

Exam I on Oct 5th
Exam I conflict form – fill by **today**

Assigned: Quiz3
Conditionals 1,
Conditionals 2, and
Iteration 1

[220 / 319] Iteration

Meena Syamkumar
Mike Doescher
Gurmail Singh

Readings:

Chapter 7 of Think Python

Chapter 6.1 to 6.3 of Python for Everybody

Due: P3
Grade posted: P2

Learning Objectives

Implement an iterative algorithm using a while loop

- printing /counting
- validating user input
- performing iterative calculation
- printing grids / character art

Trace iterative algorithms and determine their output

Recognize common while loop errors:

- infinite loops (when unintentional)
- off-by-one mistakes in the loop control variable increment / decrement

Worksheet

State:



Code:

1. Put 1 in the “total” box
2. If “N” equals 1, skip to step 6, otherwise continue to step 3
3. Multiply the value in “total” by the value in “N”, and put the result back in “total”
4. Decrease the value in “N” by 1
5. Go to step 2
6. Copy the value in total to the answer box

Combination of conditionally skipping forward (2) with going back is (5) is called a “while loop”

Worksheet

State:

N

4

total

0

answer

0

6

Code:

1. Put 1 in the “total” box
2. If “N” equals 1, skip to step 6, otherwise continue to step 3
3. Multiply the value in “total” by the value in “N”, and put the result back in “total”
4. Decrease the value in “N” by 1
5. Go to step 2
6. Copy the value in total to the answer box

loop condition

skip past loop body

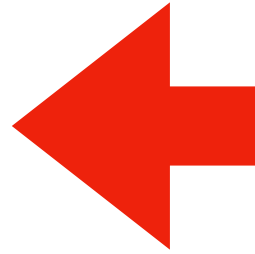
continue to loop body

loop body

going back will be implicit in Python and will happen right after loop body.
you can identify the loop body because it will be indented

Today's Outline

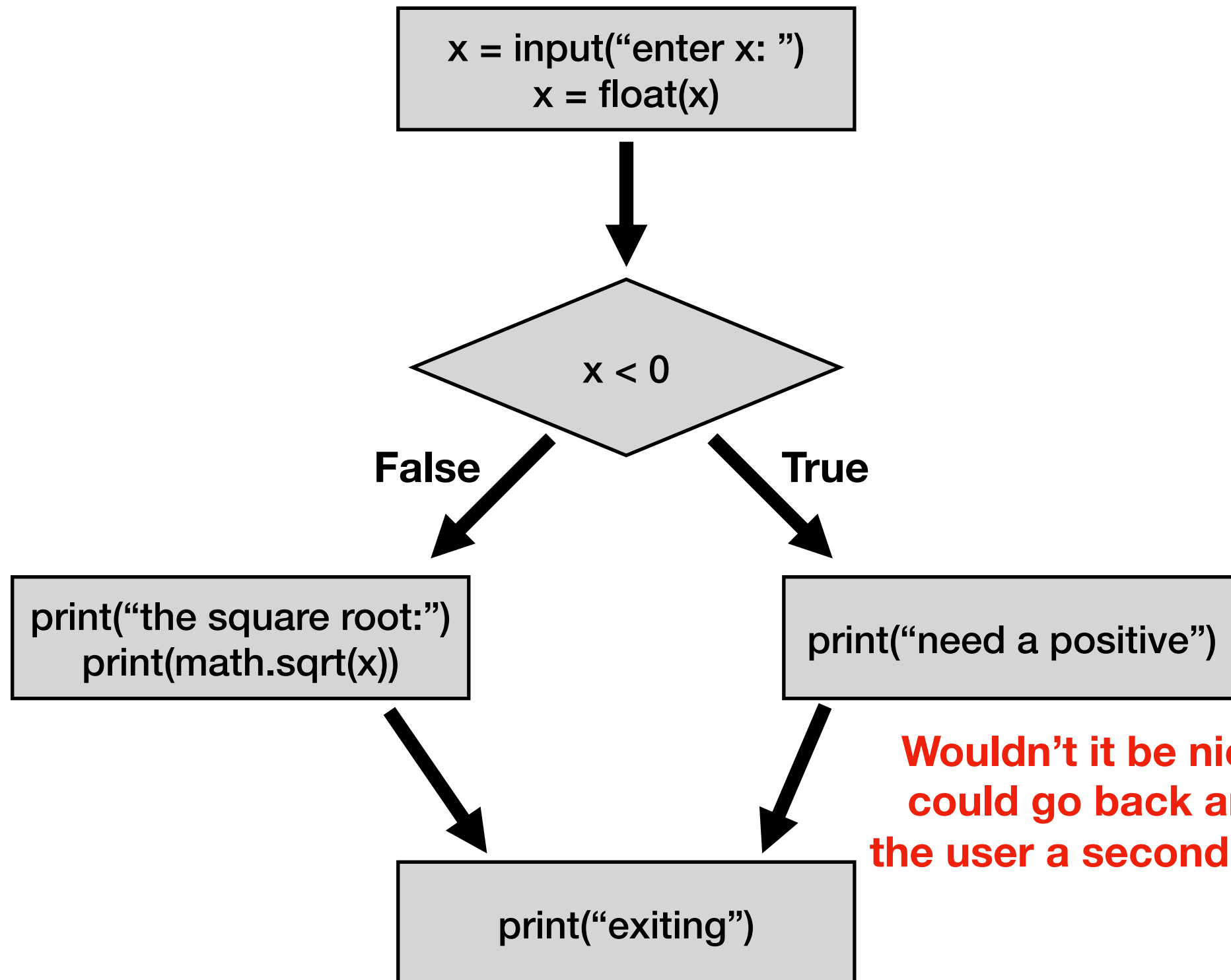
Control Flow Diagrams



Basic syntax for “while”

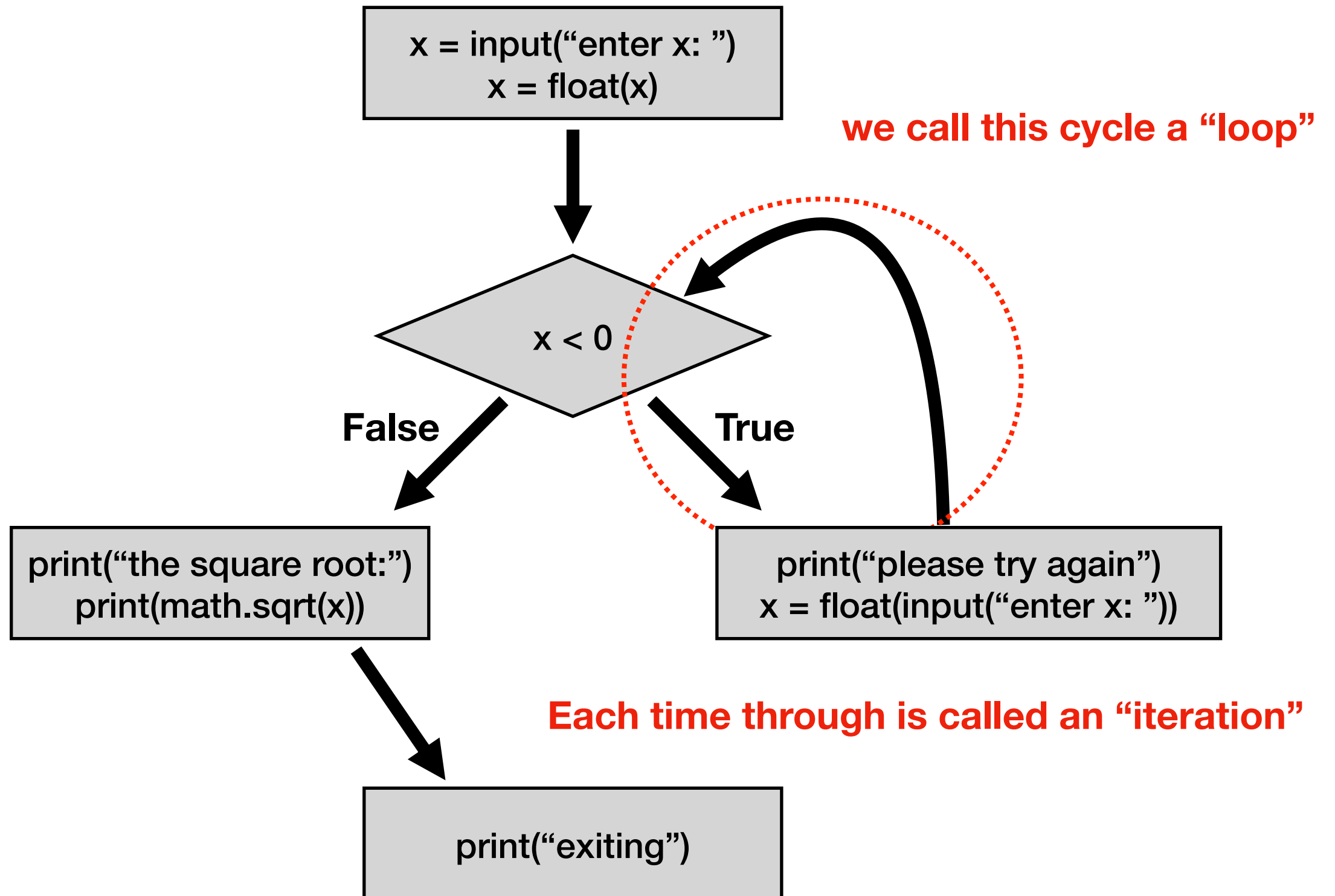
Examples

Control Flow Diagrams: “if”

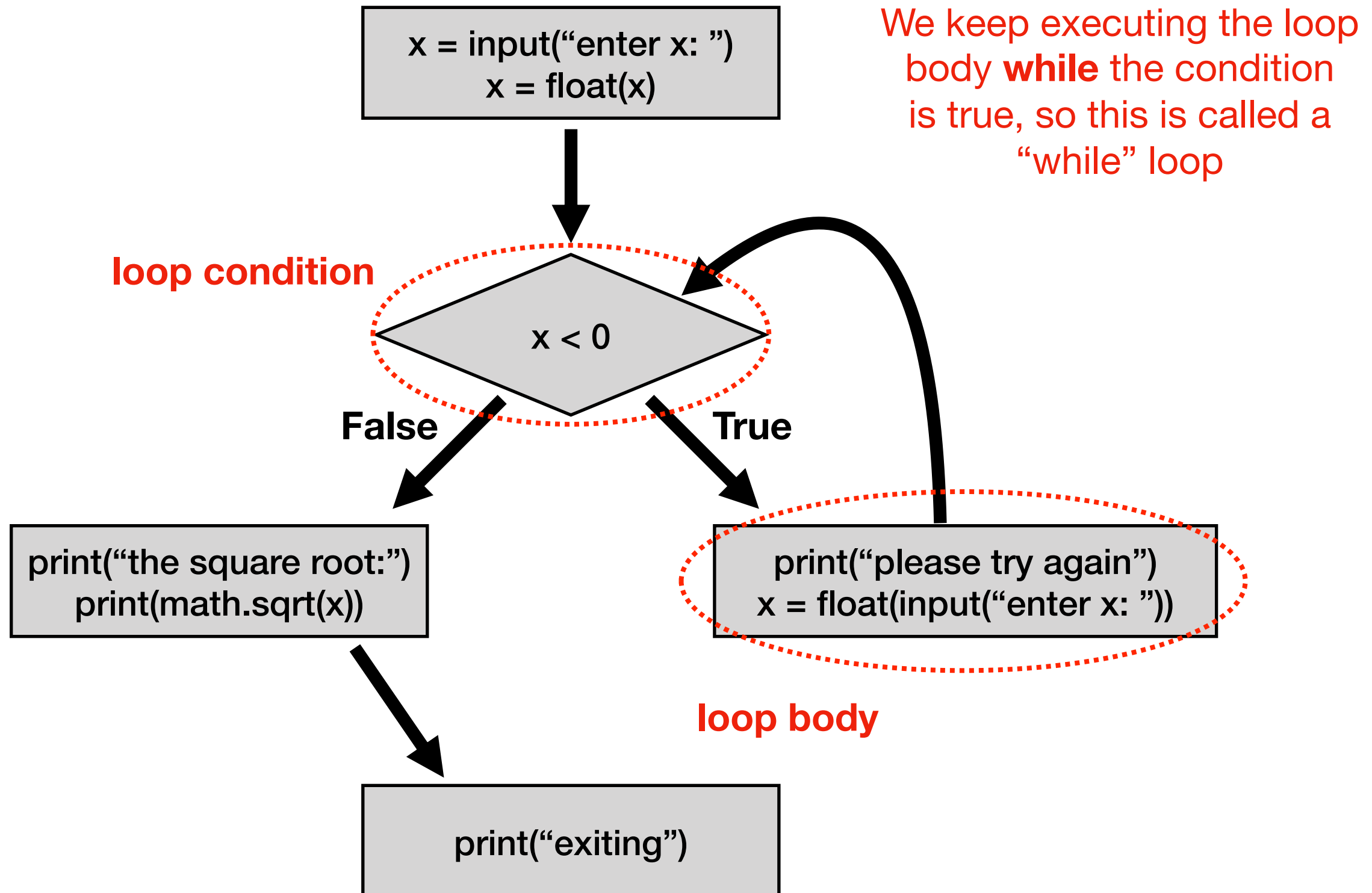


Wouldn't it be nice if we could go back and give the user a second chance?

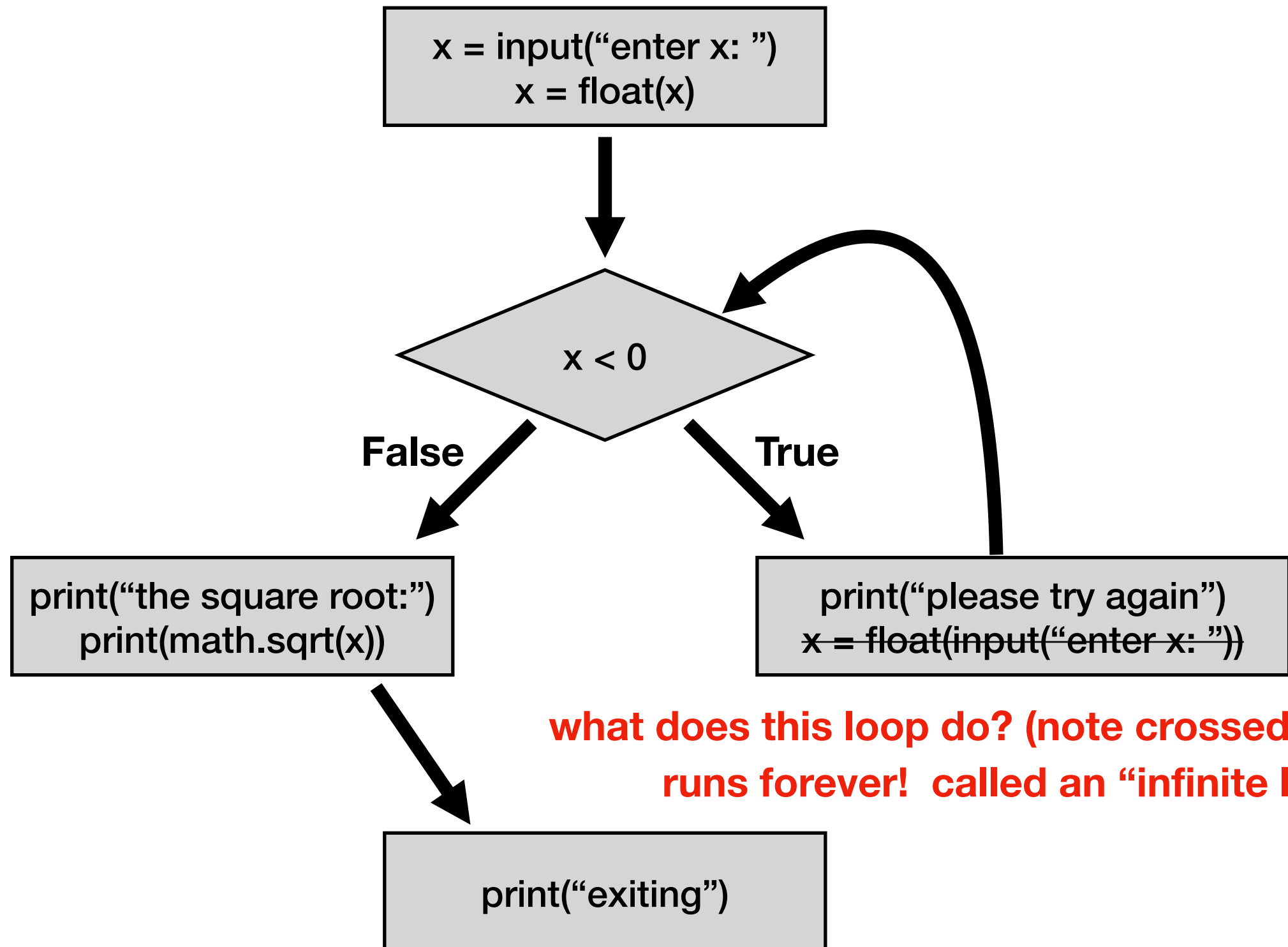
Control Flow Diagrams: “while”



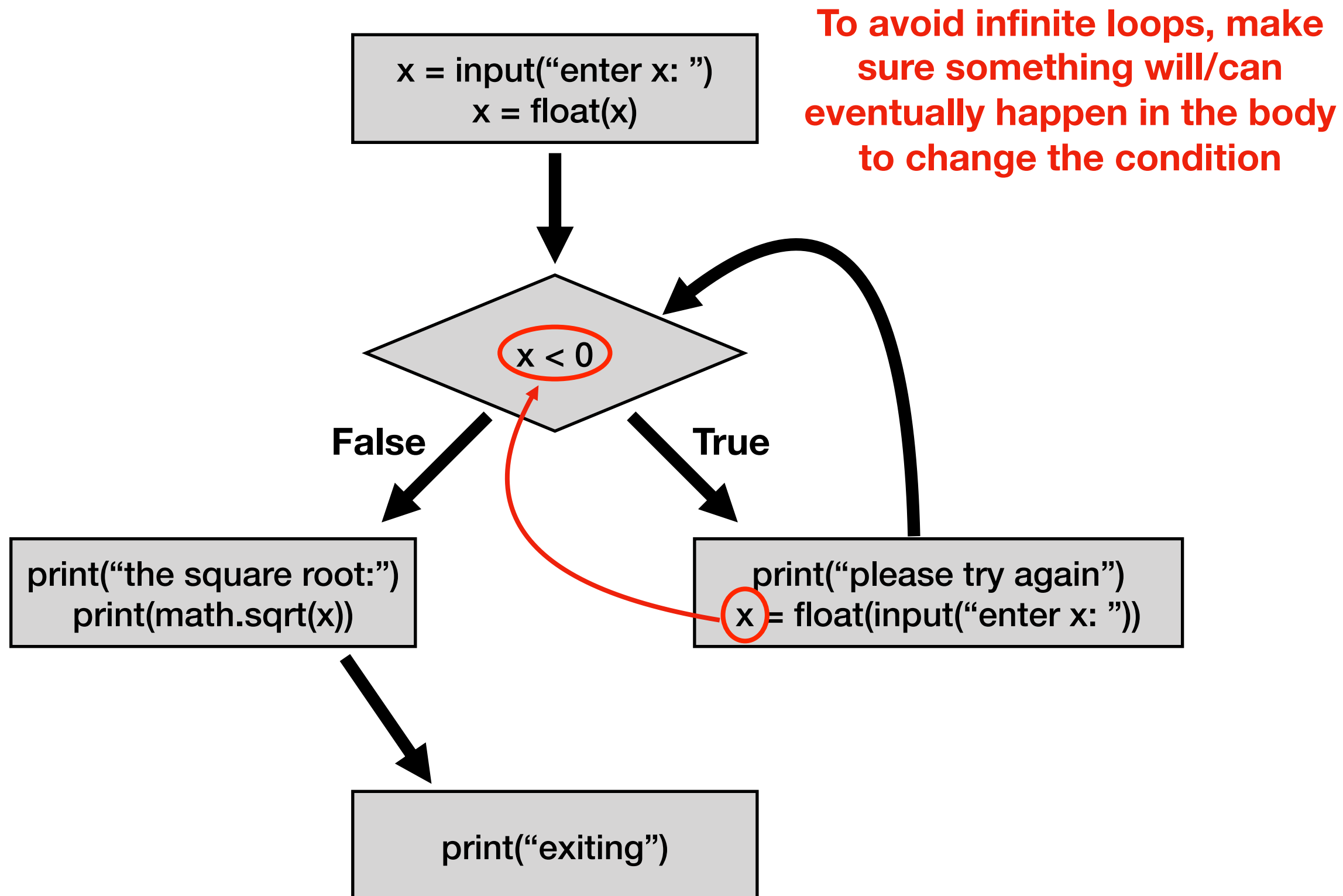
Control Flow Diagrams: “while”



Control Flow Diagrams: “while”



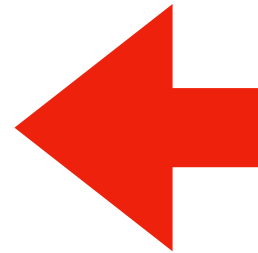
Control Flow Diagrams: “while”



Today's Outline

Control Flow Diagrams

Basic syntax for “while”



Examples

Syntax

```
x = int(input("enter x: "))
```

```
if x < 0:  
    x = int(input("please try again: "))
```

Syntax for “if”

Syntax

```
x = int(input("enter x: "))
```

```
while x < 0:  
    x = int(input("please try again: "))
```

Syntax for “while loop” is just like for “if”, just replace “if” with “while”

**This example gives user an arbitrary number of tries
until they get it right**

Terminology

```
x = int(input("enter x: "))
```

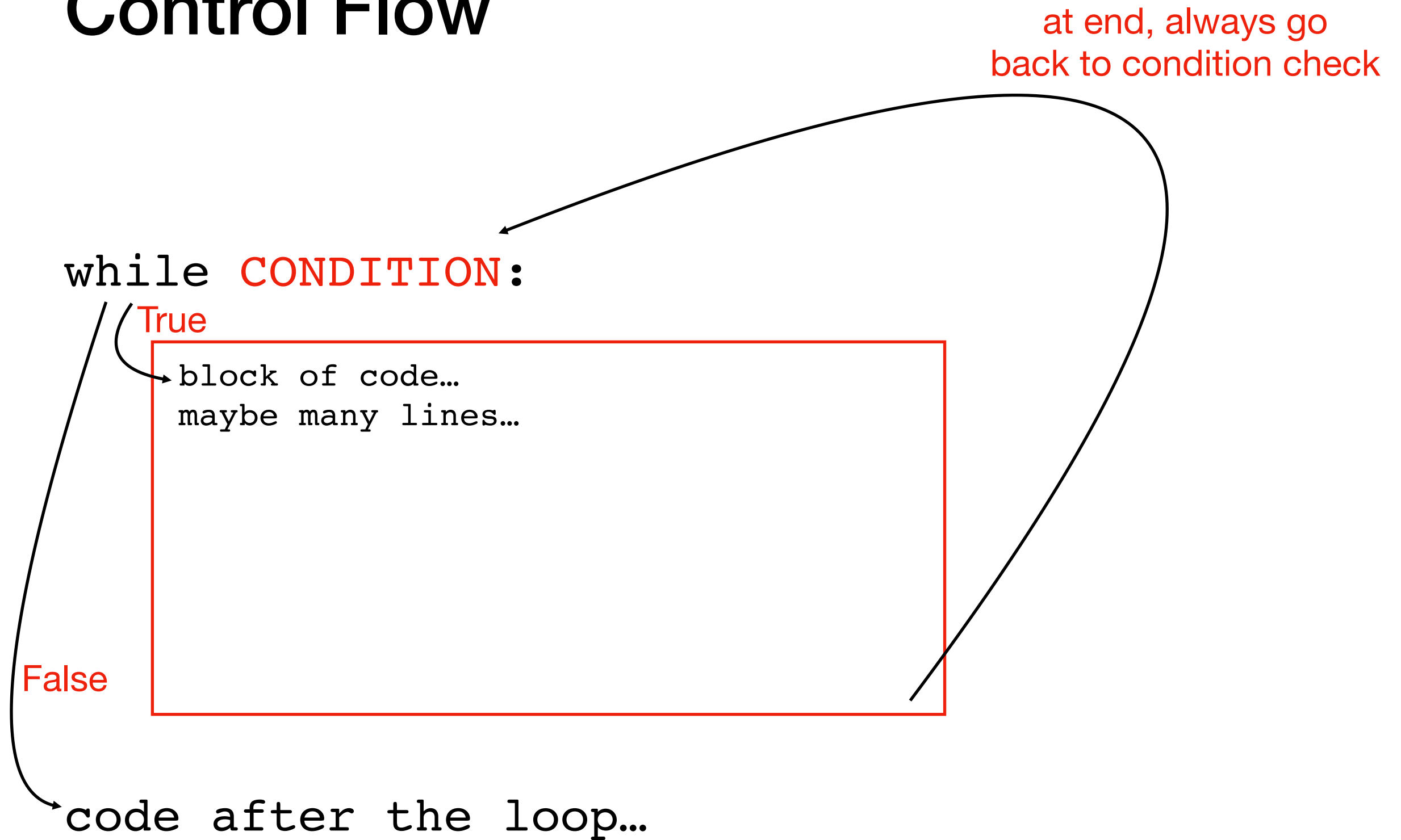
```
while x < 0:
    x = int(input("please try again: "))
```

loop condition

loop control variable

loop body

Control Flow



Steps to follow

Whenever you write a while loop, keep these in mind:

1. **Initialize** your loop condition variable
2. a) **Update** your loop condition variable in loop body
b) Make **progress towards** eventually turning your loop condition to **False**

Congrats!

You now understand the 4 key **Flow of Execution** ideas, in the context of Python.

1. **generally, proceed forward, one step at a time**

2. sometimes go run a “mini program” somewhere else before continuing to the next line

- This is a **function call**

3. sometimes skip forward over some lines of code

- **Conditional** or **while loop**, when the condition is false

4. sometimes go back to a previous line of code

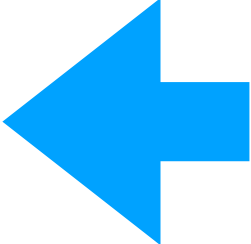
- **while loop**. When at the end of body, always go back to condition

three primary exceptions to the general case (1)

Today's Outline

Control Flow Diagrams

Basic syntax for “while”

Examples 

Example: Countdown Timer

use `time.sleep(1)` 

How many seconds? **5**

5 seconds left

4 seconds left

3 seconds left

2 seconds left

1 seconds left

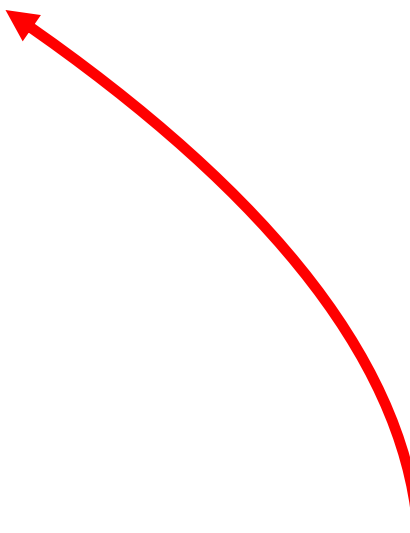
DING DING DING DING DING!

for with range

Output:

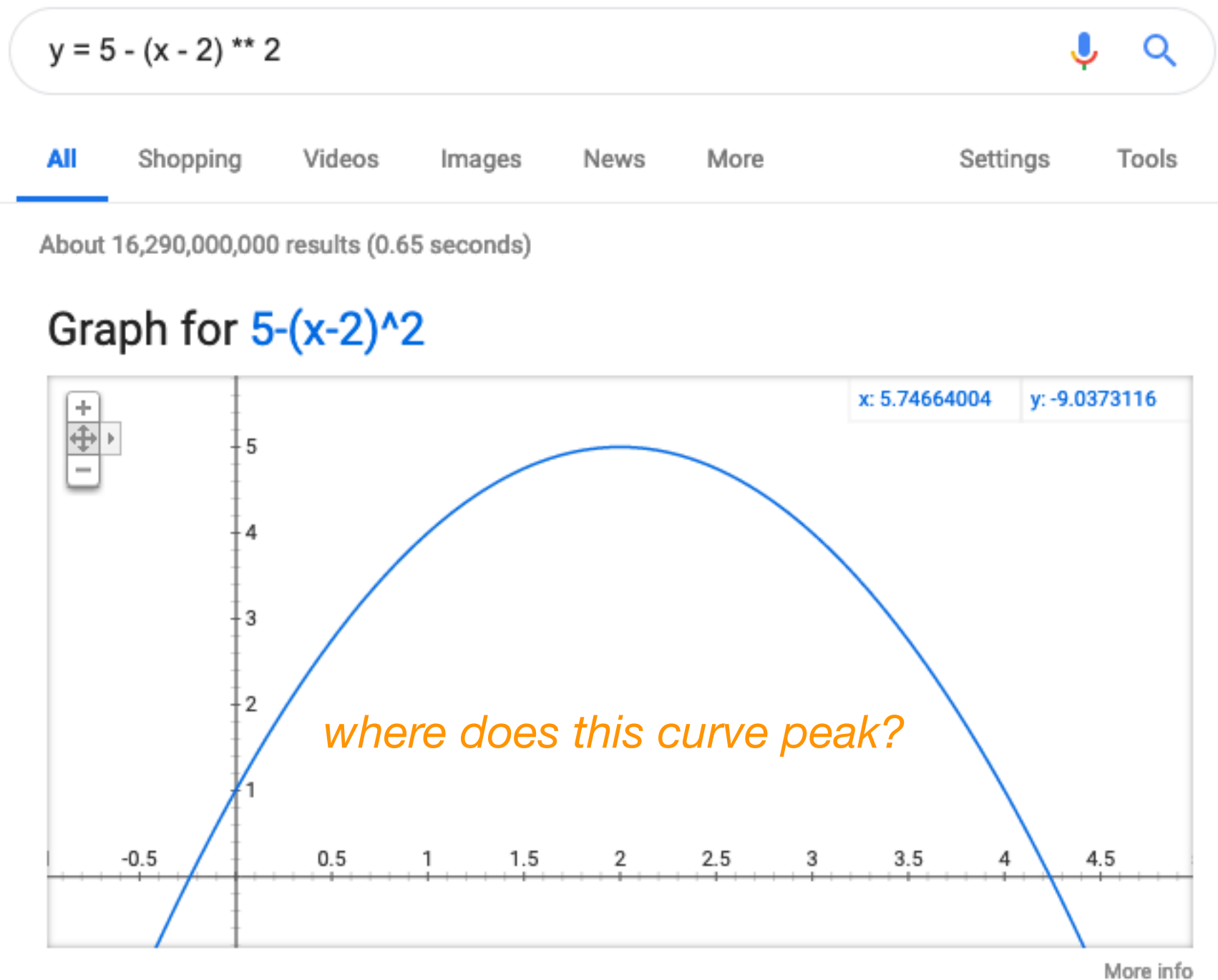
0
3
6
9
12

```
for item in range(5):  
    print(item * 3)
```



using range(N) with a for loop will
iterate with these values for item:
0, 1, 2, ..., N-2, N-1

Example: Maximum (Finding the Peak)



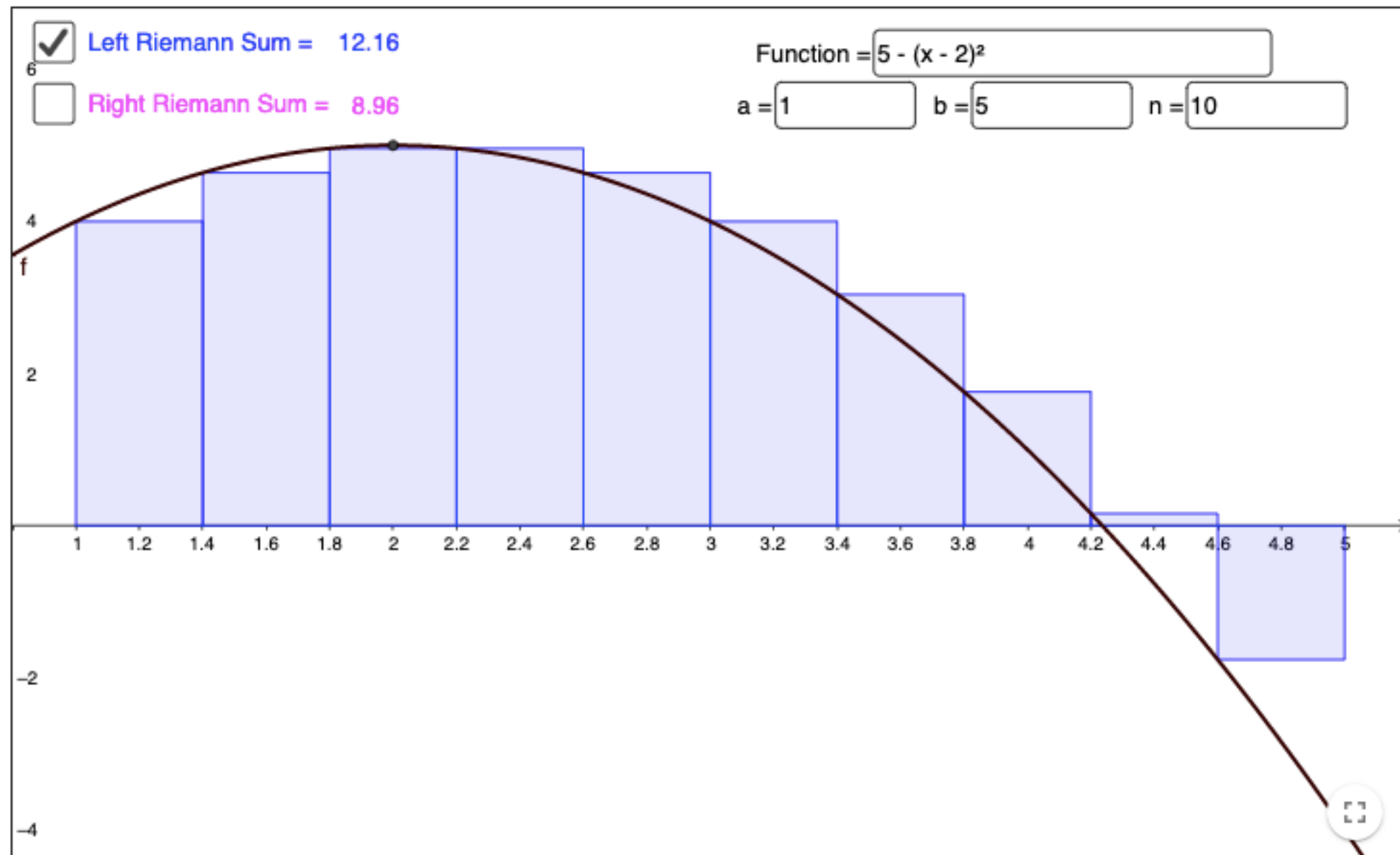
Example: Integration (Riemann Sum)

GeoGebra

Riemann Sum Calculator

Author: [megan.ann.martinez](#)

Topic: [Area](#), [Upper and Lower Sum or Riemann Sum](#)



Example: Prime Finder

Prime numbers:

2 is prime

3 is prime

4 is not prime

5 is prime

6 is not prime

7 is prime

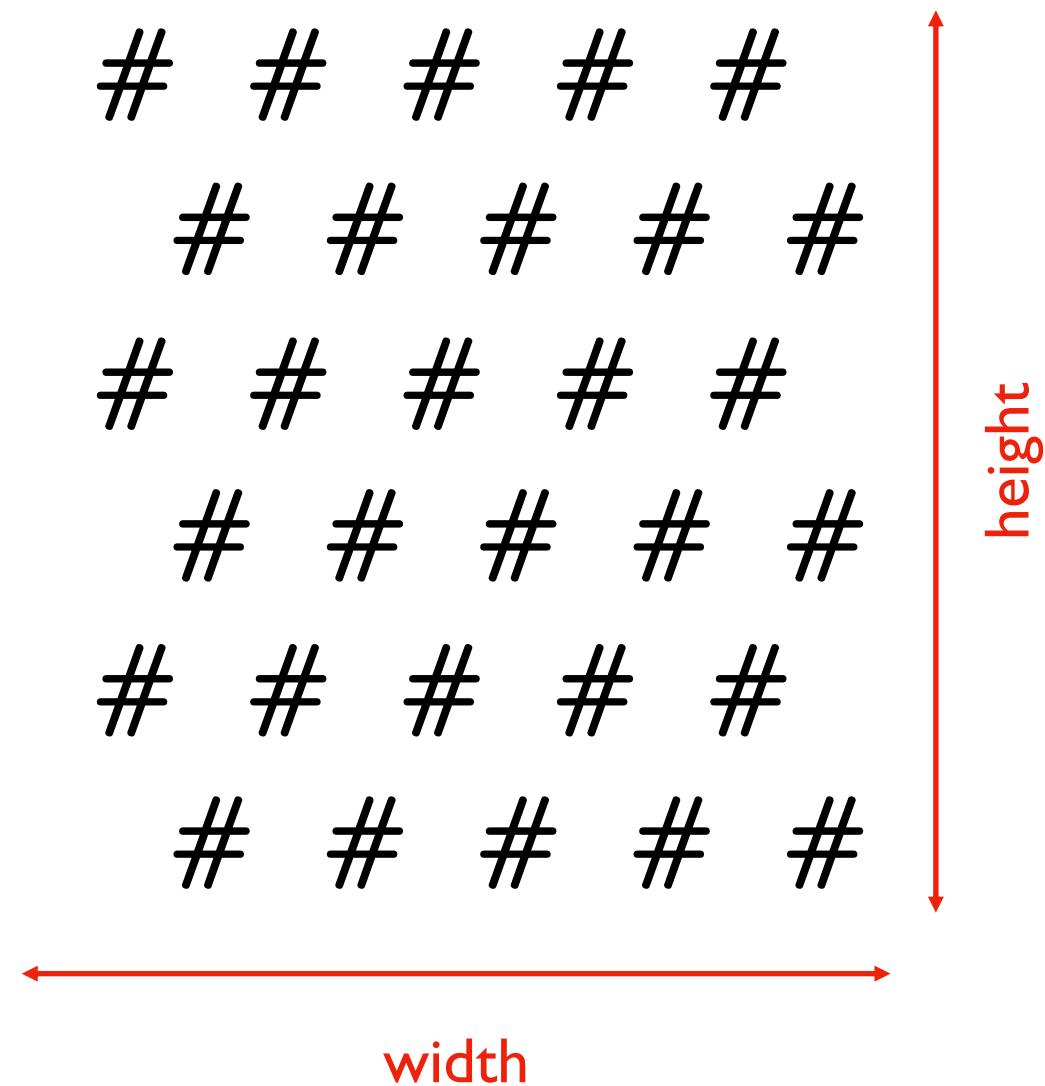
8 is not prime

9 is not prime

...

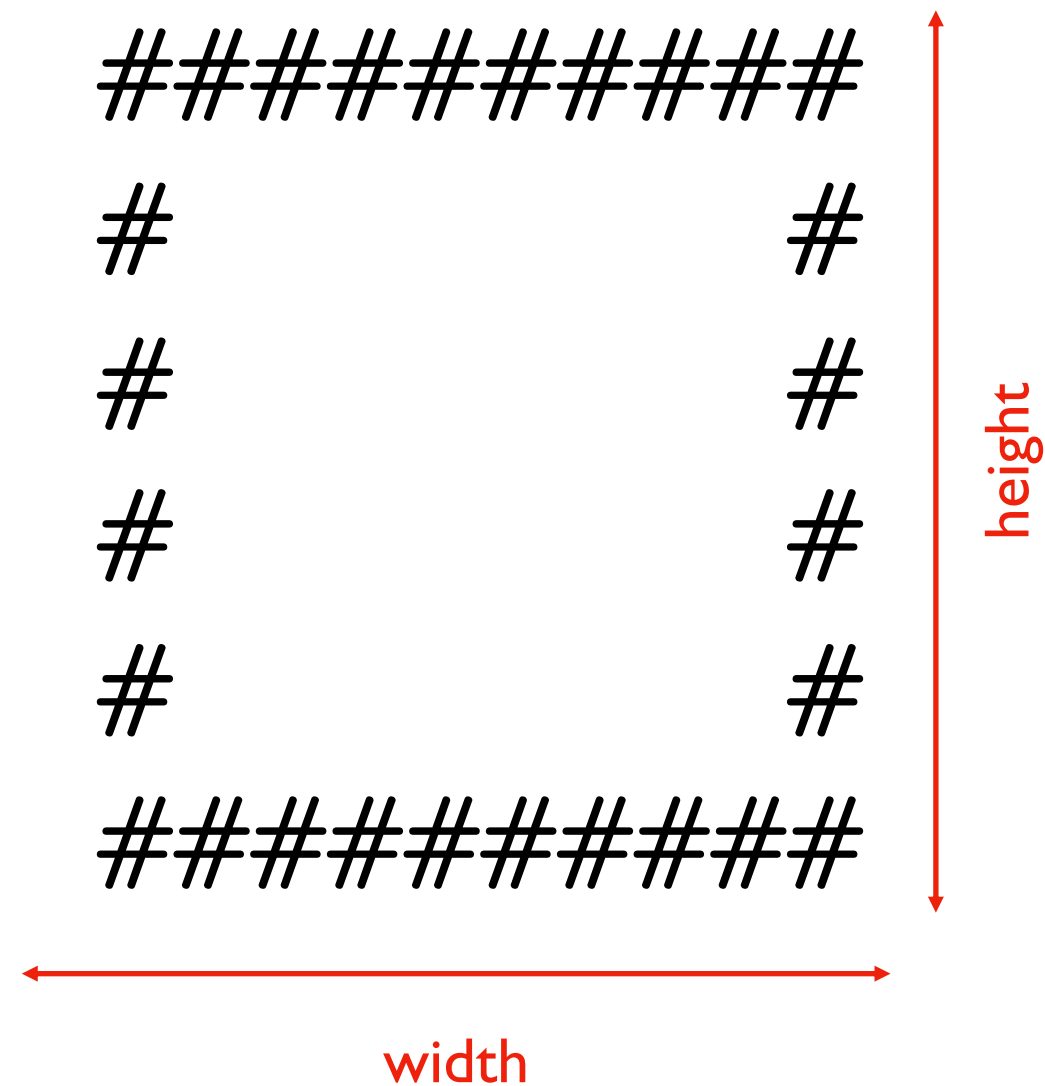
Practice: Checkers

write a loop to draw the following:



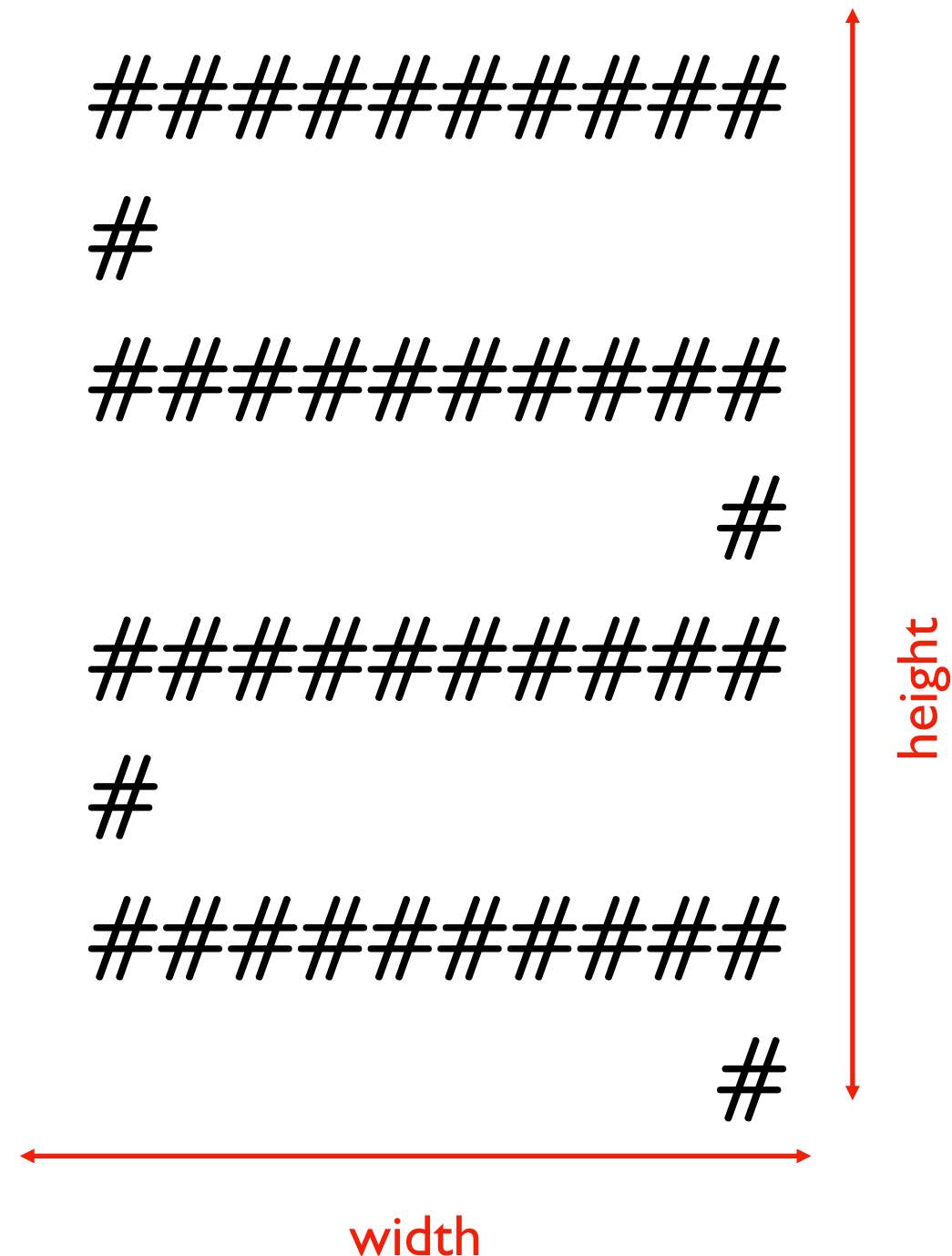
Practice: Border

write a loop to draw the following:



Practice: Snake

write a loop to draw the following:



Challenge: Countdown Timer

use `time.sleep(1)` →

```
how many seconds? 5
5
4
3
2
1
DING DING DING DING DING!
how many seconds? 2
2
1
0
DING DING DING DING DING!
how many seconds? q
goodbye!
```

← exit program

this program should involve a nested loop!!!