

a is fixed while b
runs 1, 2, 3.

Nested loops with an accumulator

```
rows = 3
cols = 4
planted = 0
for row in range(rows):
    for col in range(cols):
        planted += 1
print(planted, "flowers")
```

planted starts
before BOTH
loops.

Output: 12
flowers

This is mission
30: plant a rows
× cols field.

Preview: a loop over a string

```
word = "hello"  
for ch in word:  
    print(ch)
```

```
count = 0  
for ch in "programming":  
    if ch in "aeiou":  
        count += 1  
print(count, "vowels")
```

A string is a sequence of characters.

for visits each one in order.

Output: h e l l o,
then 3 vowels.

PokéLab Phase V: The Loop Trails

mission	name	loop idea
25	Fence line	while + counter
26	Stepping stones	for + range()
27	Berry harvest	accumulator
28	Flower count	counting with an if
29	Until the goal	while until a goal
30	Flower field	nested loops

How the trail world works

```
steps = 3

count = 0
while count < steps:
    move()          # one tile per pass
    count += 1
say("done")
```

Each call moves the Pokémon one action.

The map replays every pass with the line highlighted.

Fence, rock, water: the error names the bug.

Lab time: missions 25–30

Do them in order; 25–28 should go quickly after Class 14.

Stuck? 1. Read the error — it names the bug. 2. Trace one pass with a table. 3. Try every scenario button.

Mission 29 is `weeks_to_goal` with a Pokémon: `while`, `until` the goal.

Mission 30 is the `rows × cols` field: nested loops.

Show me a passing mission 29 or 30 before you leave.

Exit ticket

In the star example with `range(3)` outside and `range(4)` inside, how many times does `print("*")` run?

What is wrong with: `while count < steps: move()`

Which loop fits "walk until the Pokémon stands on the berry tile", and why?

Before next class

Finish missions 25–30 in the Loop Trails.

Playground, Class 15: the bug hunt and the nested-loop examples.

Thursday (Oct 22): strings — indexing, slicing, and loops over text.

Thu Oct 22 is also the university course-withdrawal deadline (see the syllabus).