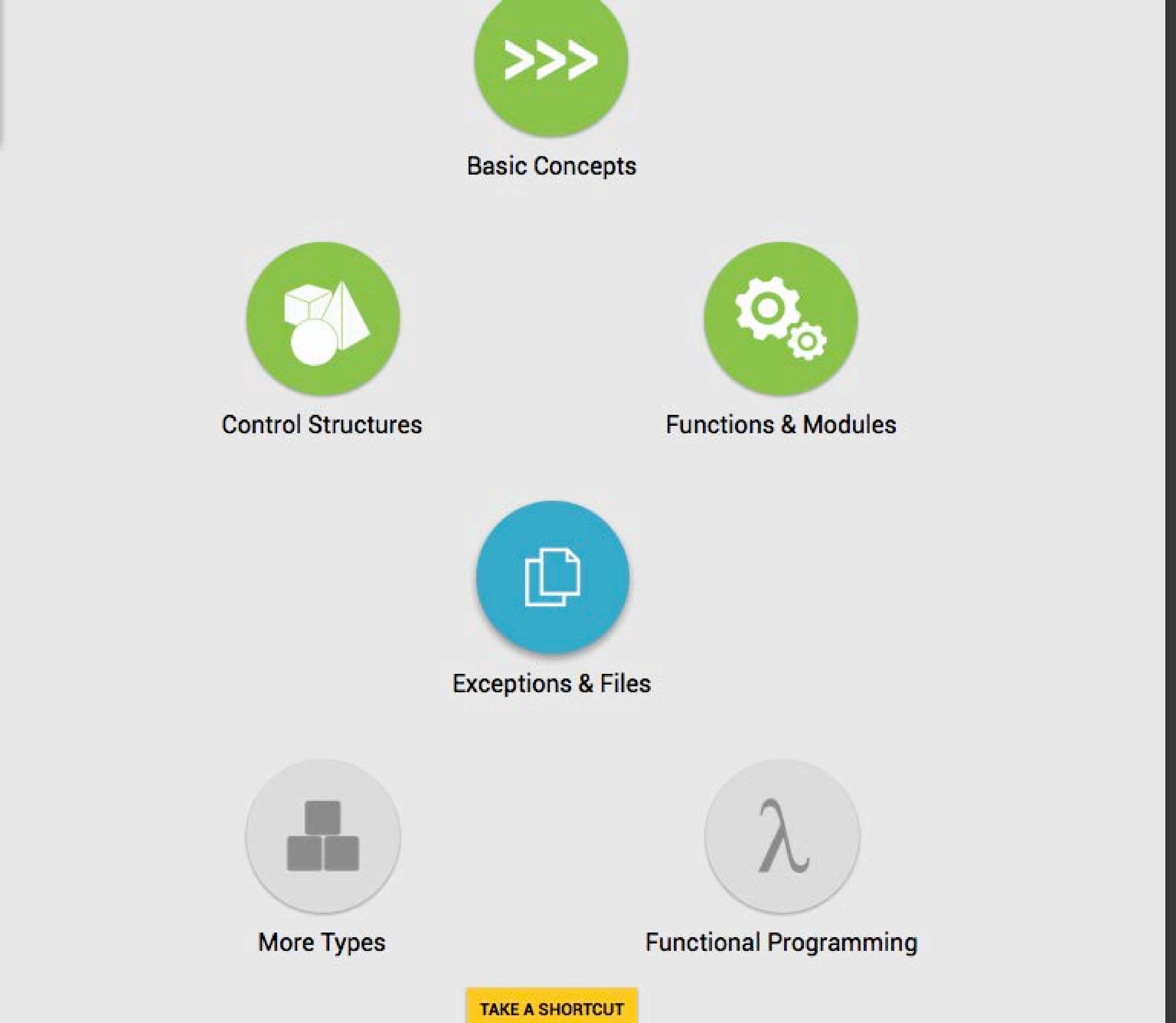
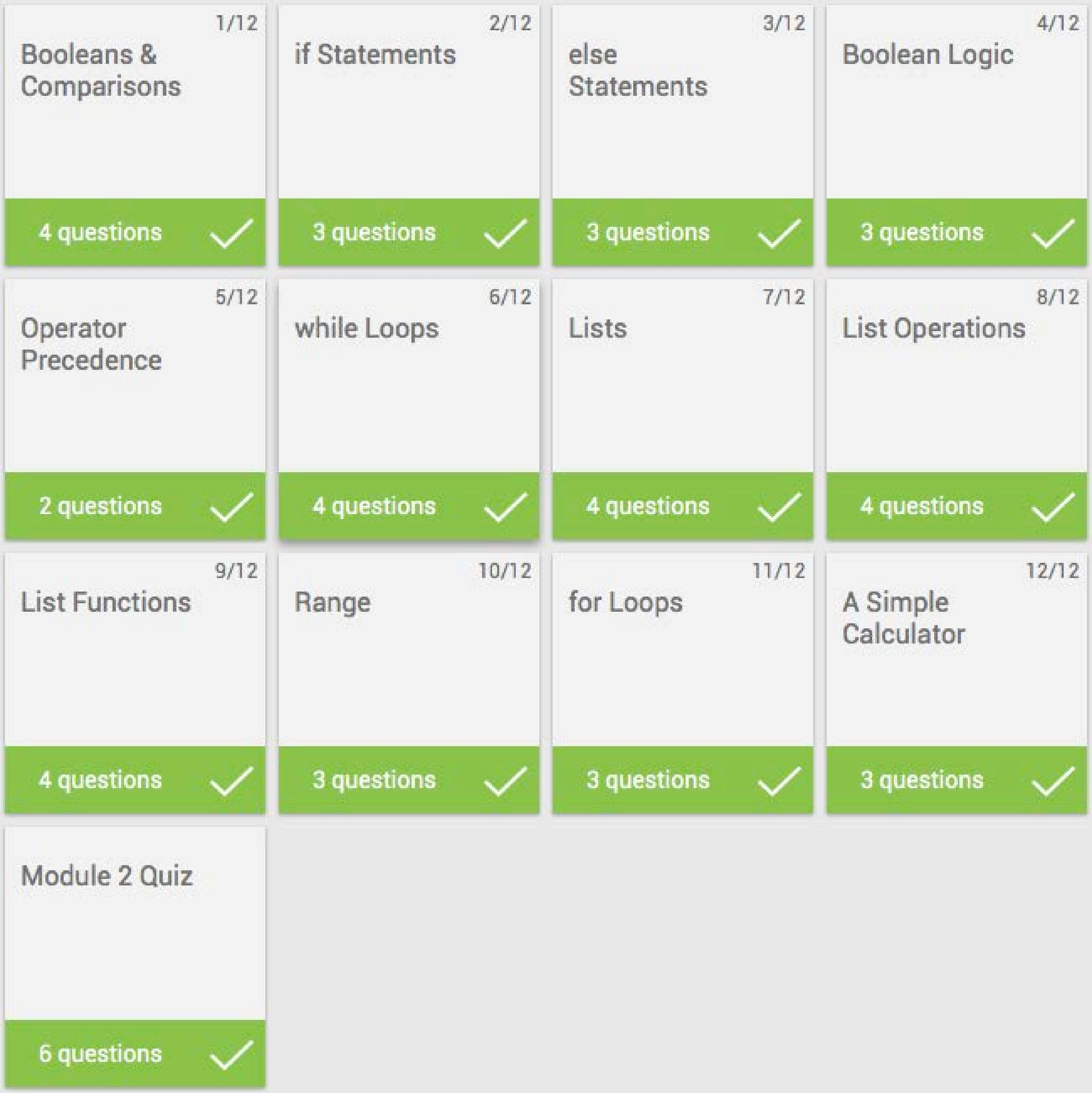

Basic Concepts
Control Structures
Functions & Modules
Exceptions & Files
More Types
Functional Programming
TAKE A SHORTCUT



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Booleans & Comparisons
4 questions ✓

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3 questions ✓

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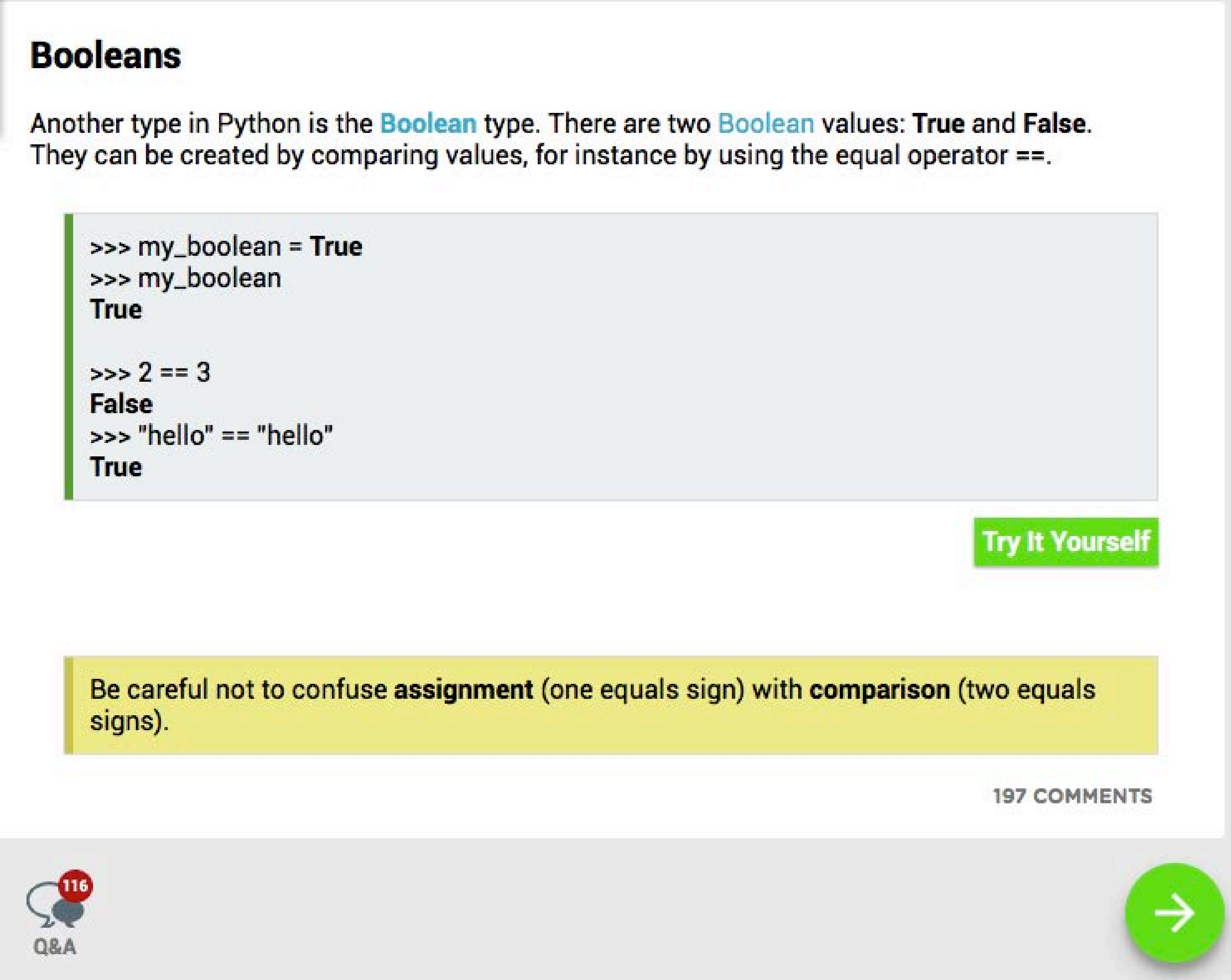
3 questions ✓

12/12
A Simple Calculator
3 questions ✓

Module 2 Quiz
6 questions ✓



Booleans

Another type in Python is the Boolean type. There are two Boolean values: **True** and **False**. They can be created by comparing values, for instance by using the equal operator ==.

```
>>> my_boolean = True
>>> my_boolean
True

>>> 2 == 3
False
>>> "hello" == "hello"
True
```

Be careful not to confuse **assignment** (one equals sign) with **comparison** (two equals signs).

What are the two Boolean values in Python?

- ○ Truth and Falsity
- ○ true and false
- ○ True and False

116

Q&A

Unlock

Comparison

Another comparison operator, the **not equal** operator (**!=**), evaluates to **True** if the items being compared aren't equal, and **False** if they are.

```
>>> 1 != 1
False
>>> "eleven" != "seven"
True
>>> 2 != 10
True
```

Try It Yourself

76 COMMENTS

116

Q&A

What is the output of this code?

```
>>> 7 != 8
```

○ True

○ False

116

Q&A

Unlock

Comparison

Python also has operators that determine whether one number (float or integer) is greater than or smaller than another. These operators are > and < respectively.

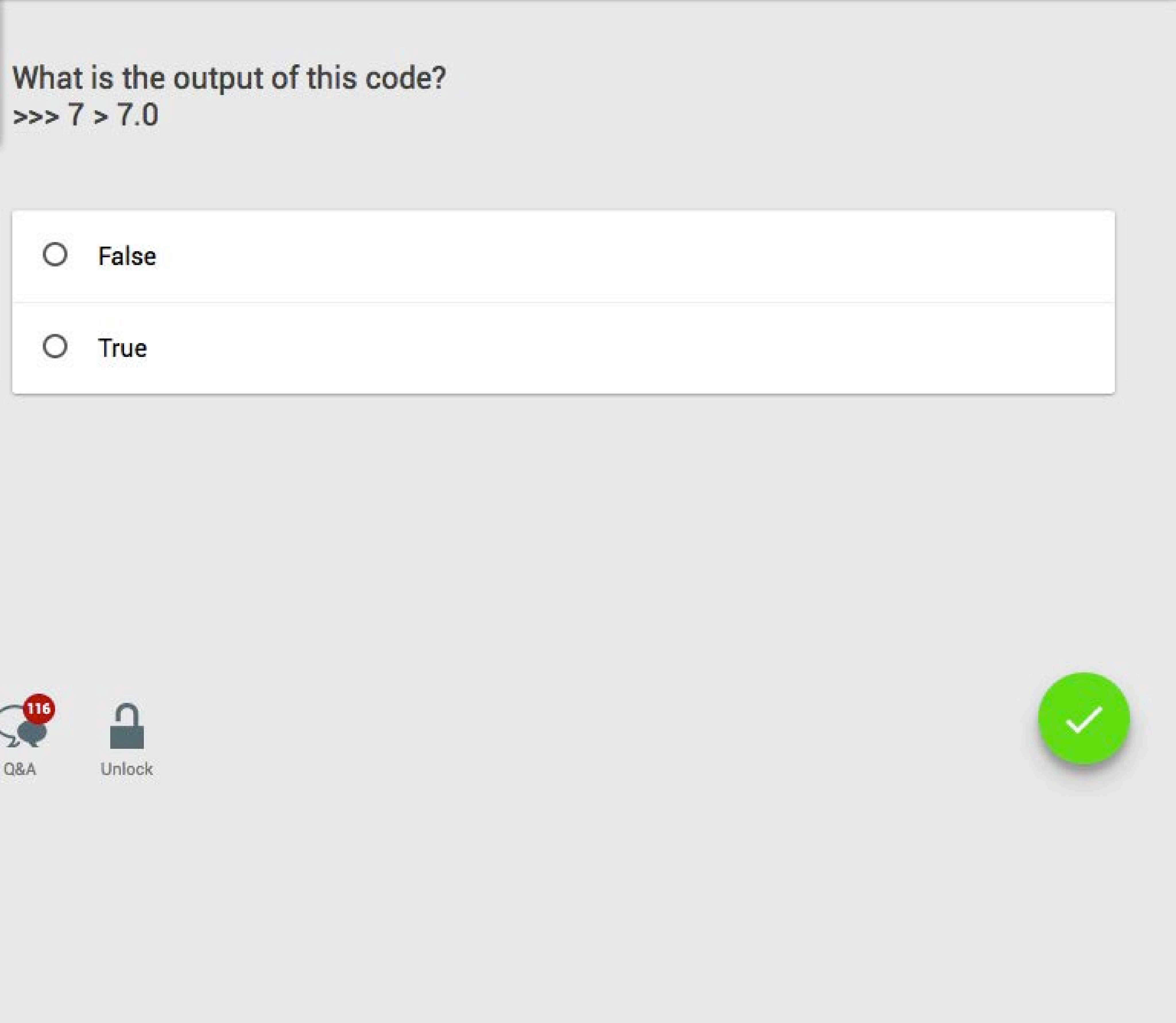
```
>>> 7 > 5
True
>>> 10 < 10
False
```

Try It Yourself

74 COMMENTS

116

Q&A



What is the output of this code?

```
>>> 7 > 7.0
```

- False
- True

Comparison

The greater than or equal to, and smaller than or equal to operators are >= and <=.
They are the same as the strict greater than and smaller than operators, except that they return **True** when comparing equal numbers.

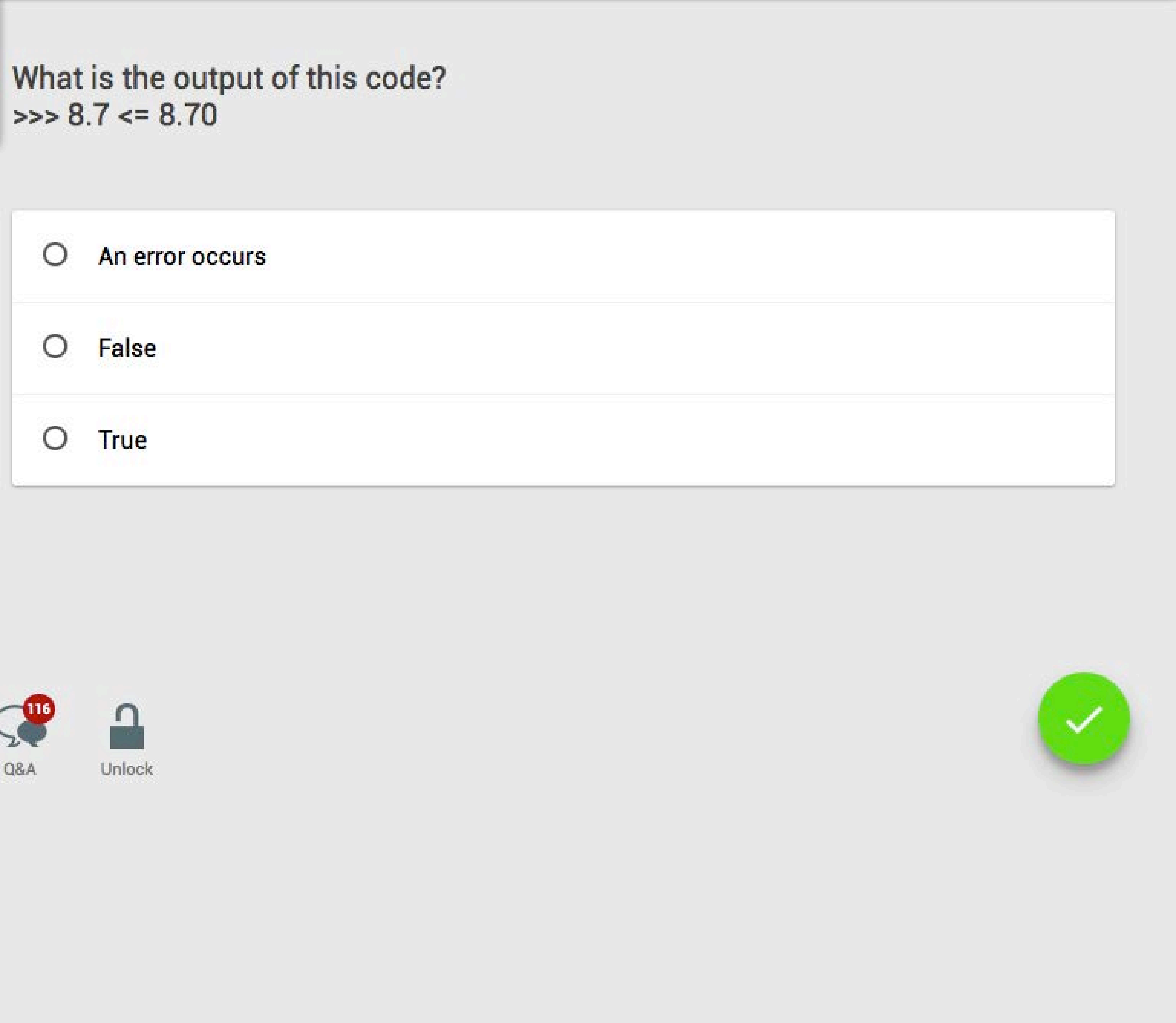
```
>>> 7 <= 8
True
>>> 9 >= 9.0
True
```

Try It Yourself

Greater than and smaller than operators can also be used to compare strings **lexicographically** (the alphabetical order of words is based on the alphabetical order of their component letters).

182 COMMENTS

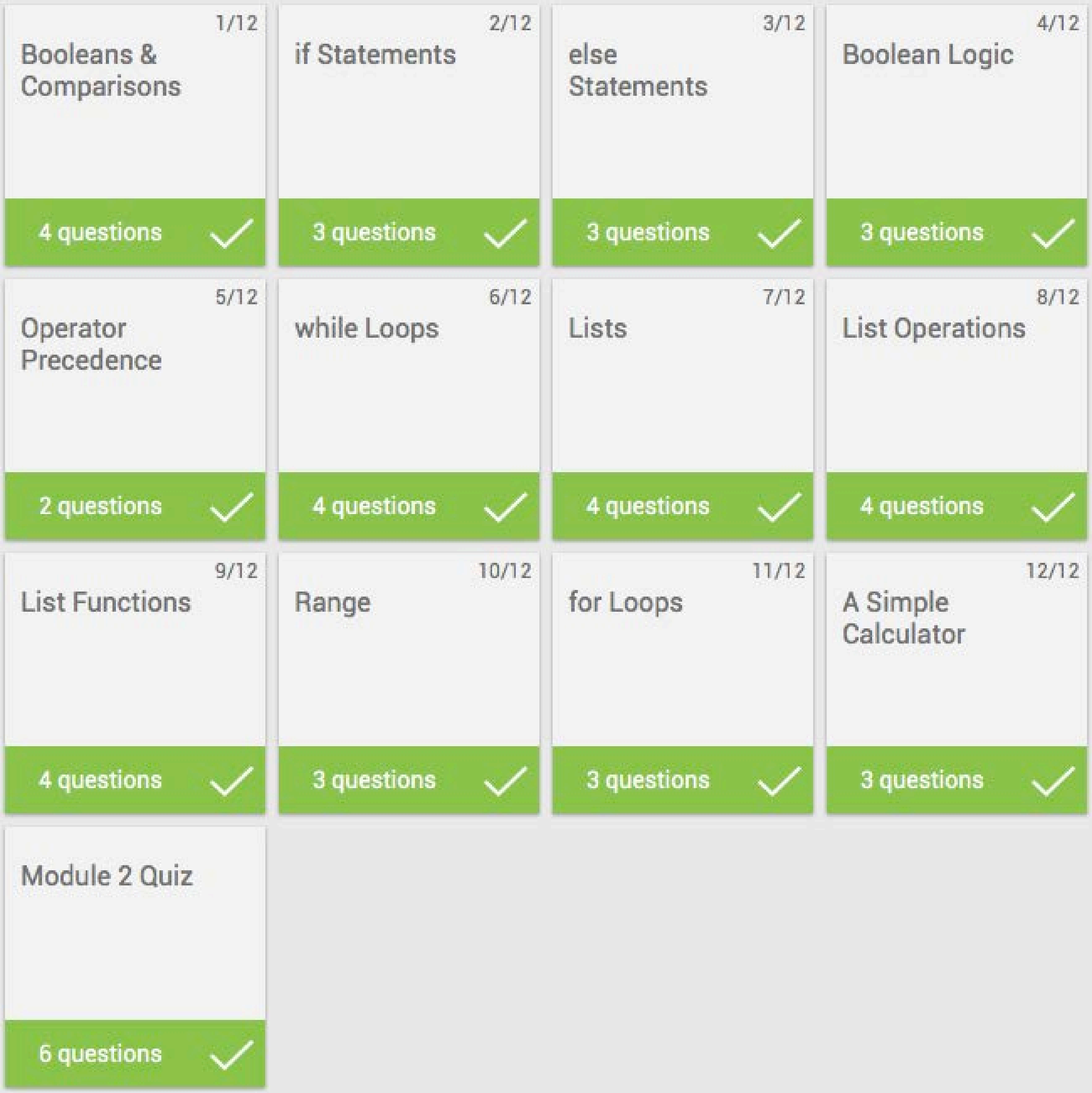
116
Q&A



What is the output of this code?

```
>>> 8.7 <= 8.70
```

- ○ An error occurs
- ○ False
- ○ True



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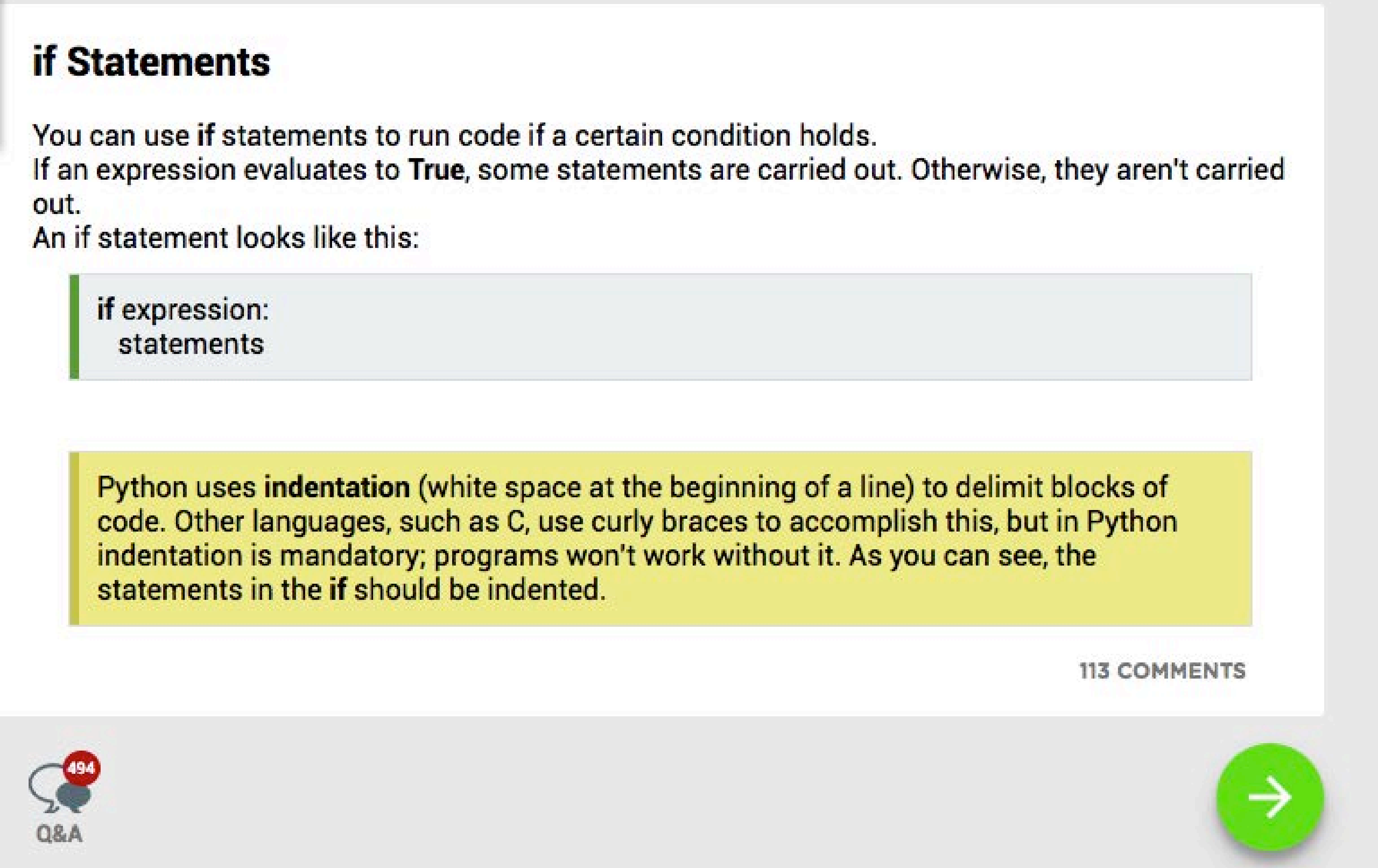
3 questions ✓

12/12
A Simple Calculator
3 questions ✓

Module 2 Quiz
6 questions ✓

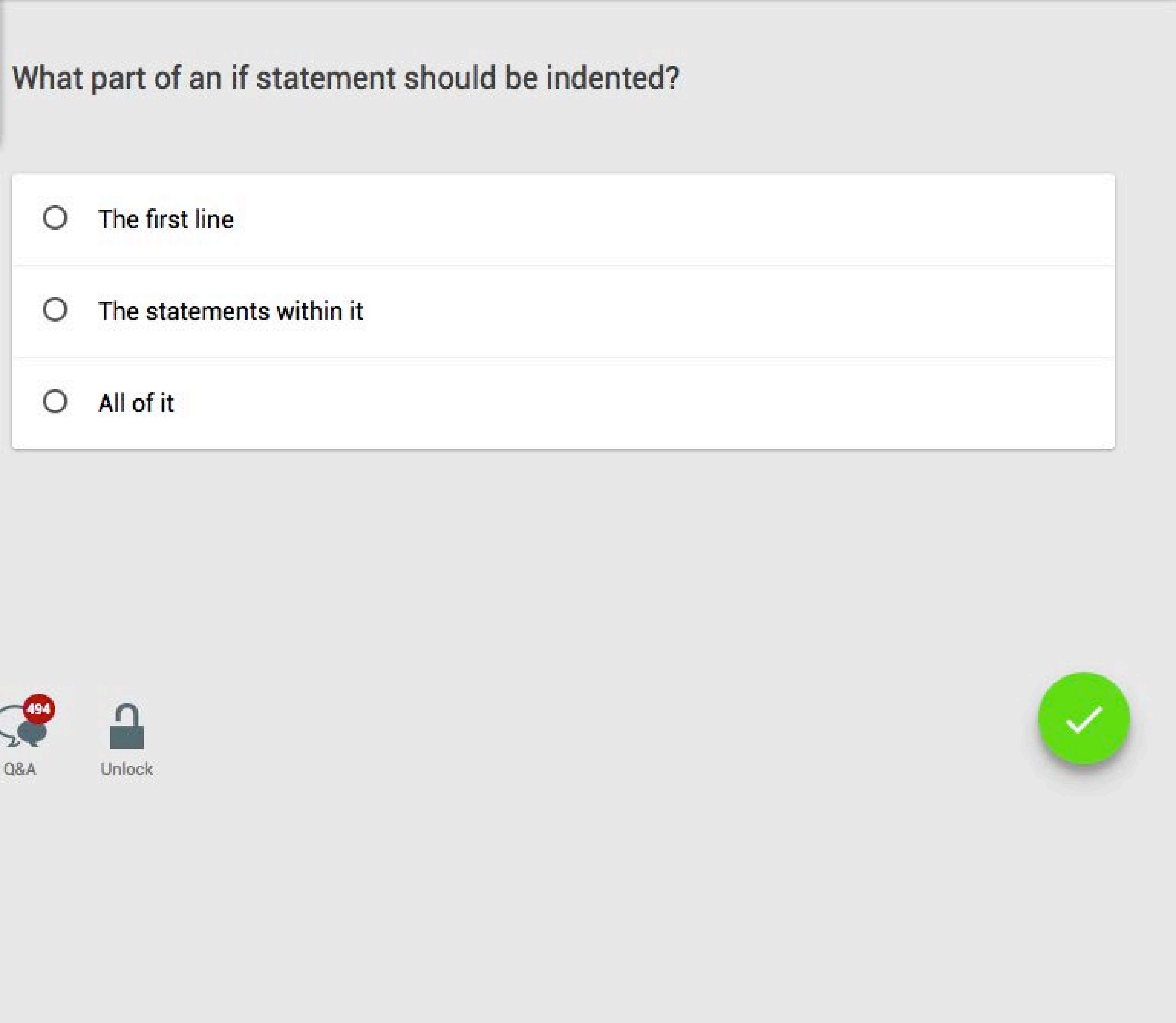


if Statements

You can use **if** statements to run code if a certain condition holds.
If an expression evaluates to **True**, some statements are carried out. Otherwise, they aren't carried out.
An if statement looks like this:

```
if expression:
  statements
```

Python uses **indentation** (white space at the beginning of a line) to delimit blocks of code. Other languages, such as C, use curly braces to accomplish this, but in Python indentation is mandatory; programs won't work without it. As you can see, the statements in the **if** should be indented.



What part of an if statement should be indented?

- ○ The first line
- ○ The statements within it
- ○ All of it

if Statements

Here is an example **if** statement:

```
if 10 > 5:
   print("10 greater than 5")

print("Program ended")
```

Try It Yourself

The expression determines whether 10 is greater than five. Since it is, the indented statement runs, and "10 greater than 5" is output. Then, the unindented statement, which is not part of the **if** statement, is run, and "Program ended" is displayed.

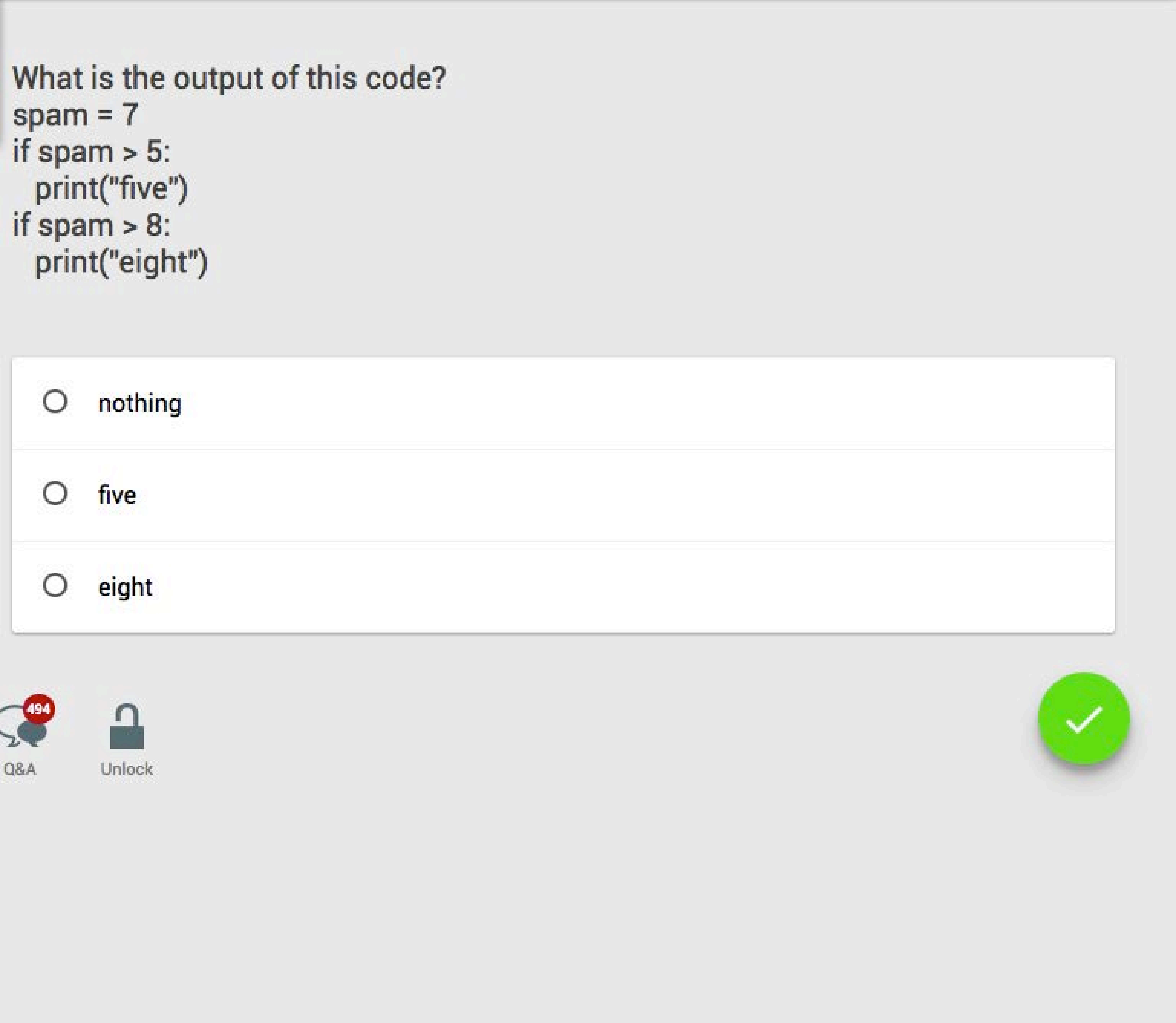
Result:

```
>>>
10 greater than 5
Program ended
>>>
```

Notice the **colon** at the end of the expression in the **if** statement.

As the program contains multiple lines of code, you should create it as a separate file and run it.

167 COMMENTS



What is the output of this code?

```
spam = 7
if spam > 5:
  print("five")
if spam > 8:
  print("eight")
```

- ○ nothing
- ○ five
- ○ eight

if Statements

To perform more complex checks, **if** statements can be nested, one inside the other.
This means that the inner **if** statement is the statement part of the outer one. This is one way to see whether multiple conditions are satisfied.

For example:

```
num = 12
if num > 5:
  print("Bigger than 5")
  if num <=47:
    print("Between 5 and 47")
```

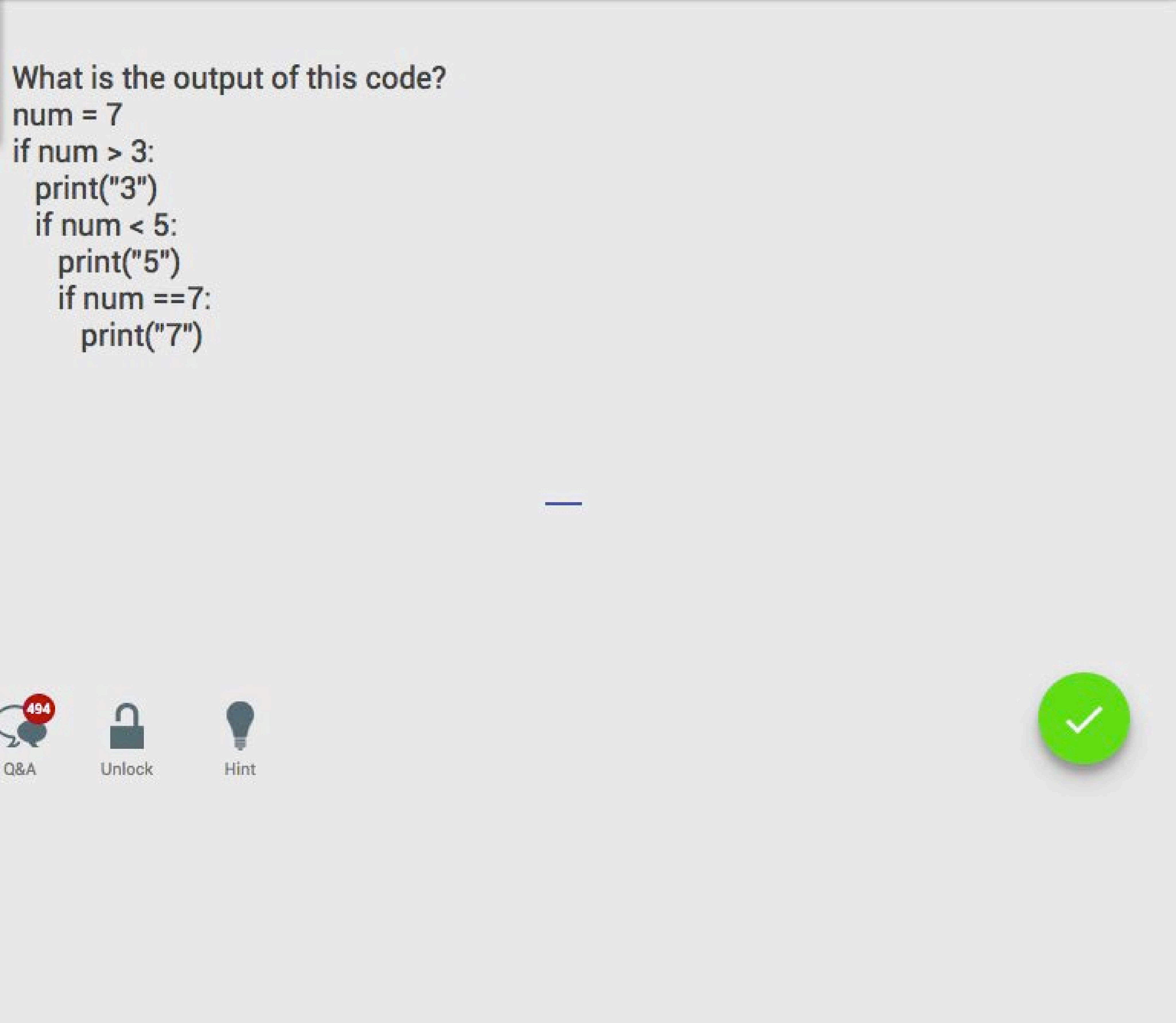
Try It Yourself

Result:

```
>>>
Bigger than 5
Between 5 and 47
>>>
```

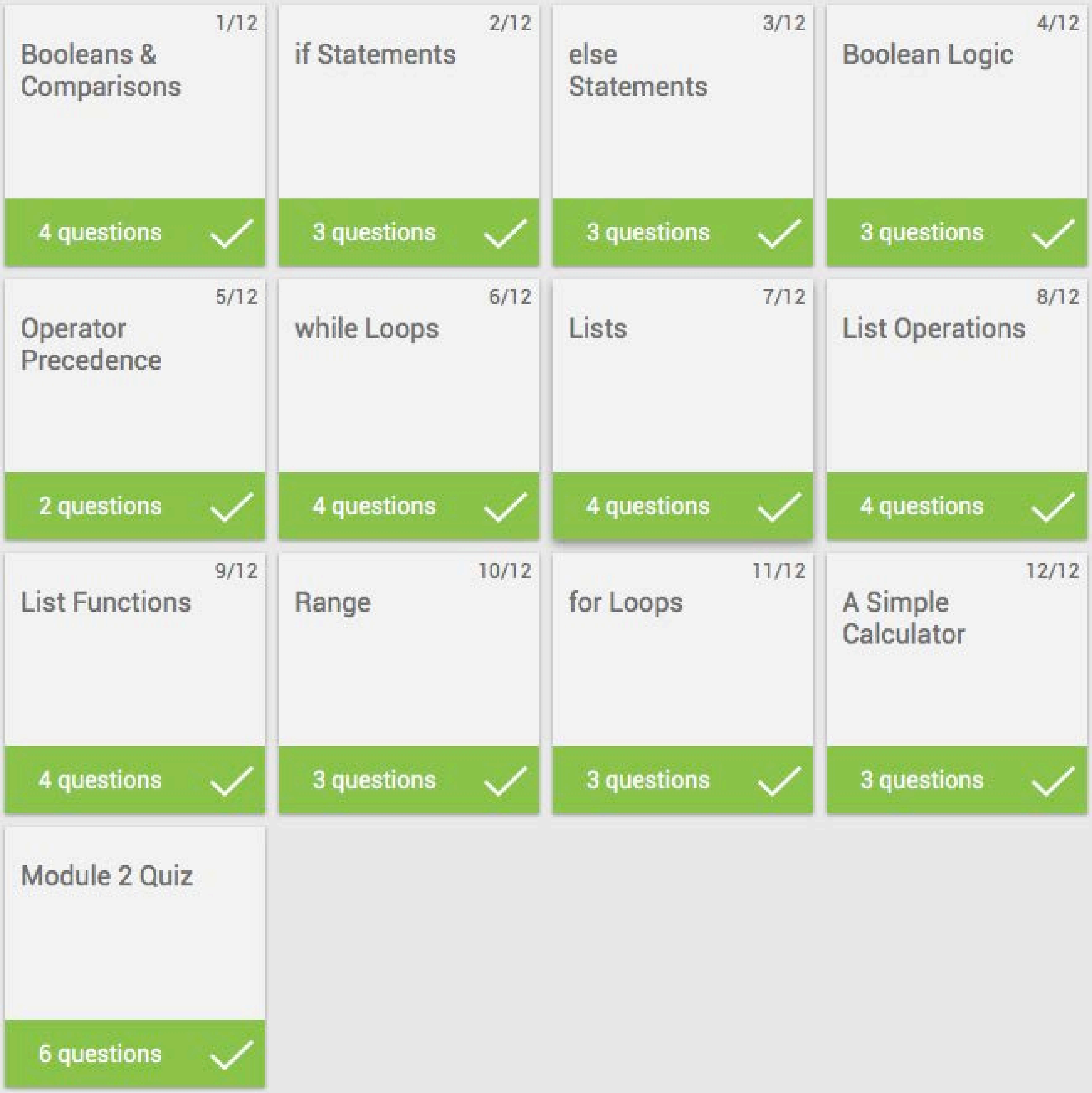
131 COMMENTS

494
Q&A



What is the output of this code?

```
num = 7
if num > 3:
  print("3")
  if num < 5:
    print("5")
    if num ==7:
      print("7")
```



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3 questions ✓

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A Simple Calculator
3 questions ✓

Module 2 Quiz
6 questions ✓

else Statements

An **else** statement follows an **if** statement, and contains code that is called when the if statement evaluates to **False**.
As with **if** statements, the code inside the block should be indented.

```
x = 4
if x == 5:
  print("Yes")
else:
  print("No")
```

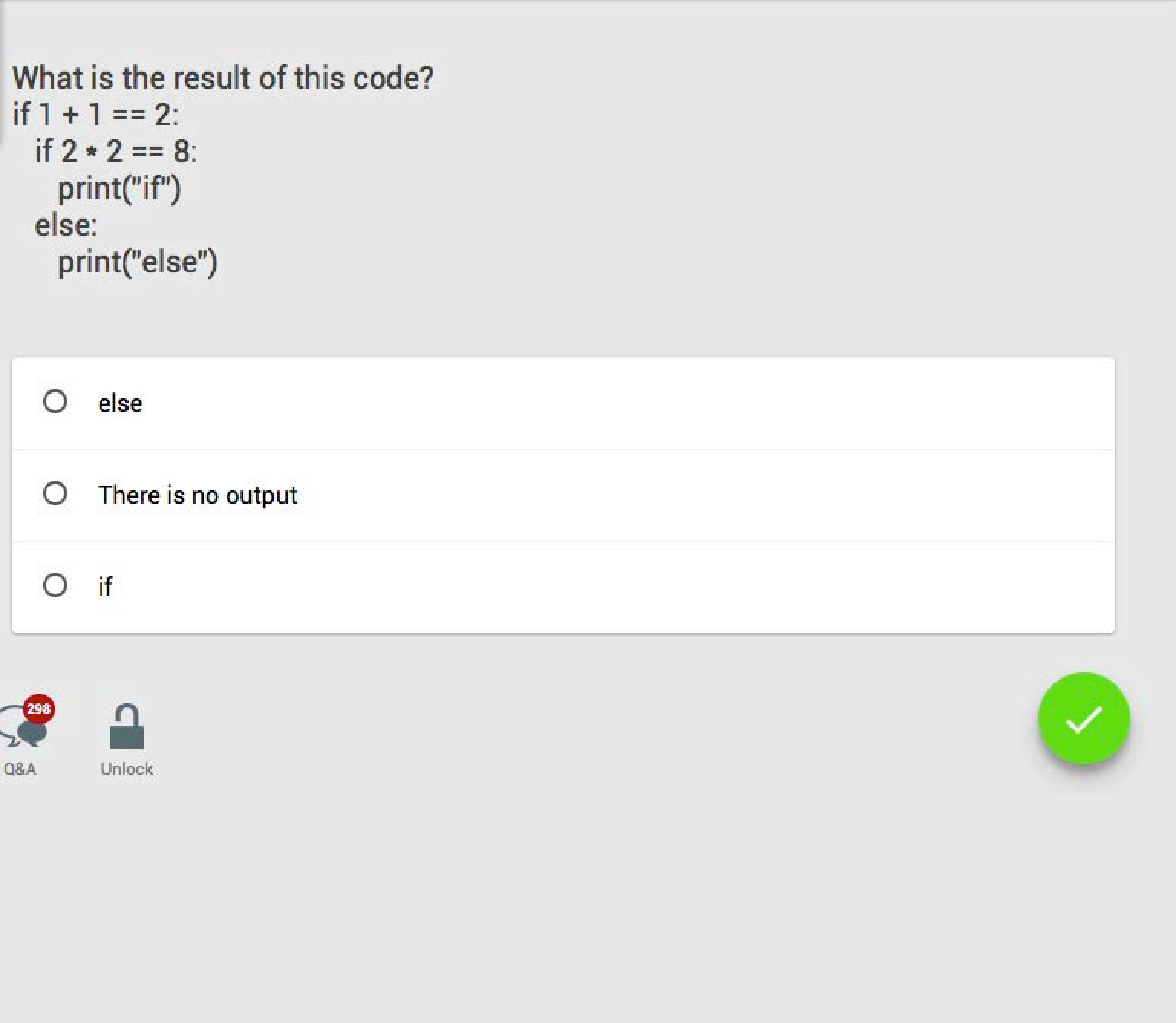
Try It Yourself

Result:

```
>>>
No
>>>
```

135 COMMENTS

298
Q&A



What is the result of this code?

```
if 1 + 1 == 2:
  if 2 * 2 == 8:
    print("if")
  else:
    print("else")
```

○ else

○ There is no output

○ if

else Statements

You can chain **if** and **else** statements to determine which option in a series of possibilities is true.
For example:

```
num = 7
if num == 5:
 print("Number is 5")
else:
 if num == 11:
  print("Number is 11")
 else:
  if num == 7:
   print("Number is 7")
  else:
   print("Number isn't 5, 11 or 7")
```

Try It Yourself

Result:

```
>>>
Number is 7
>>>
```

118 COMMENTS

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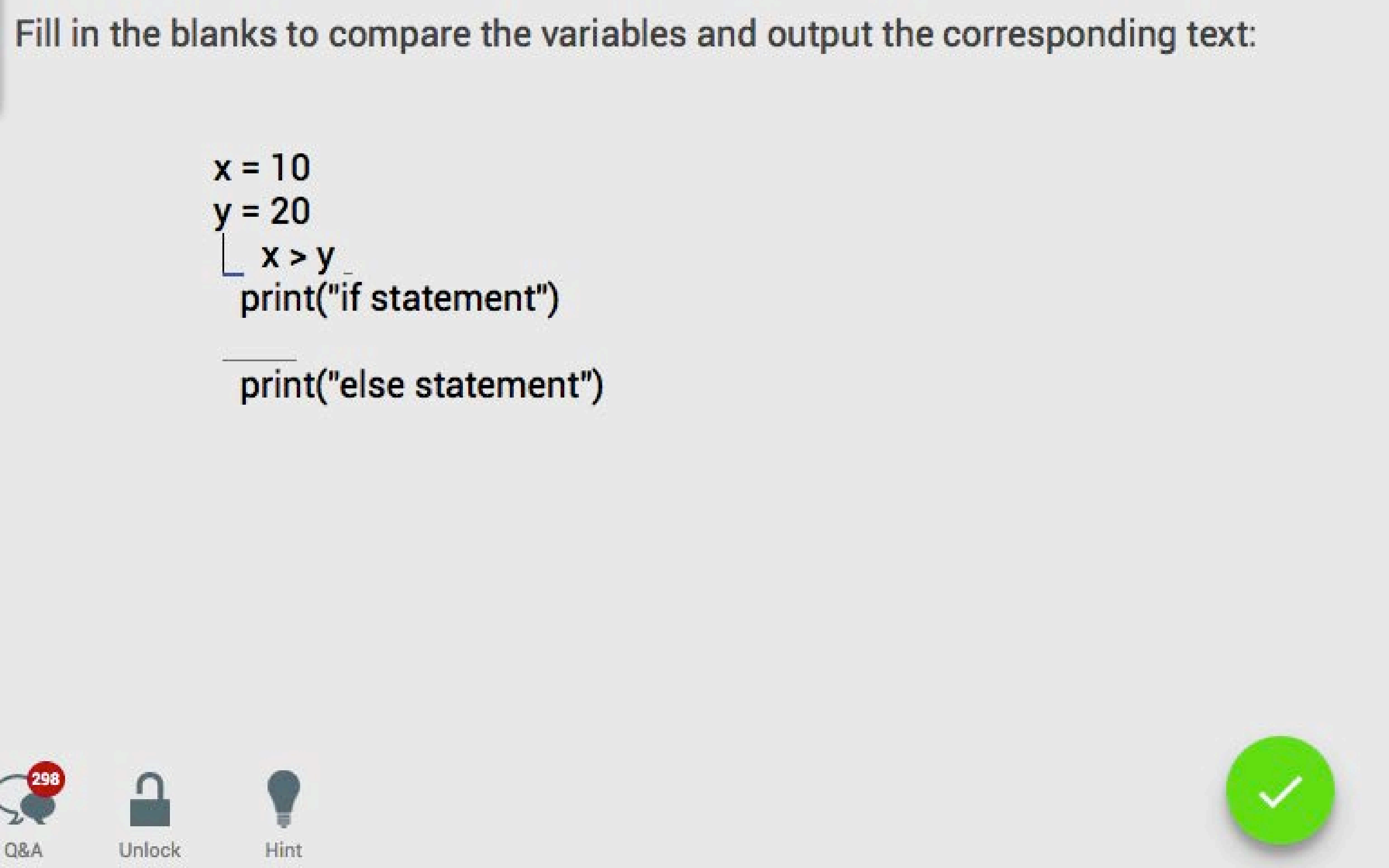
Fill in the blanks to compare the variables and output the corresponding text:

```
x = 10
y = 20
__ x > y _
  print("if statement")
__
  print("else statement")
```

elif Statements

The elif (short for else if) statement is a shortcut to use when chaining **if** and **else** statements.
A series of **if** elif statements can have a final **else** block, which is called if none of the **if** or elif expressions is True.
For example:

```
num = 7
if num == 5:
  print("Number is 5")
elif num == 11:
  print("Number is 11")
elif num == 7:
  print("Number is 7")
else:
  print("Number isn't 5, 11 or 7")
```

Try It Yourself

Result:

```
>>>
Number is 7
>>>
```

In other programming languages, equivalents to the elif statement have varying names, including **else if**, **elseif** or **elsif**.

A shorter option for an "else if" statement is:

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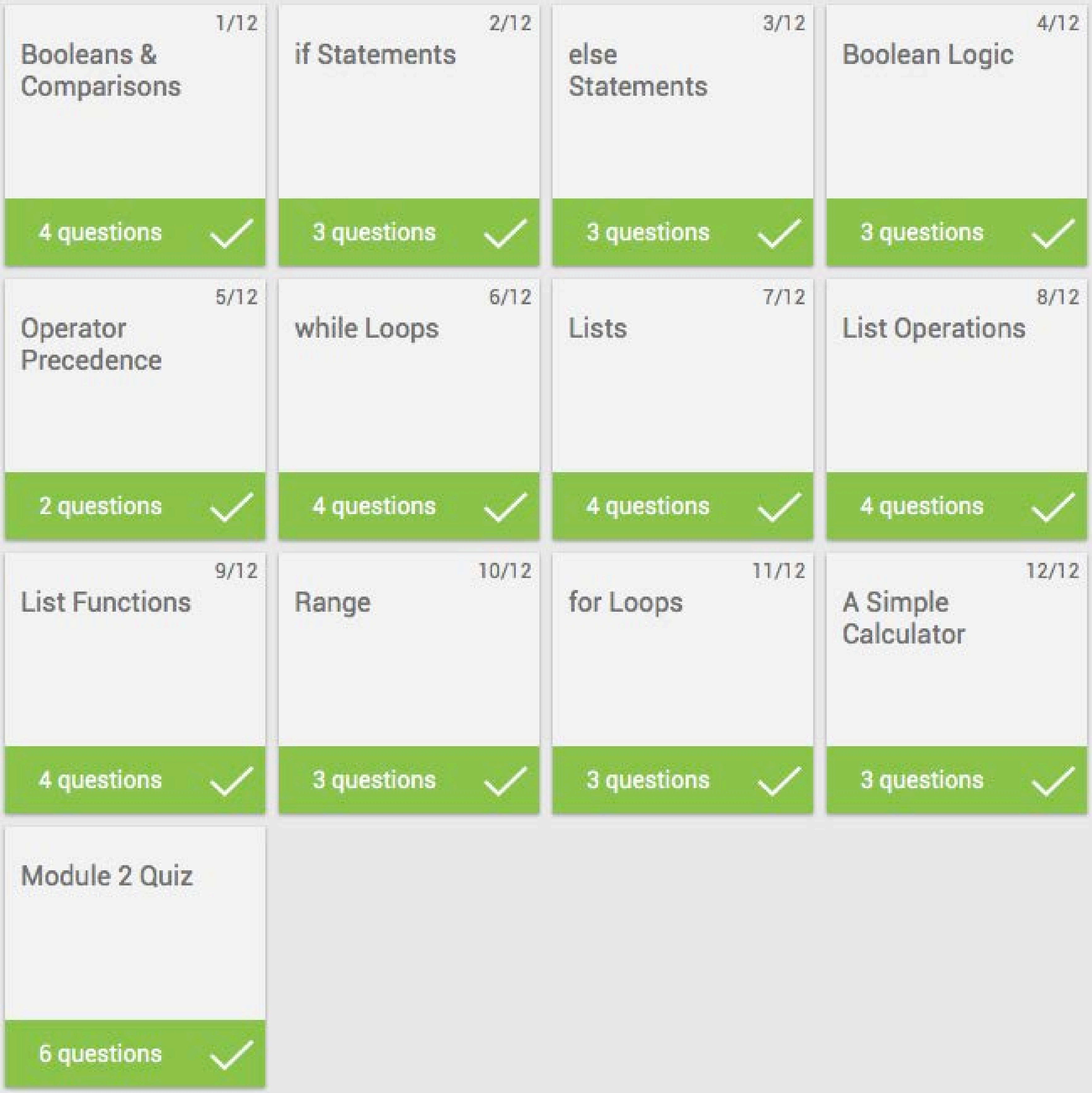
Q&A Unlock Hint



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5/12 Operator Precedence — 2 questions ✓	6/12 while Loops — 4 questions ✓	7/12 Lists — 4 questions ✓	8/12 List Operations — 4 questions ✓
9/12 List Functions — 4 questions ✓	10/12 Range — 3 questions ✓	11/12 for Loops — 3 questions ✓	12/12 A Simple Calculator — 3 questions ✓
Module 2 Quiz — 6 questions ✓			

Boolean Logic

Boolean **logic** is used to make more complicated conditions for **if** statements that rely on more than one condition.
Python's Boolean operators are **and**, **or**, and **not**.
The **and** operator takes two arguments, and evaluates as **True** if, and only if, both of its arguments are **True**. Otherwise, it evaluates to **False**.

```
>>> 1 == 1 and 2 == 2
True
>>> 1 == 1 and 2 == 3
False
>>> 1 != 1 and 2 == 2
False
>>> 2 < 1 and 3 >  6
False
```

Try It Yourself

Python uses words for its Boolean operators, whereas most other languages use symbols such as &&, || and !.

85 COMMENTS

89
Q&A

Boolean Or

The **or** operator also takes two arguments. It evaluates to **True** if either (or both) of its arguments are **True**, and **False** if both arguments are **False**.

```
>>> 1 == 1 or 2 == 2
True
>>> 1 == 1 or 2 == 3
True
>>> 1 != 1 or 2 == 2
True
>>> 2 < 1 or 3 >  6
False
```

Try It Yourself

45 COMMENTS

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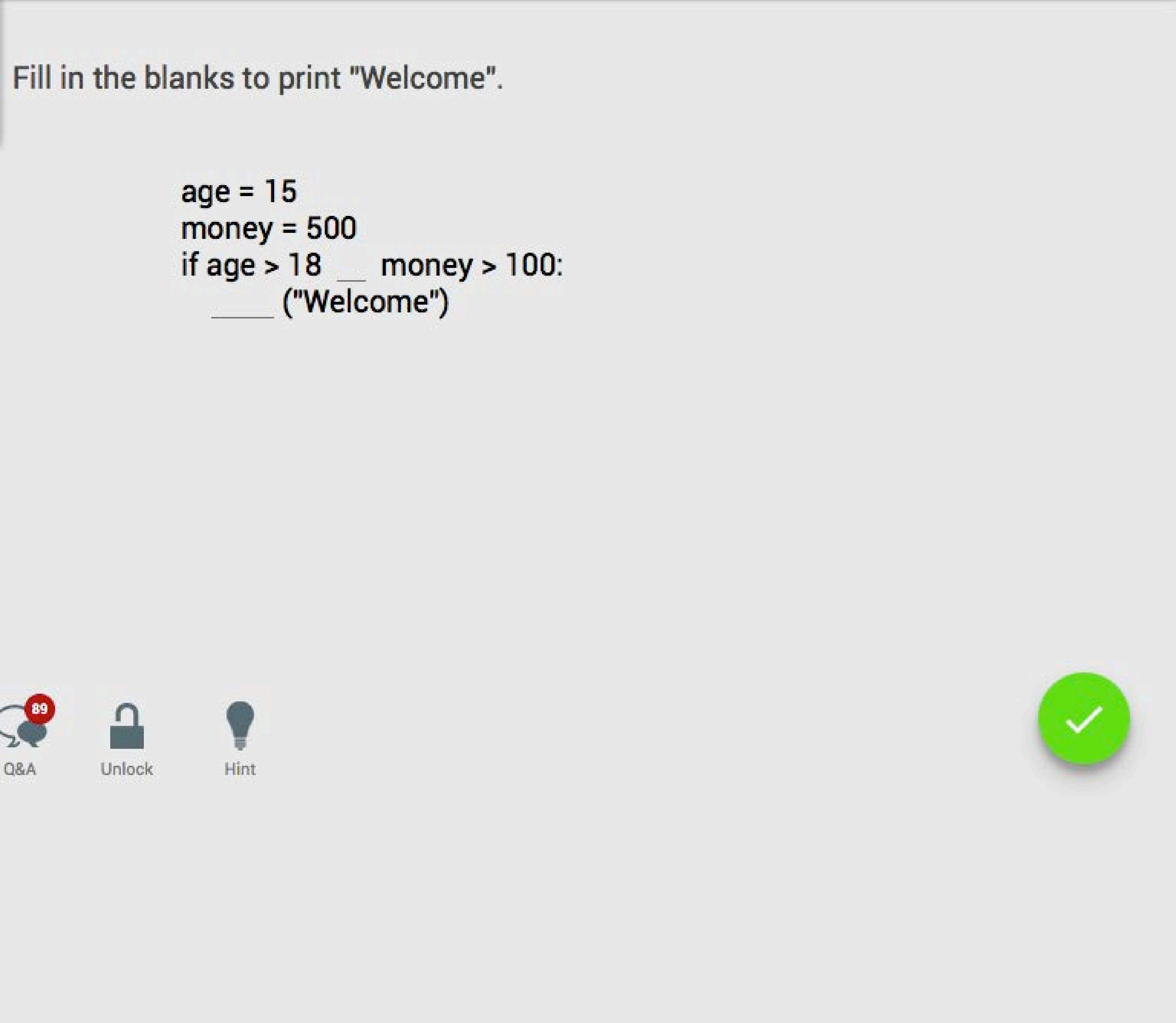
Q&A



Fill in the blanks to print "Welcome".

```
age = 15
money = 500
if age > 18 __ money > 100:
    ____ ("Welcome")
```

Boolean Not

Unlike other operators we've seen so far, **not** only takes one argument, and inverts it.
The result of **not True** is **False**, and **not False** goes to **True**.

```
>>> not 1 == 1
False
>>> not 1 > 7
True
```

Try It Yourself

You can chain multiple conditional statements in an **if** statement using the Boolean operators.

45 COMMENTS

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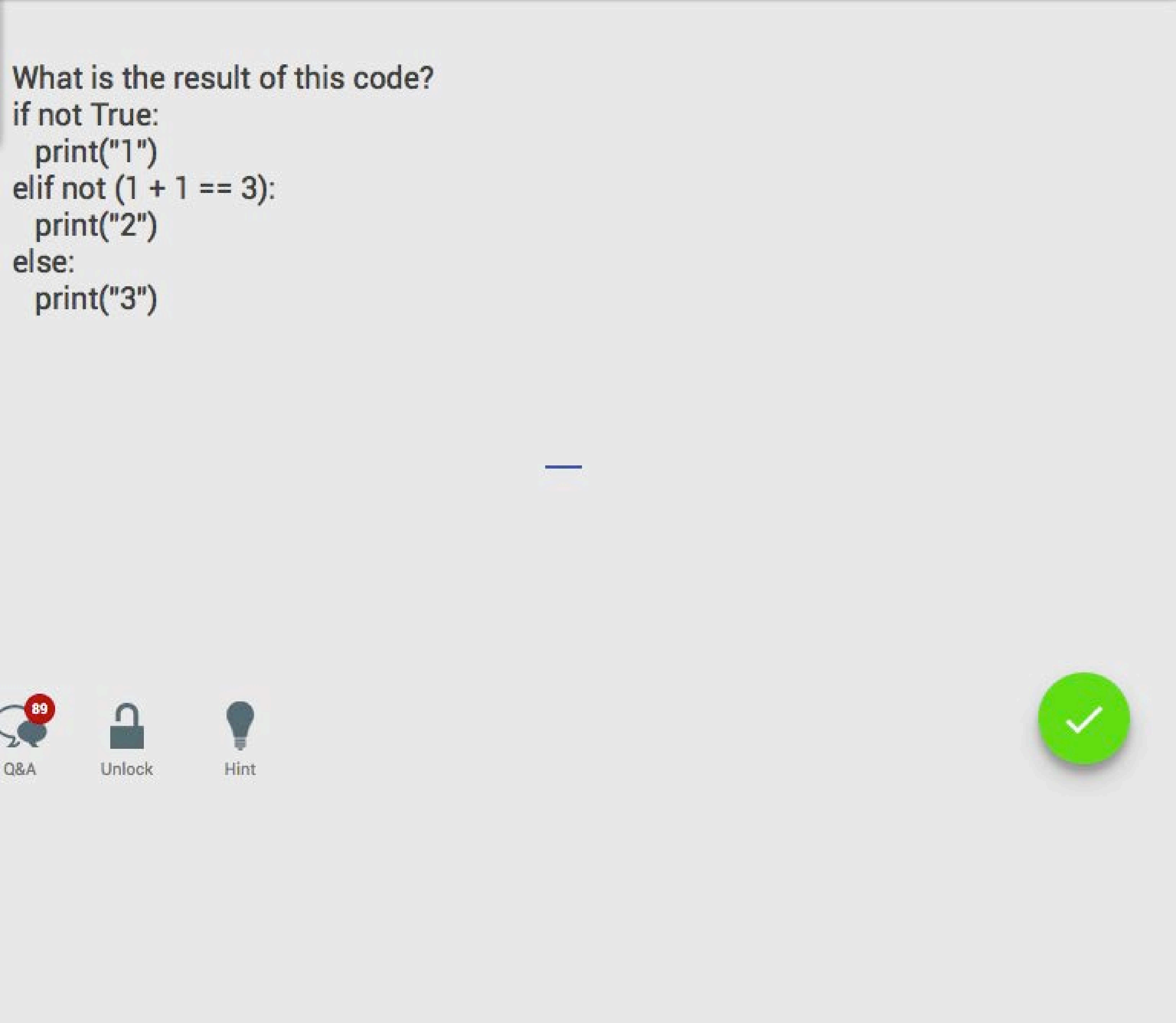
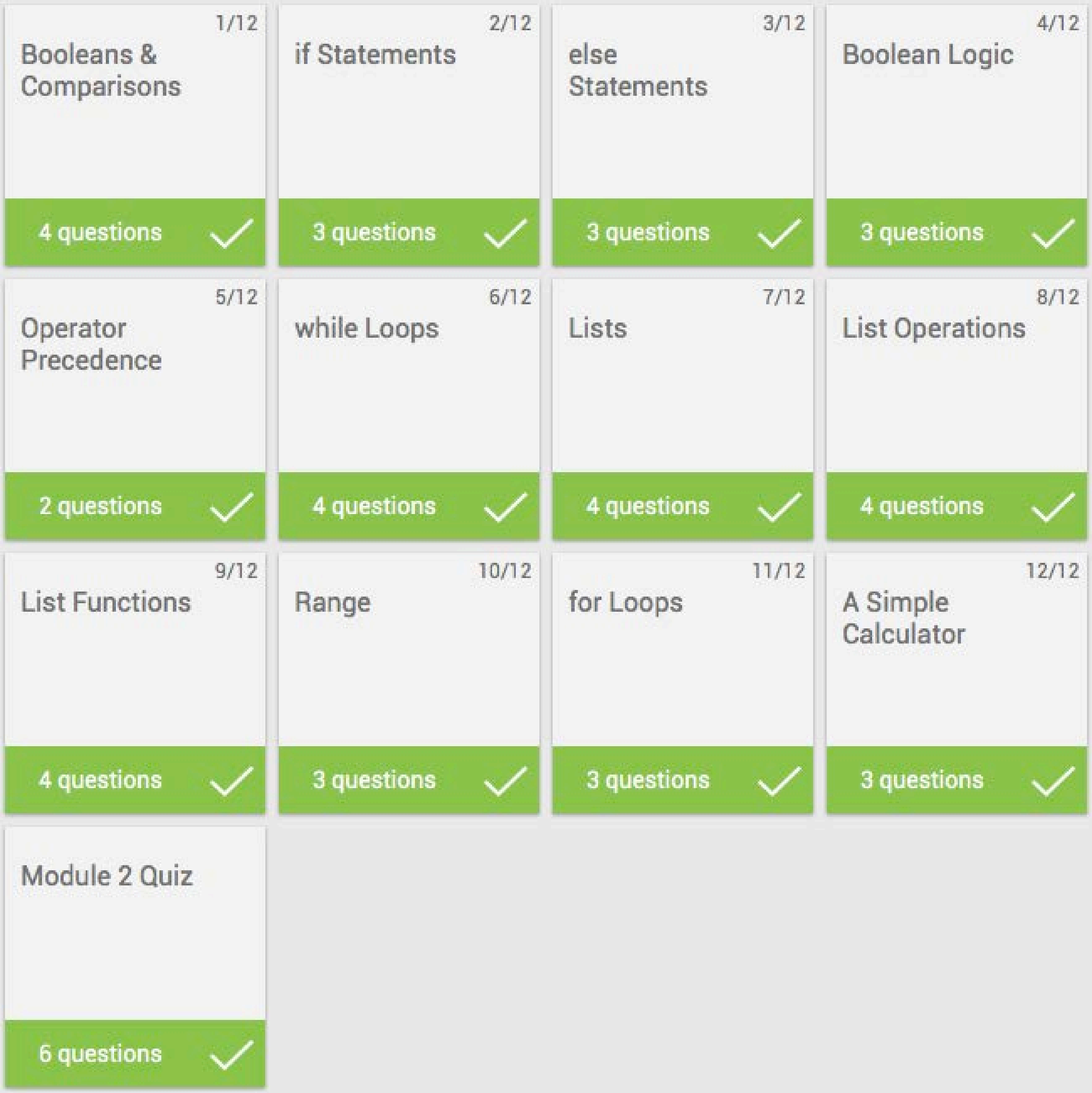
Q&A



What is the result of this code?

```
if not True:
  print("1")
elif not (1 + 1 == 3):
  print("2")
else:
  print("3")
```



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12/12 A Simple Calculator — 3 questions ✓

Module 2 Quiz — 6 questions ✓

Operator Precedence

Operator precedence is a very important concept in programming. It is an extension of the mathematical idea of order of operations (multiplication being performed before addition, etc.) to include other operators, such as those in Boolean logic.

The below code shows that == has a higher precedence than **or**:

```
>>> False == False or True
True
>>> False == (False or True)
False
>>> (False == False) or True
True
```

Try It Yourself

Python's order of operations is the same as that of normal mathematics: parentheses first, then exponentiation, then multiplication/division, and then addition/subtraction.

239 COMMENTS

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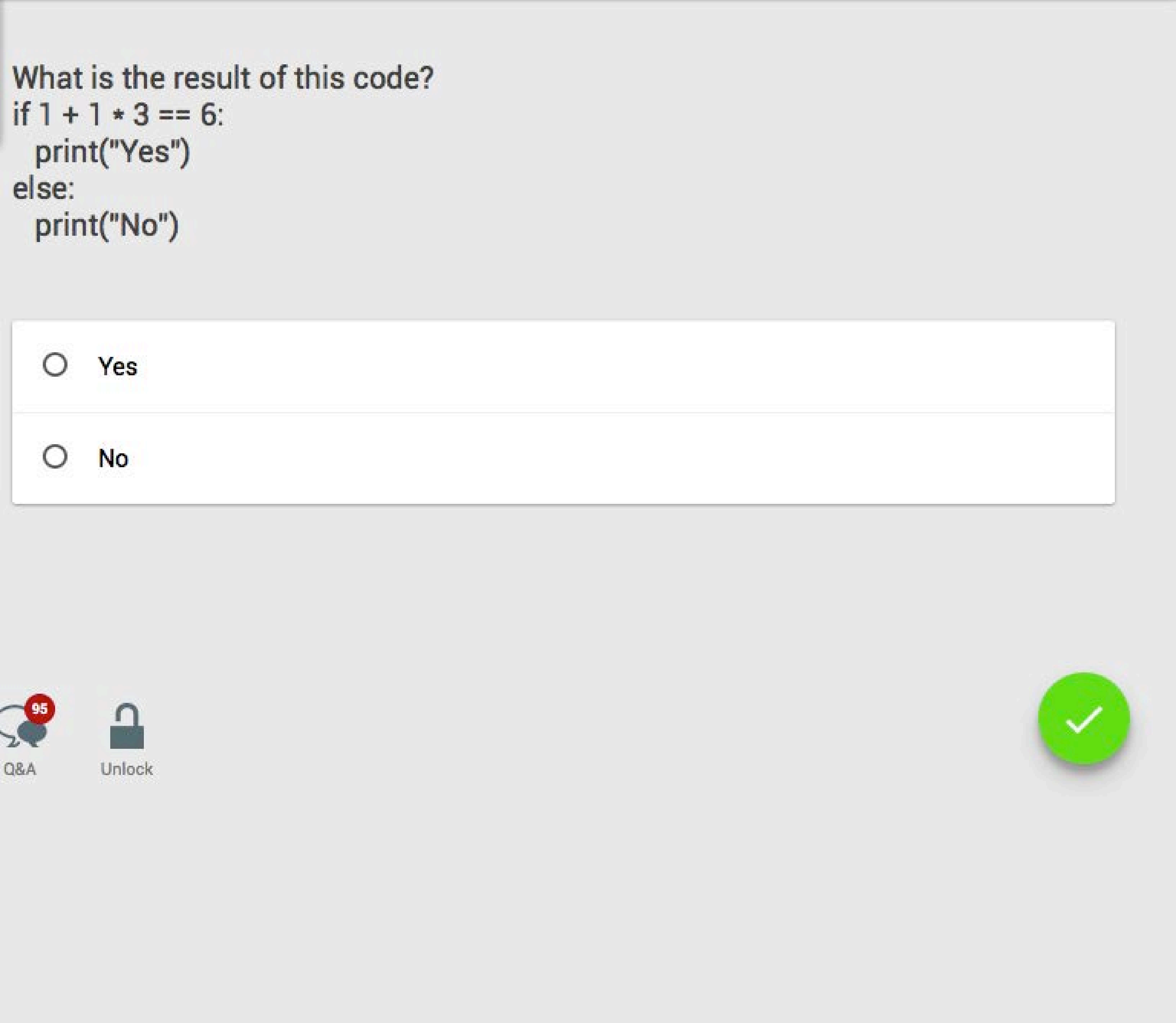
Q&A



What is the result of this code?

```
if 1 + 1 * 3 == 6:
  print("Yes")
else:
  print("No")
```

- ○ Yes
- ○ No

Operator Precedence

The following table lists all of Python's operators, from highest precedence to lowest.

Operator	Description
**	Exponentiation (raise to the power)
~ + -	Complement, unary plus and minus (method names for the last two are +@ and -@)
* / % //	Multiply, divide, modulo and floor division
+ -	Addition and subtraction
>> <<	Right and left bitwise shift
&	Bitwise 'AND'
^ |	Bitwise exclusive `OR' and regular `OR'
<= < > >=	Comparison operators
<> == !=	Equality operators
= %= /= //= -= += *= **=	Assignment operators
is is not	Identity operators
in not in	Membership operators

~ + -	Complement, unary plus and minus (method names for the last two are +@ and -@)
* / % //	Multiply, divide, modulo and floor division
+ -	Addition and subtraction
>> <<	Right and left bitwise shift
&	Bitwise 'AND'
^ |	Bitwise exclusive `OR' and regular `OR'
<= < > >=	Comparison operators
<> == !=	Equality operators
= %= /= //= -= += *= **=	Assignment operators
is is not	Identity operators
in not in	Membership operators
not or and	Logical operators

153 COMMENTS

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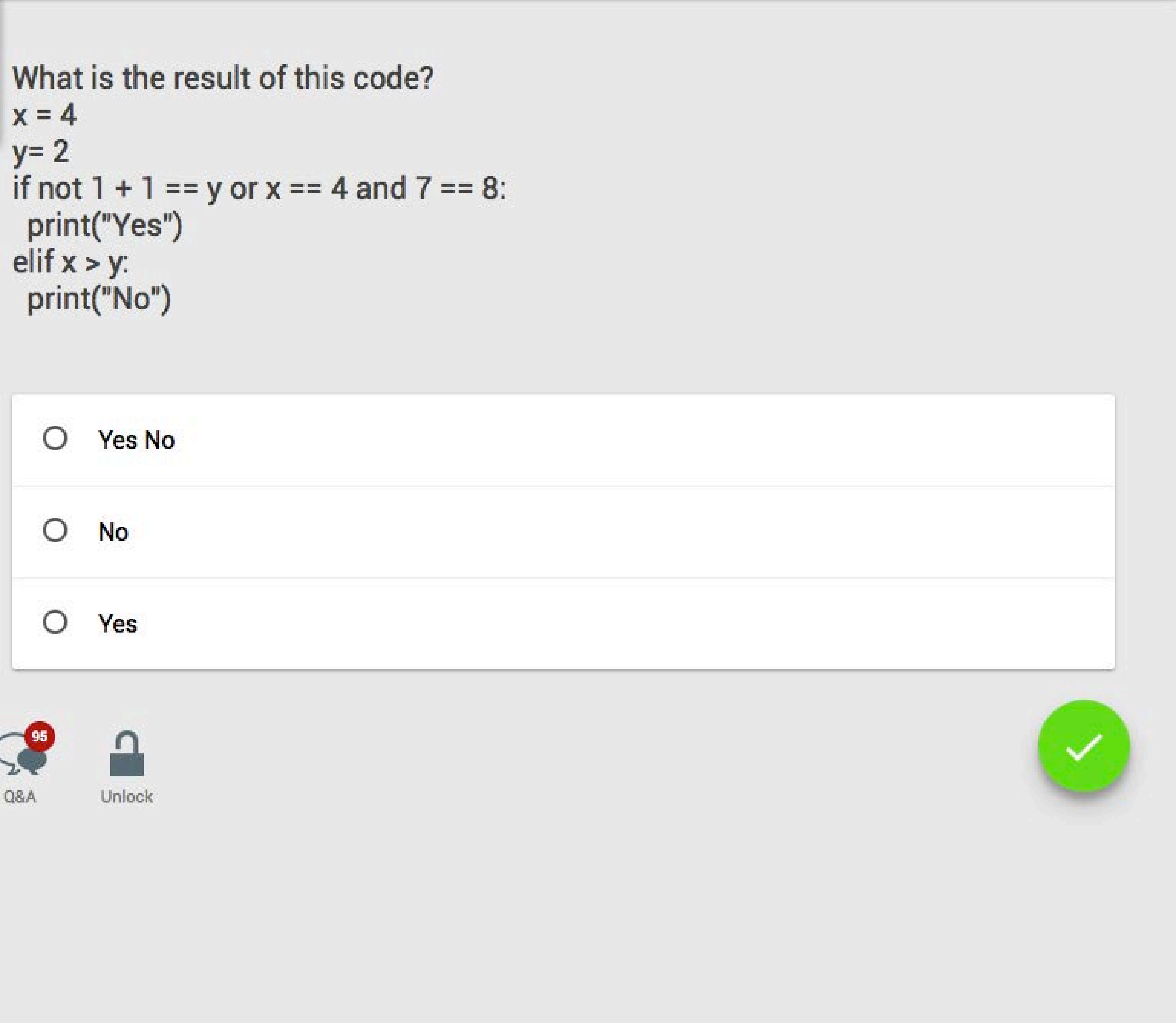
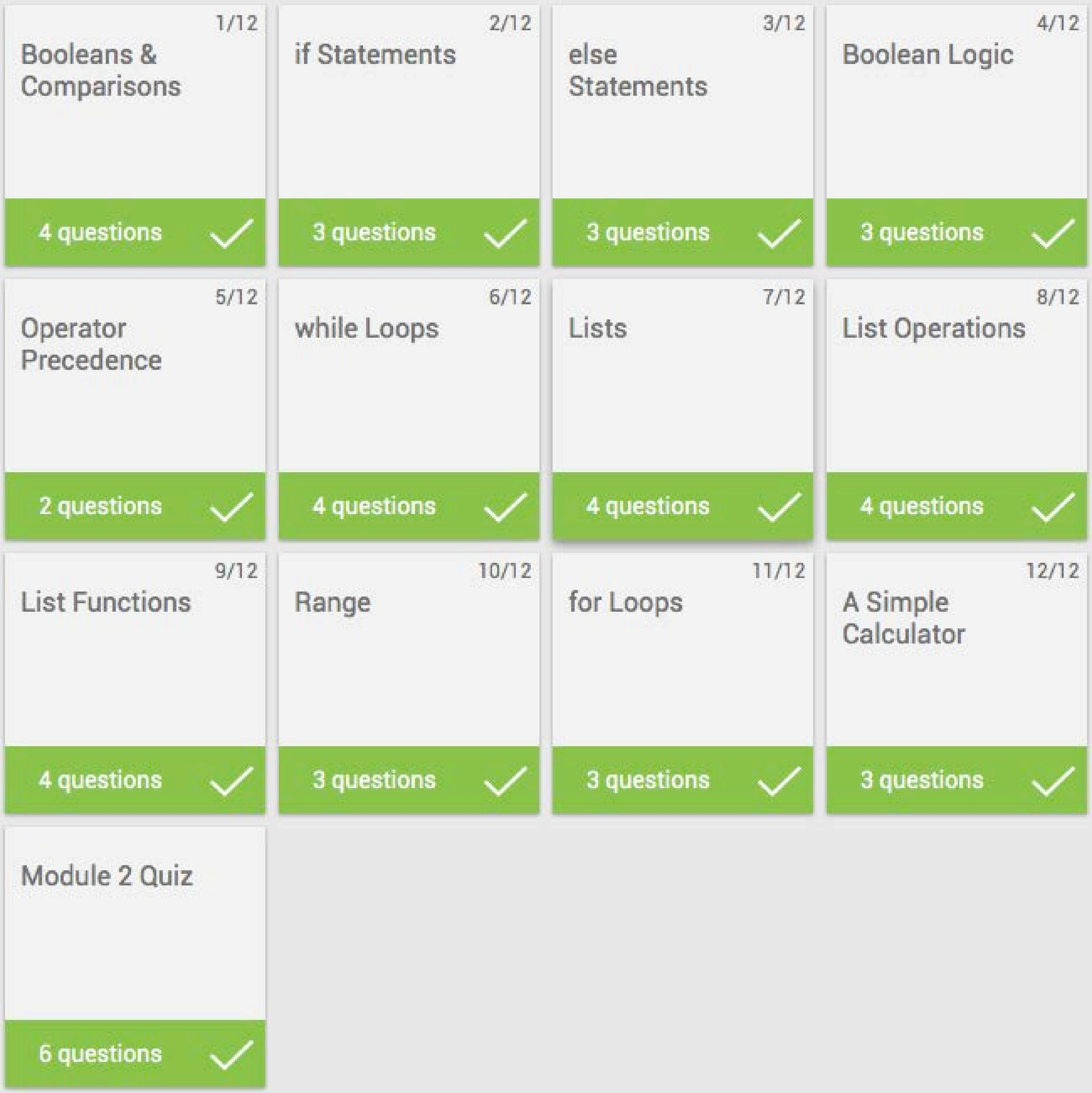
Q&A



What is the result of this code?

```
x = 4
y= 2
if not 1 + 1 == y or x == 4 and 7 == 8:
 print("Yes")
elif x > y:
 print("No")
```

- Yes No
- No
- Yes



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3 questions ✓

Module 2 Quiz
6 questions ✓

while Loops

An **if** statement is run once if its condition evaluates to **True**, and never if it evaluates to **False**.
A **while** statement is similar, except that it can be run more than once. The statements inside it are repeatedly executed, as long as the condition holds. Once it evaluates to **False**, the next section of code is executed.
Below is a **while** loop containing a variable that counts up from 1 to 5, at which point the loop terminates.

```
i = 1
while i <=5:
   print(i)
   i = i + 1

print("Finished!")
```

Try It Yourself

Result:

```
>>>
1
2
3
4
5
Finished!
>>>
```

```
i = 1
while i <=5:
   print(i)
   i = i + 1

print("Finished!")
```

Try It Yourself

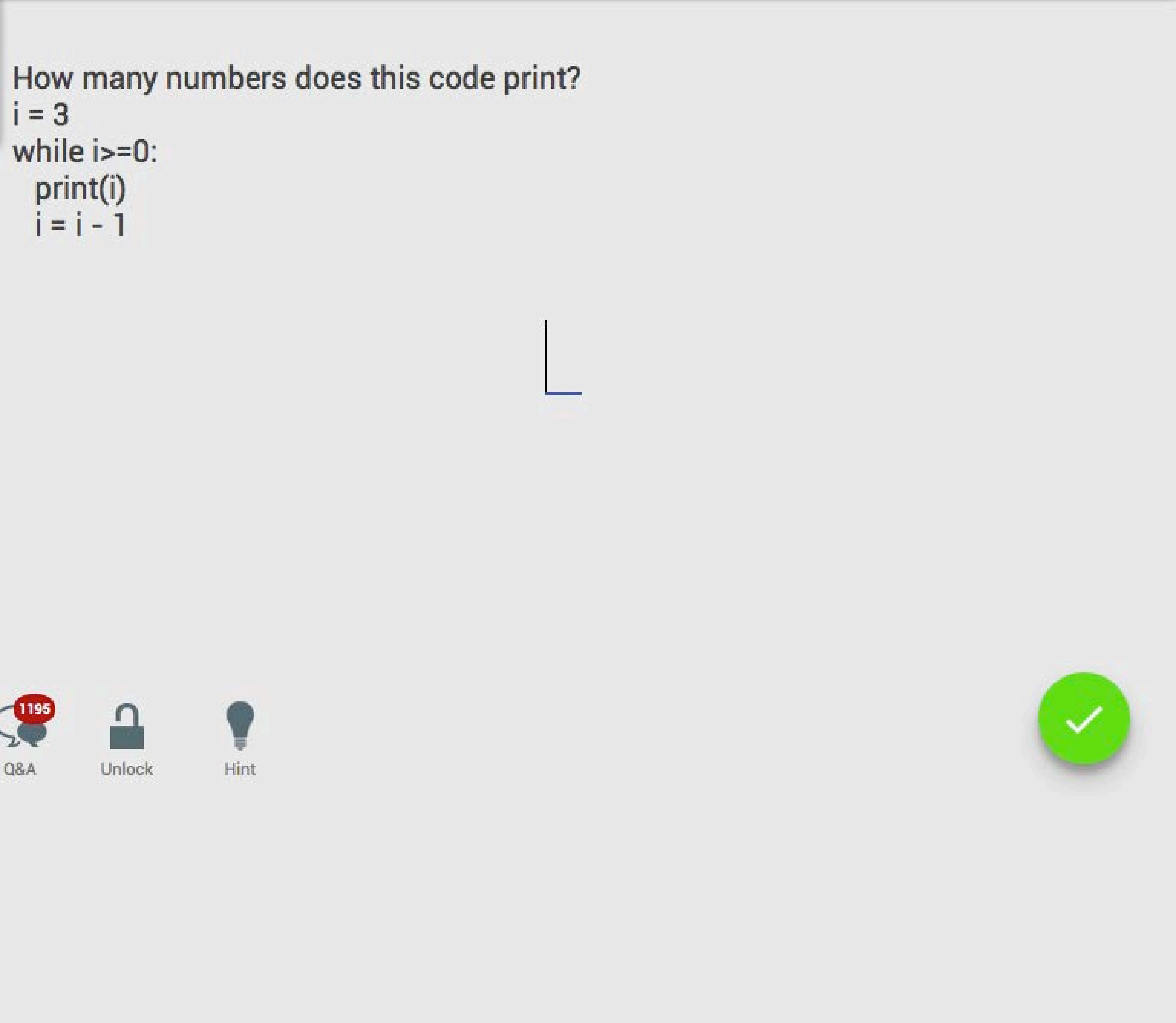
Result:

```
>>>
1
2
3
4
5
Finished!
>>>
```

The code in the body of a **while** loop is executed repeatedly. This is called **iteration**.

326 COMMENTS

1195
Q&A



How many numbers does this code print?

```
i = 3
while i>=0:
  print(i)
  i = i - 1
```

while Loops

The **infinite loop** is a special kind of while loop; it never stops running. Its condition always remains **True**.
An example of an infinite loop:

```
while 1==1:
  print("In the loop")
```

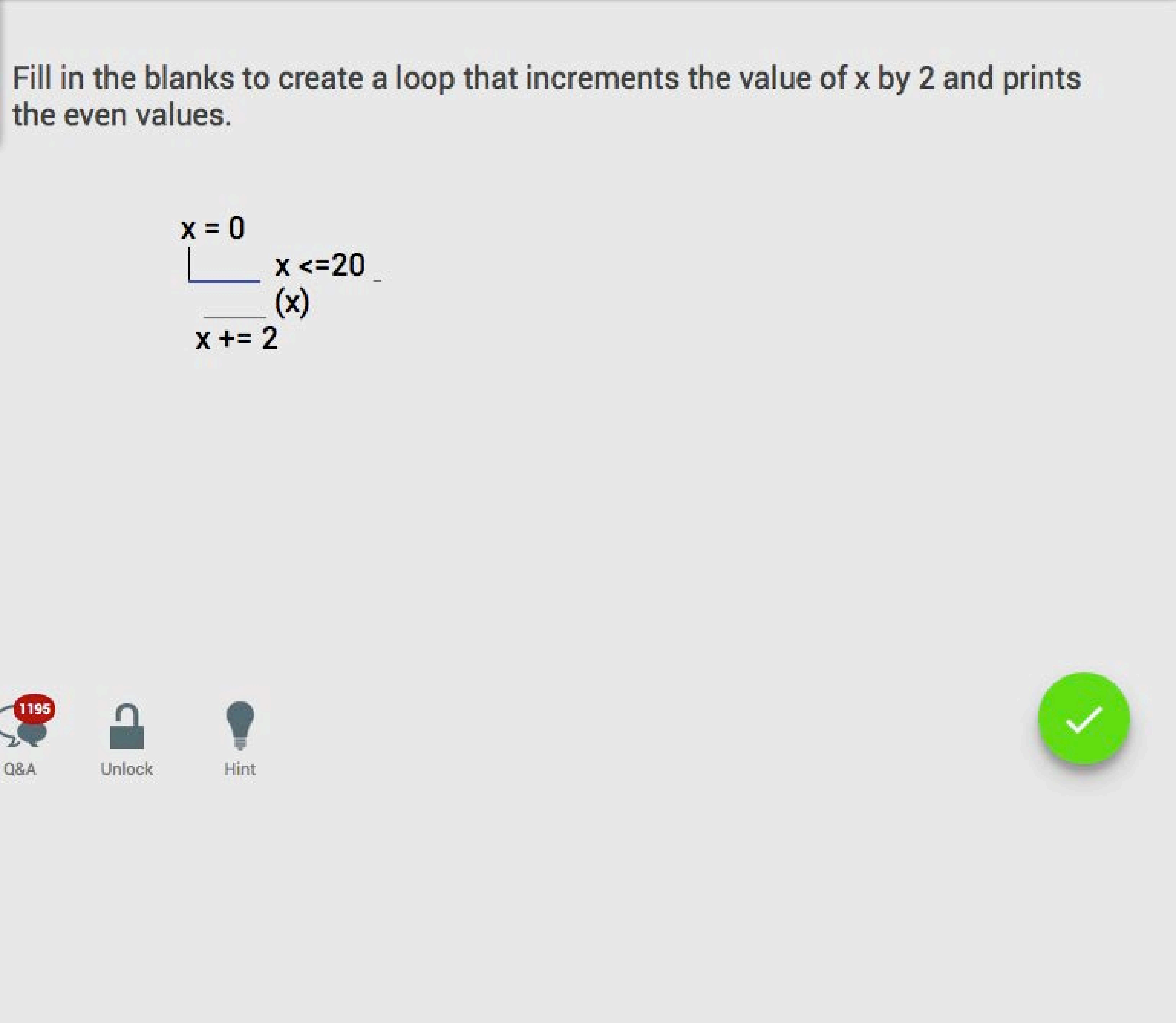
Try It Yourself

This program would indefinitely print "In the loop".

> You can stop the program's execution by using the Ctrl-C shortcut or by closing the program.

179 COMMENTS

1195
Q&A



Fill in the blanks to create a loop that increments the value of x by 2 and prints the even values.

```
x = 0
_____ x <=20 _
    _____(x)
    x += 2
```

break

To end a **while** loop prematurely, the **break** statement can be used.
When encountered inside a loop, the **break** statement causes the loop to finish immediately.

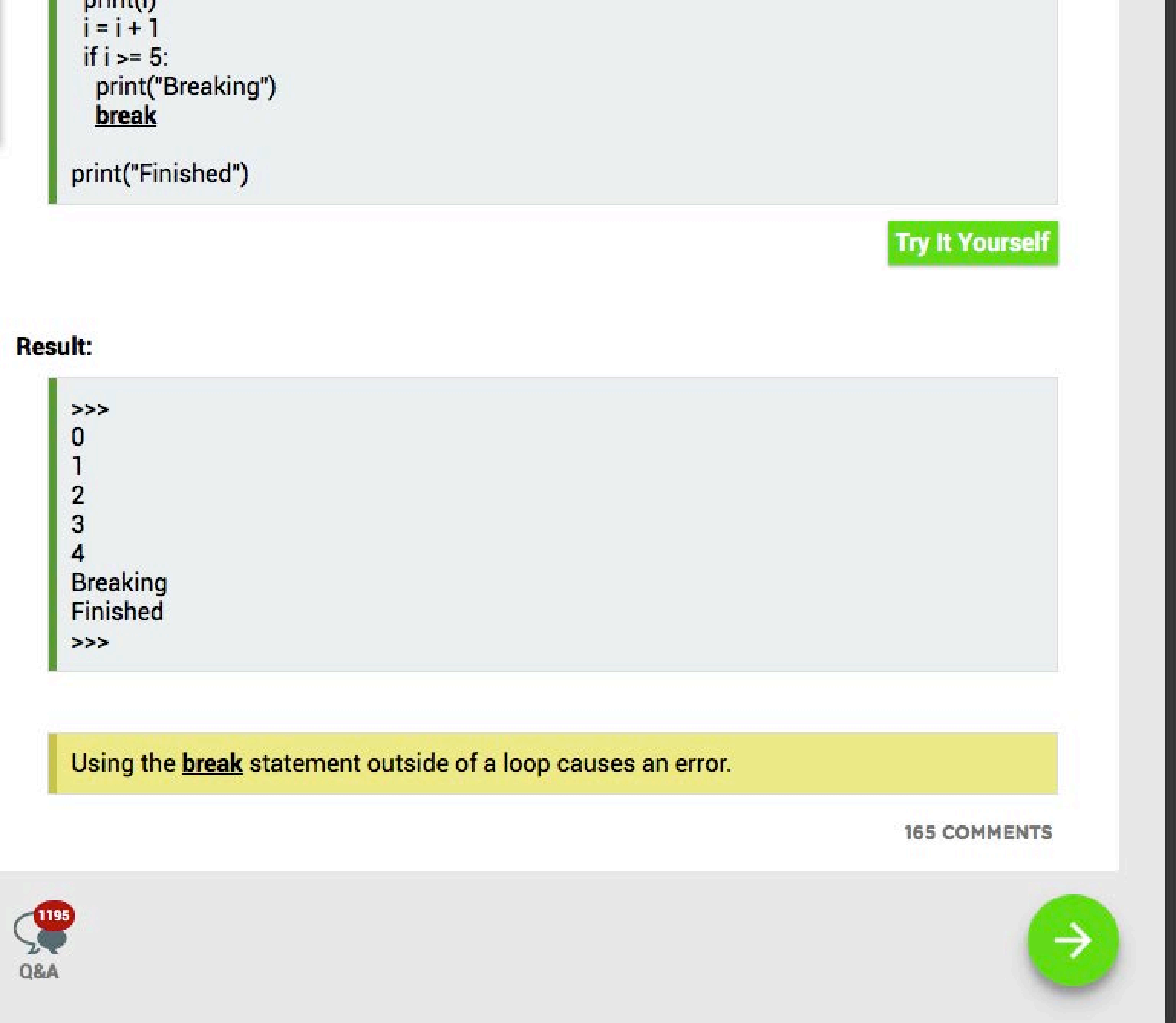
```
i = 0
while 1==1:
 print(i)
 i = i + 1
 if i >= 5:
  print("Breaking")
  break

print("Finished")
```

Try It Yourself

Result:

```
>>>
0
1
2
3
4
Breaking
Finished
>>>
```



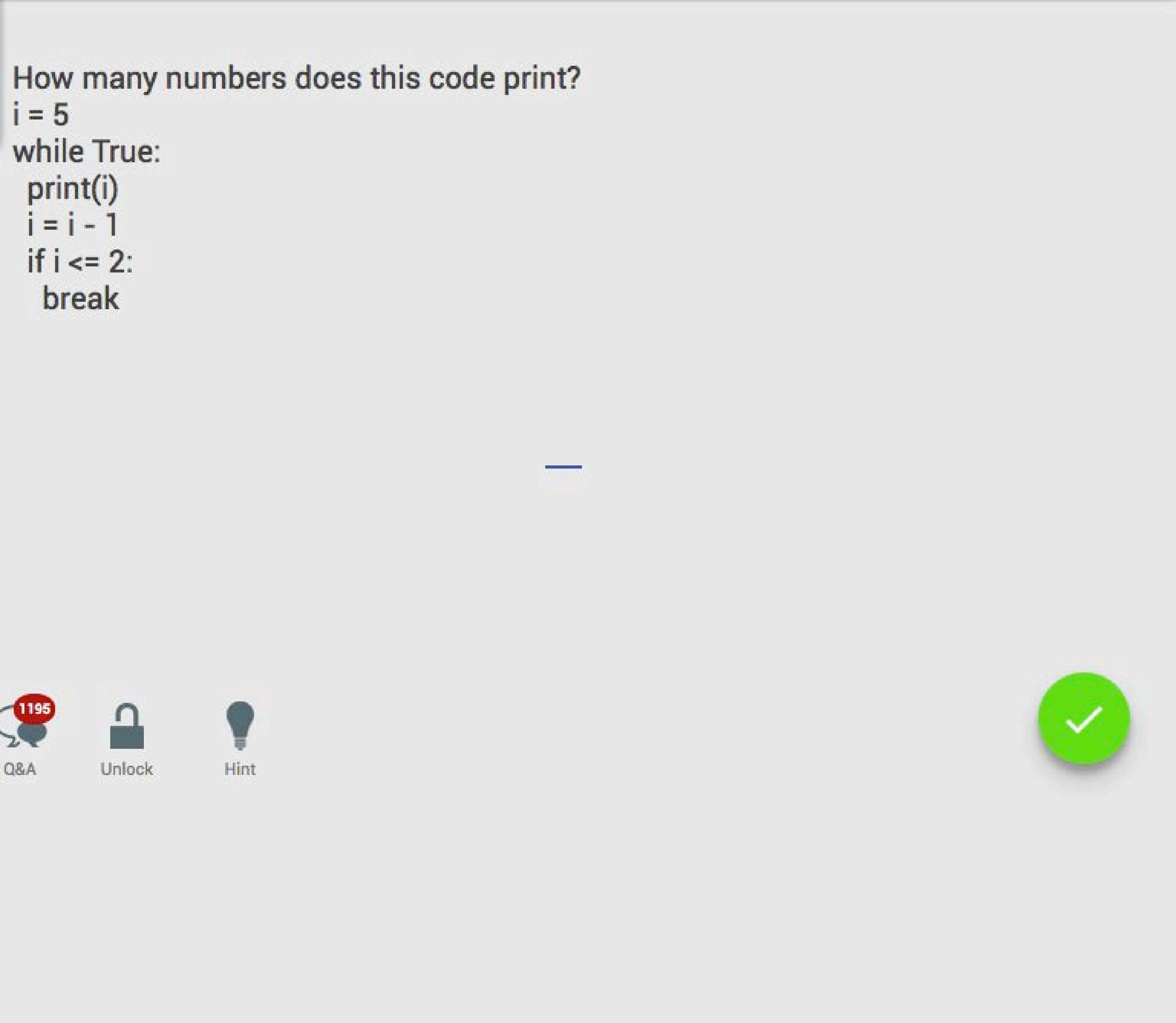
```
  print(i)
  i = i + 1
  if i >= 5:
    print("Breaking")
    break

print("Finished")
```

Result:

```
>>>
0
1
2
3
4
Breaking
Finished
>>>
```

Using the **break** statement outside of a loop causes an error.



How many numbers does this code print?

```
i = 5
while True:
  print(i)
  i = i - 1
  if i <= 2:
    break
```

continue

Another statement that can be used within loops is **continue**.
Unlike break, **continue** jumps back to the top of the loop, rather than stopping it.

```
i = 0
while True:
  i = i +1
  if i == 2:
    print("Skipping 2")
    continue
  if i == 5:
    print("Breaking")
    break
  print(i)

print("Finished")
```

Try It Yourself

Result:

```
>>>
1
Skipping 2
3
4
Breaking
Finished
>>>
```

```
    continue
  if i == 5:
    print("Breaking")
    break
  print(i)

print("Finished")
```

Try It Yourself

Result:

```
>>>
1
Skipping 2
3
4
Breaking
Finished
>>>
```

Basically, the **continue** statement stops the current iteration and continues with the next one.

Using the **continue** statement outside of a loop causes an error.

202 COMMENTS

1195
Q&A

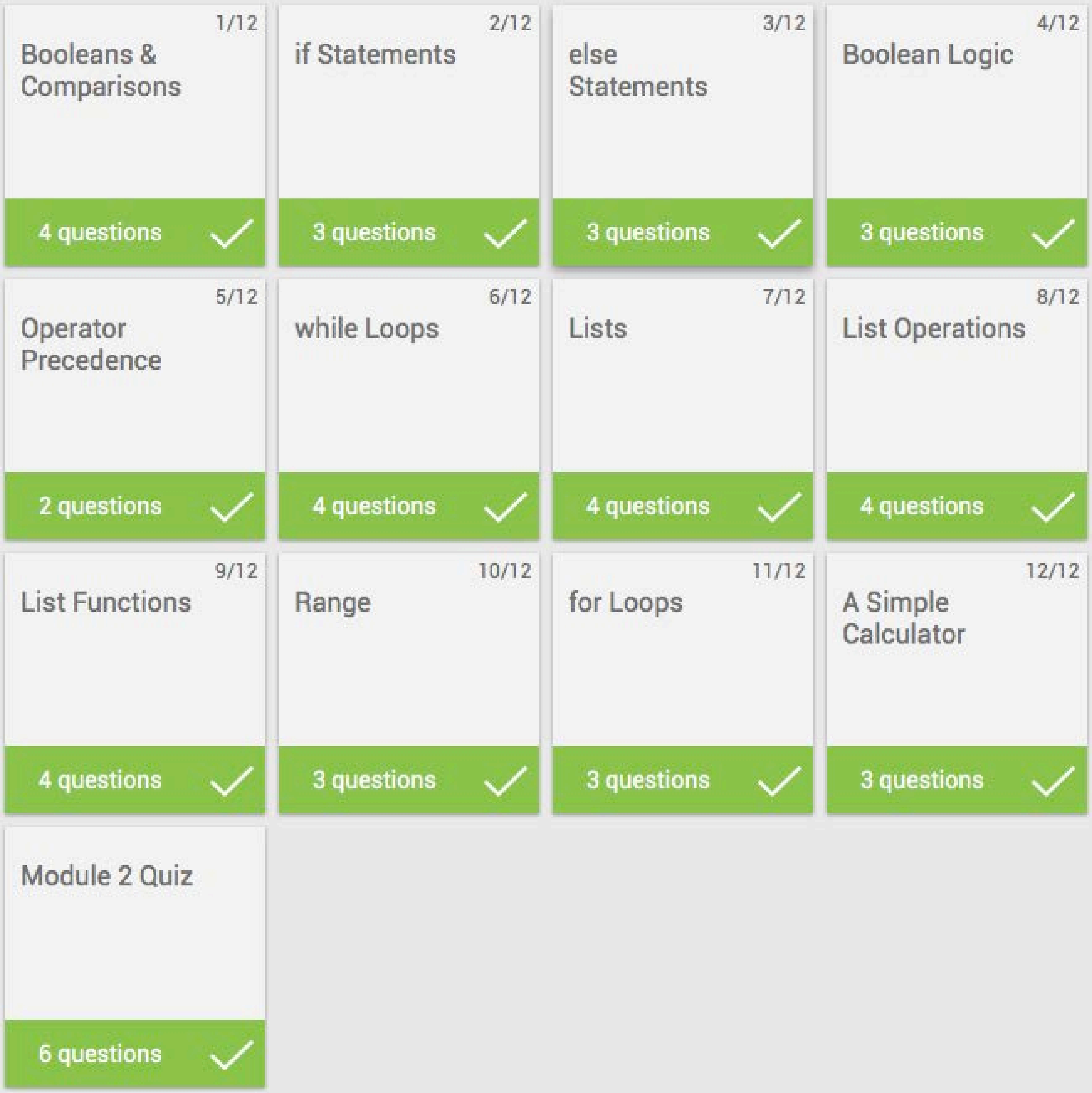
Which statement ends the current iteration and continues with the next one?

1195

Q&A

Unlock

Hint



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A Simple Calculator
3 questions ✓

Module 2 Quiz
6 questions ✓

Lists

Lists are another type of object in Python. They are used to store an indexed list of items.
A list is created using **square brackets** with **commas** separating items.
The certain item in the list can be accessed by using its index in square brackets.
For example:

```
words = ["Hello", "world", "!"]
print(words[0])
print(words[1])
print(words[2])
```

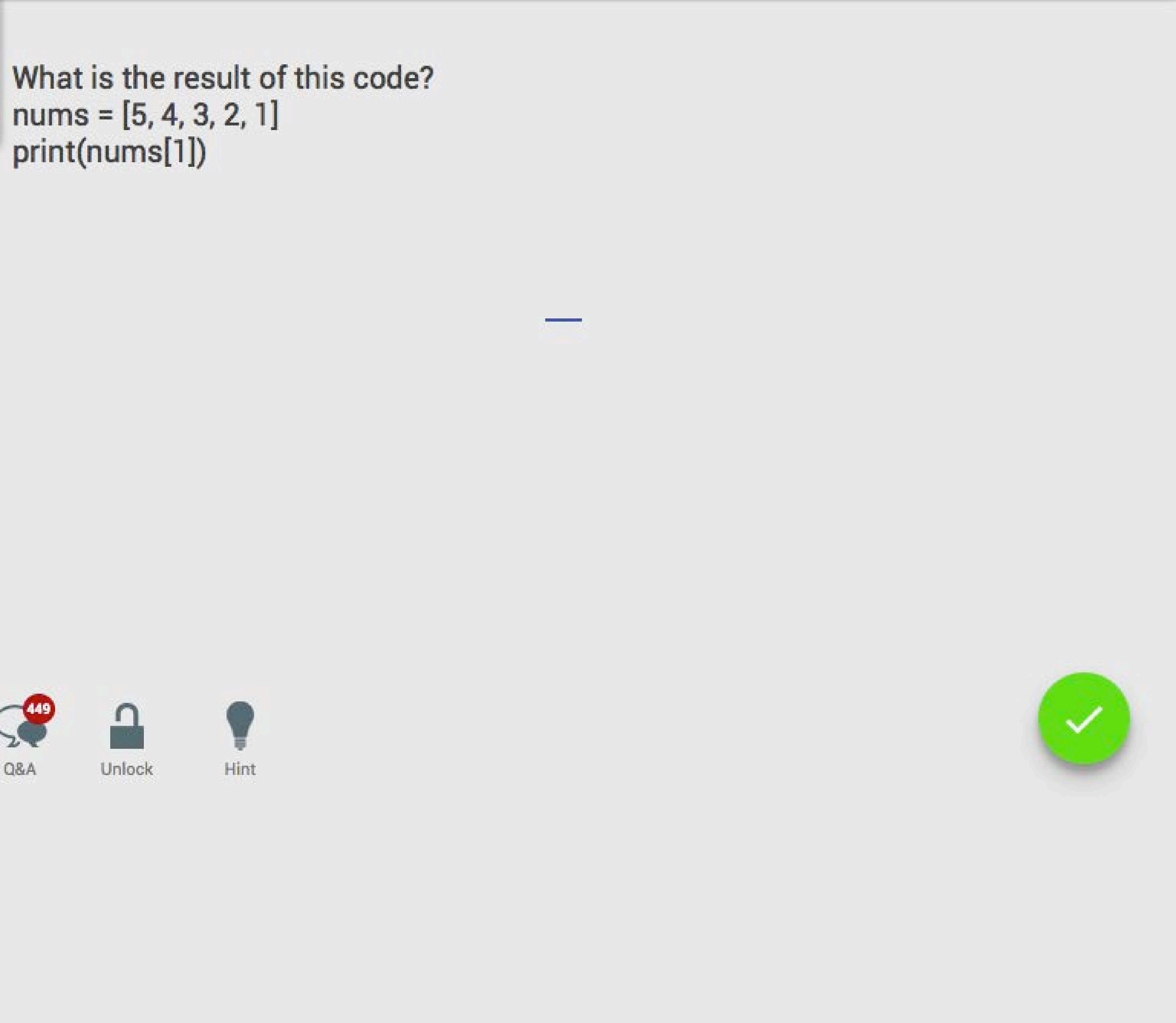
Try It Yourself

Result:

```
>>>
Hello
world
!
>>>
```

The first list item's index is **0**, rather than 1, as might be expected.

133 COMMENTS



What is the result of this code?

```
nums = [5, 4, 3, 2, 1]
print(nums[1])
```

Lists

An empty list is created with an empty pair of square brackets.

```
empty_list = []
print(empty_list)
```

Try It Yourself

Result:

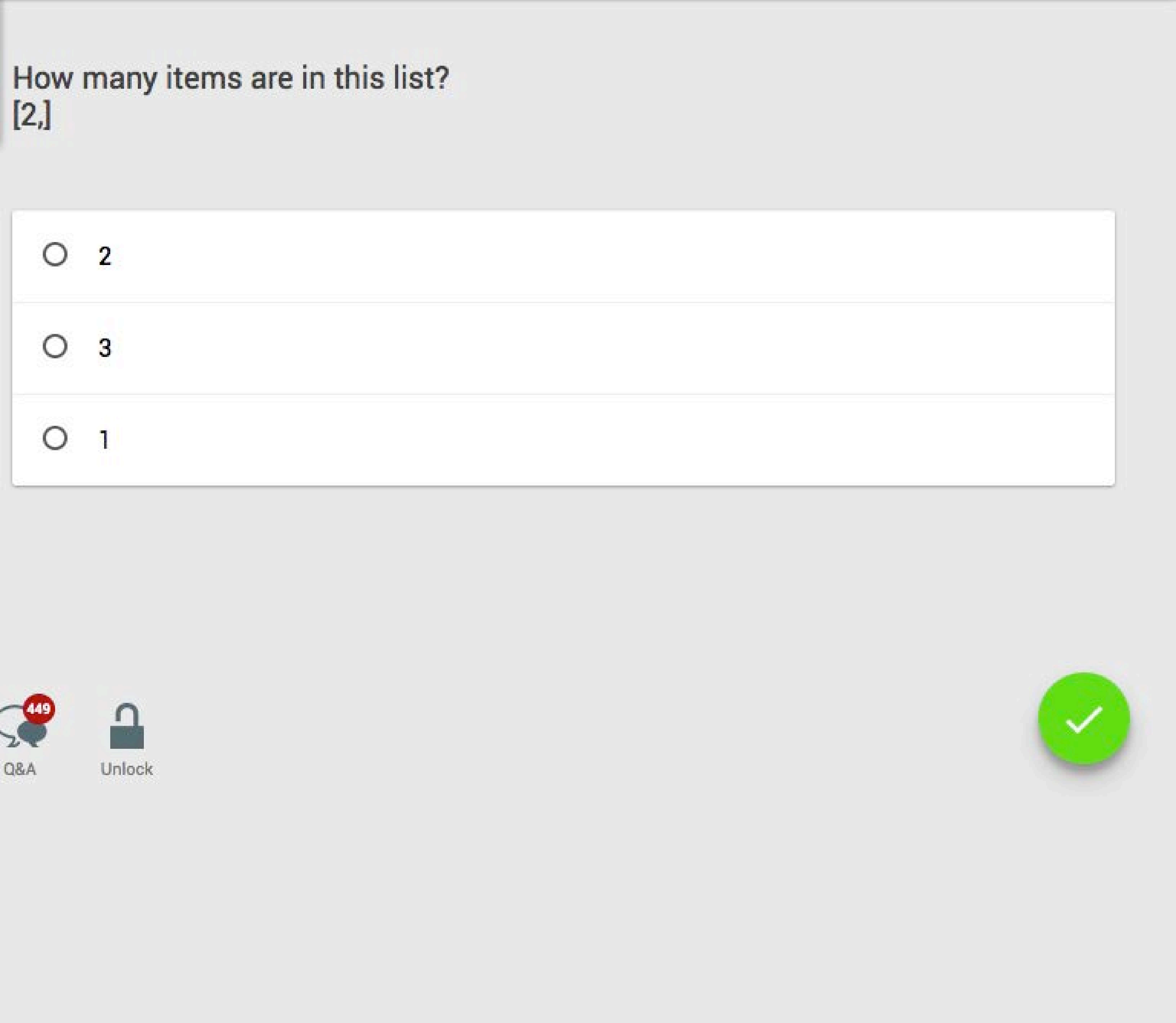
```
>>>
[]
>>>
```

Most of the time, a comma won't follow the last item in a list. However, it is perfectly valid to place one there, and it is encouraged in some cases.

78 COMMENTS

449

Q&A

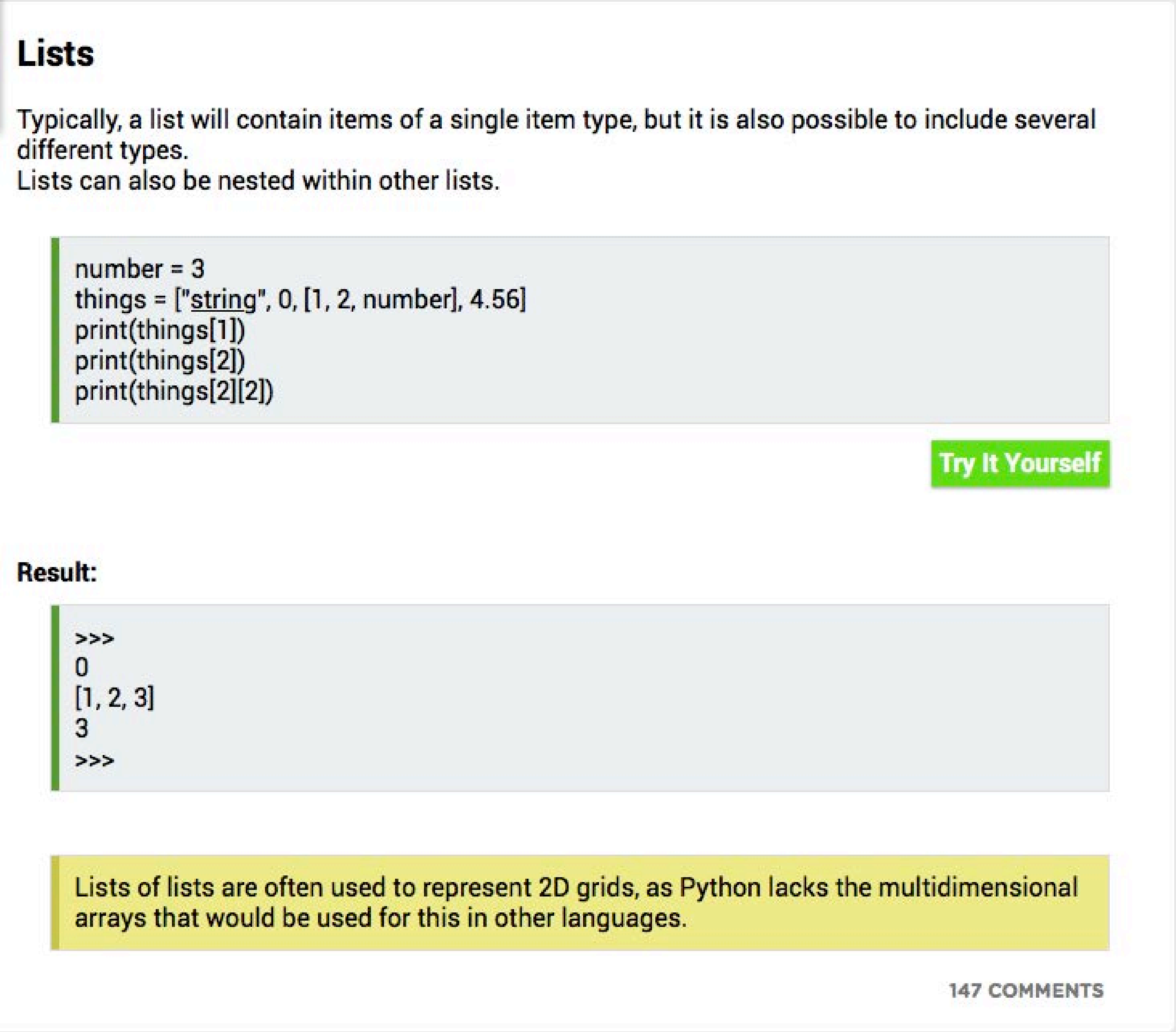


How many items are in this list?
[2,]

○ 2

○ 3

○ 1



Lists

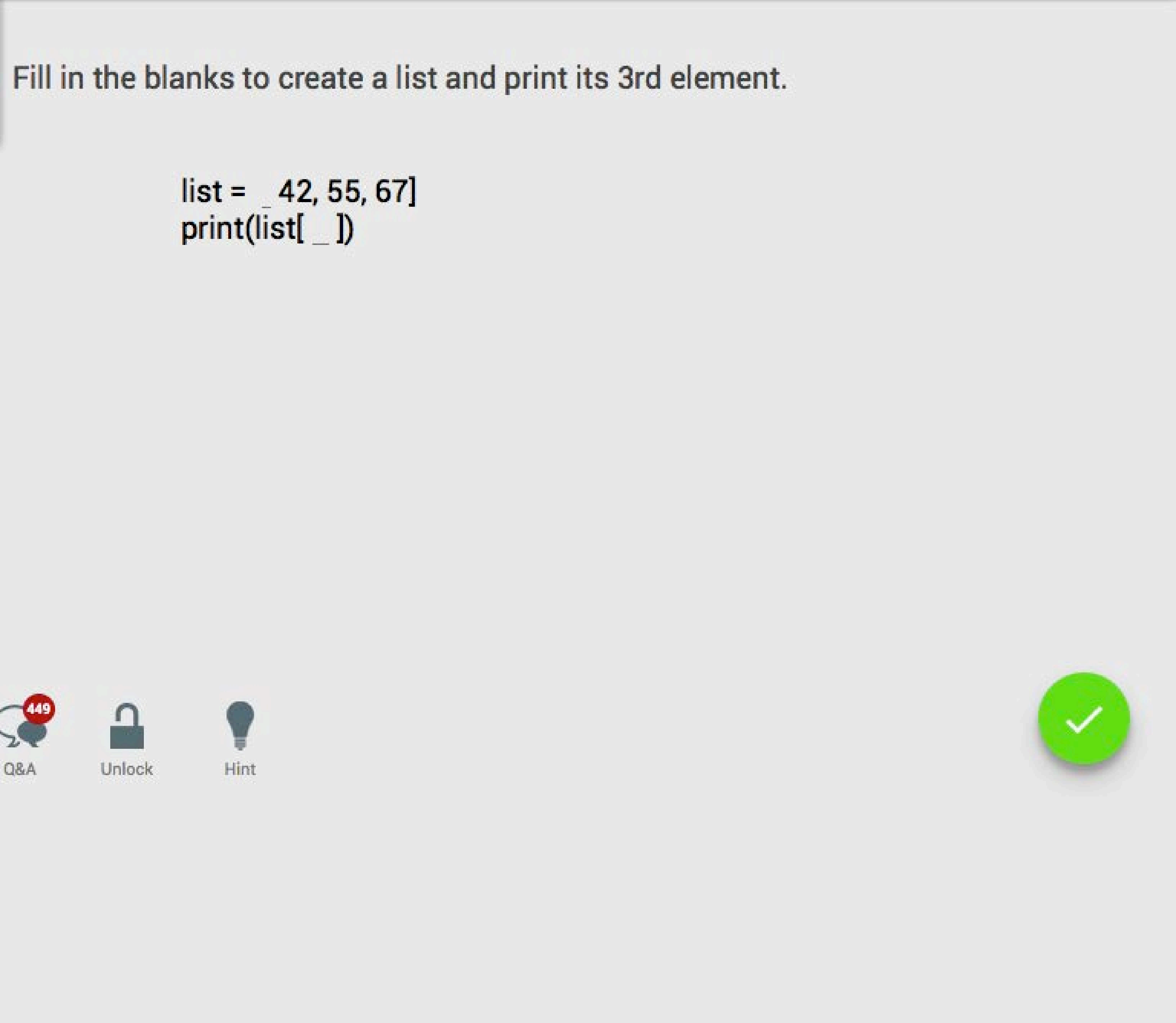
Typically, a list will contain items of a single item type, but it is also possible to include several different types.
Lists can also be nested within other lists.

```
number = 3
things = ["string", 0, [1, 2, number], 4.56]
print(things[1])
print(things[2])
print(things[2][2])
```

Result:

```
>>>
0
[1, 2, 3]
3
>>>
```

Lists of lists are often used to represent 2D grids, as Python lacks the multidimensional arrays that would be used for this in other languages.



Fill in the blanks to create a list and print its 3rd element.

```
list = _ 42, 55, 67]
print(list[ _ ])
```

Lists

Indexing out of the bounds of possible list values causes an IndexError.
Some types, such as **strings**, can be indexed like lists. Indexing **strings** behaves as though you are indexing a list containing each character in the string.
For other types, such as integers, indexing them isn't possible, and it causes a TypeError.

```
str = "Hello world!"
print(str[6])
```

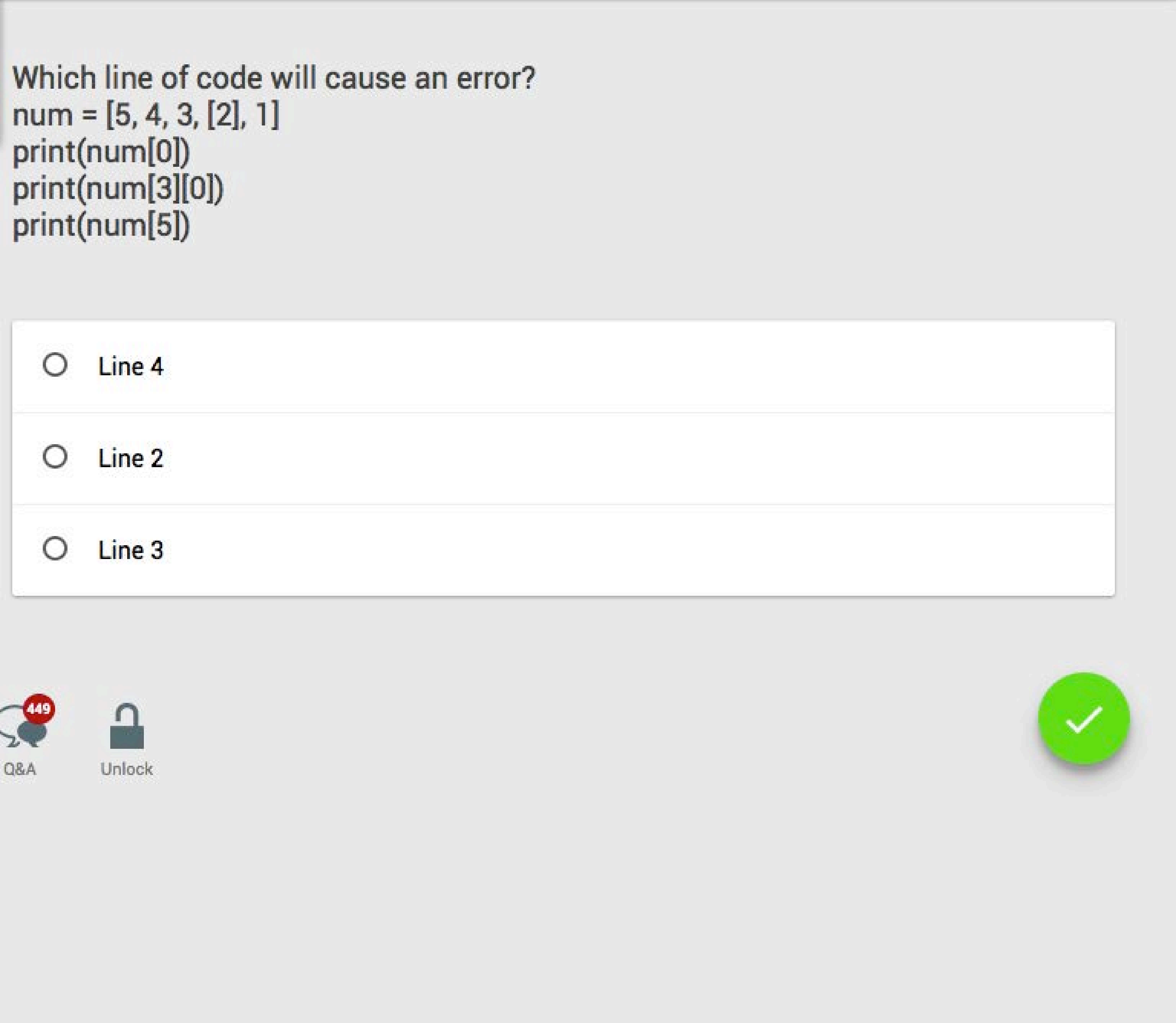
Try It Yourself

Result:

```
>>>
w
>>>
```

135 COMMENTS

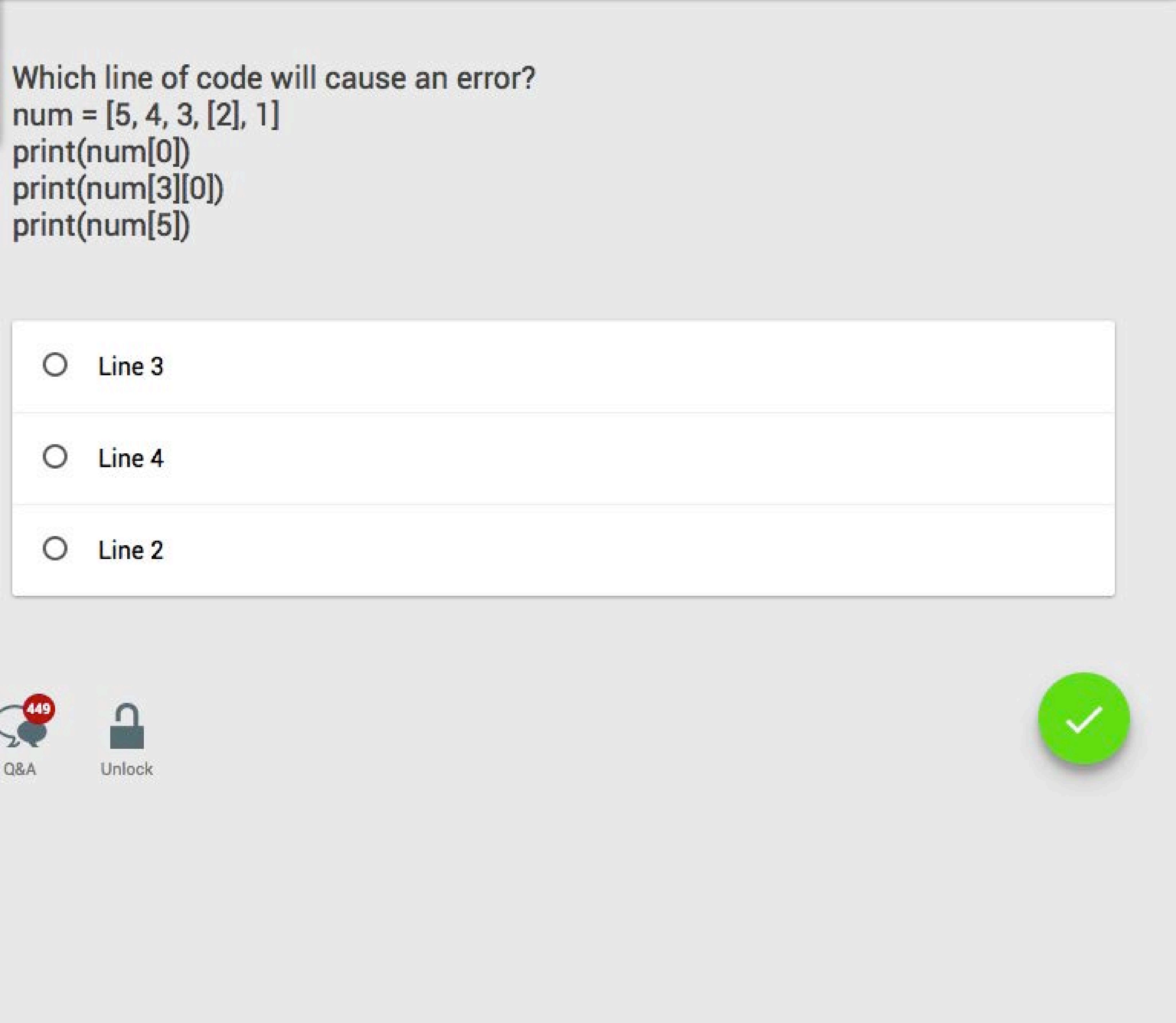
449
Q&A



Which line of code will cause an error?

```
num = [5, 4, 3, [2], 1]
print(num[0])
print(num[3][0])
print(num[5])
```

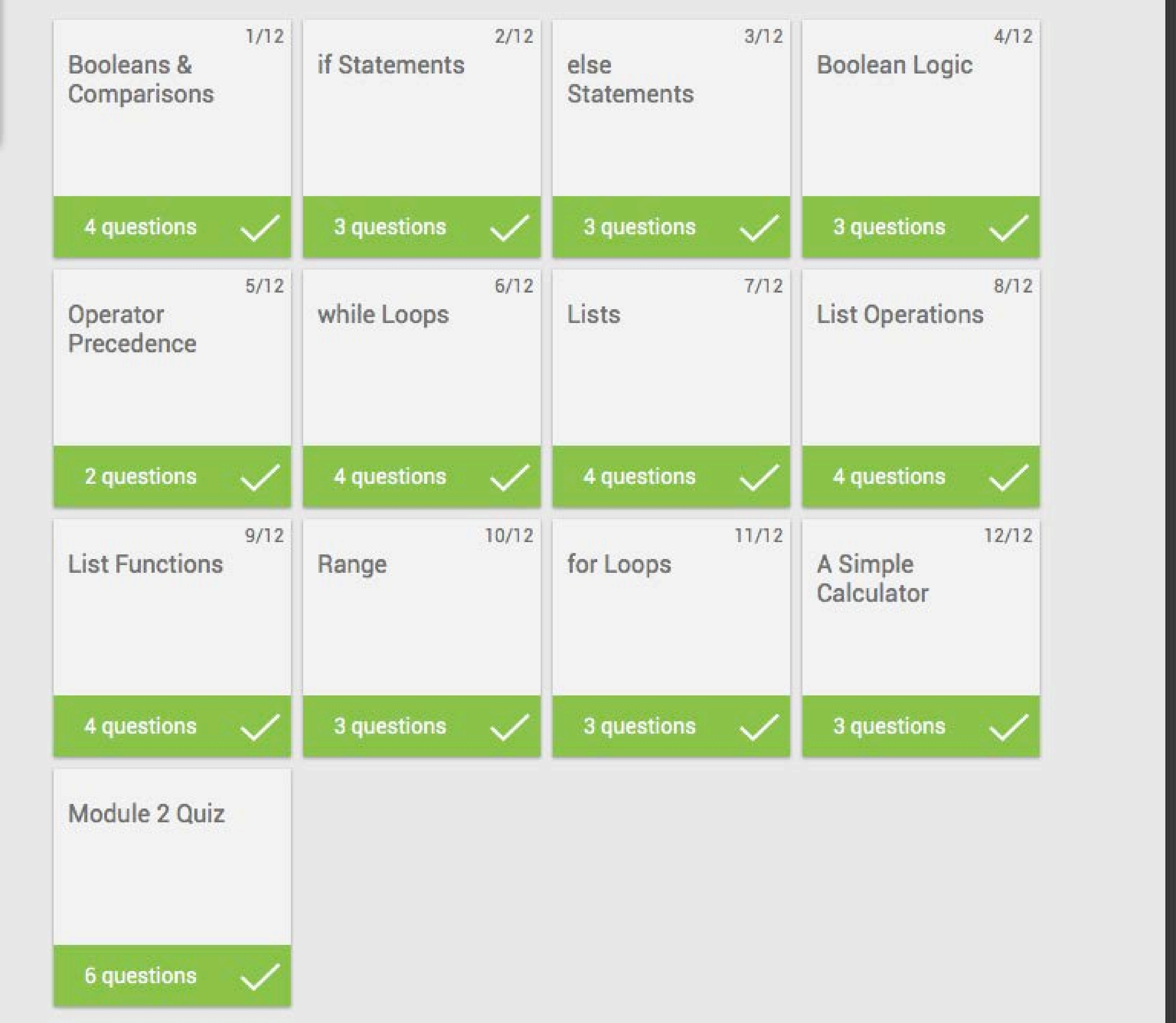
- Line 4
- Line 2
- Line 3



Which line of code will cause an error?

```
num = [5, 4, 3, [2], 1]
print(num[0])
print(num[3][0])
print(num[5])
```

- ○ Line 3
- ○ Line 4
- ○ Line 2



1/12
Booleans & Comparisons
4 questions ✓

2/12
if Statements
3 questions ✓

3/12
else Statements
3 questions ✓

4/12
Boolean Logic
3 questions ✓

5/12
Operator Precedence
2 questions ✓

6/12
while Loops
4 questions ✓

7/12
Lists
4 questions ✓

8/12
List Operations
4 questions ✓

9/12
List Functions
4 questions ✓

10/12
Range
3 questions ✓

11/12
for Loops
3 questions ✓

12/12
A Simple Calculator
3 questions ✓

Module 2 Quiz
6 questions ✓

List Operations

The item at a certain index in a list can be reassigned.
For example:

```
nums = [7, 7, 7, 7, 7]
nums[2] = 5
print(nums)
```

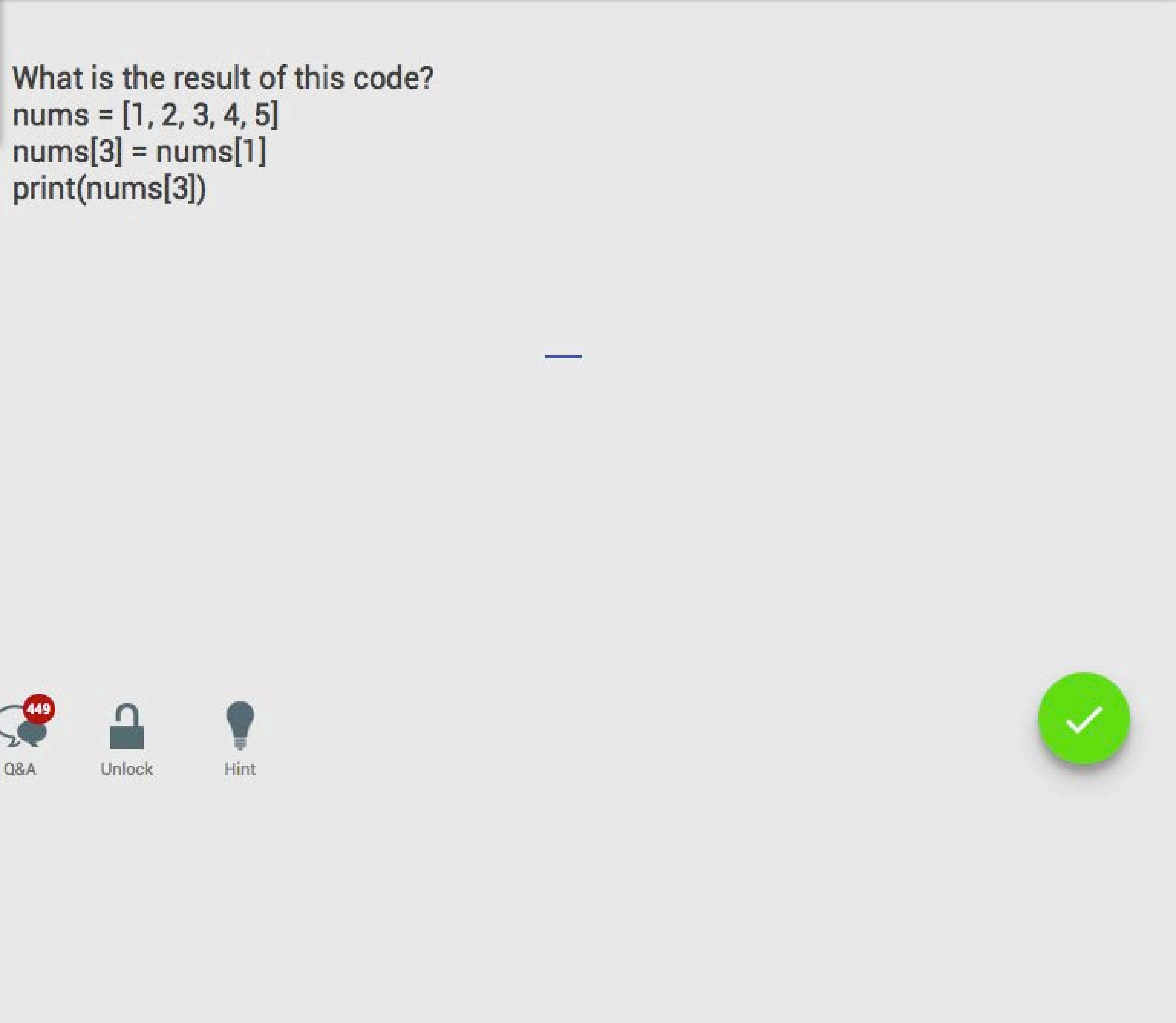
Try It Yourself

Result:

```
>>>
[7, 7, 5, 7, 7]
>>>
```

102 COMMENTS

449
Q&A


What is the result of this code?

```
nums = [1, 2, 3, 4, 5]
nums[3] = nums[1]
print(nums[3])
```

List Operations

Lists can be added and multiplied in the same way as strings.
For example:

```
nums = [1, 2, 3]
print(nums + [4, 5, 6])
print(nums * 3)
```

Try It Yourself

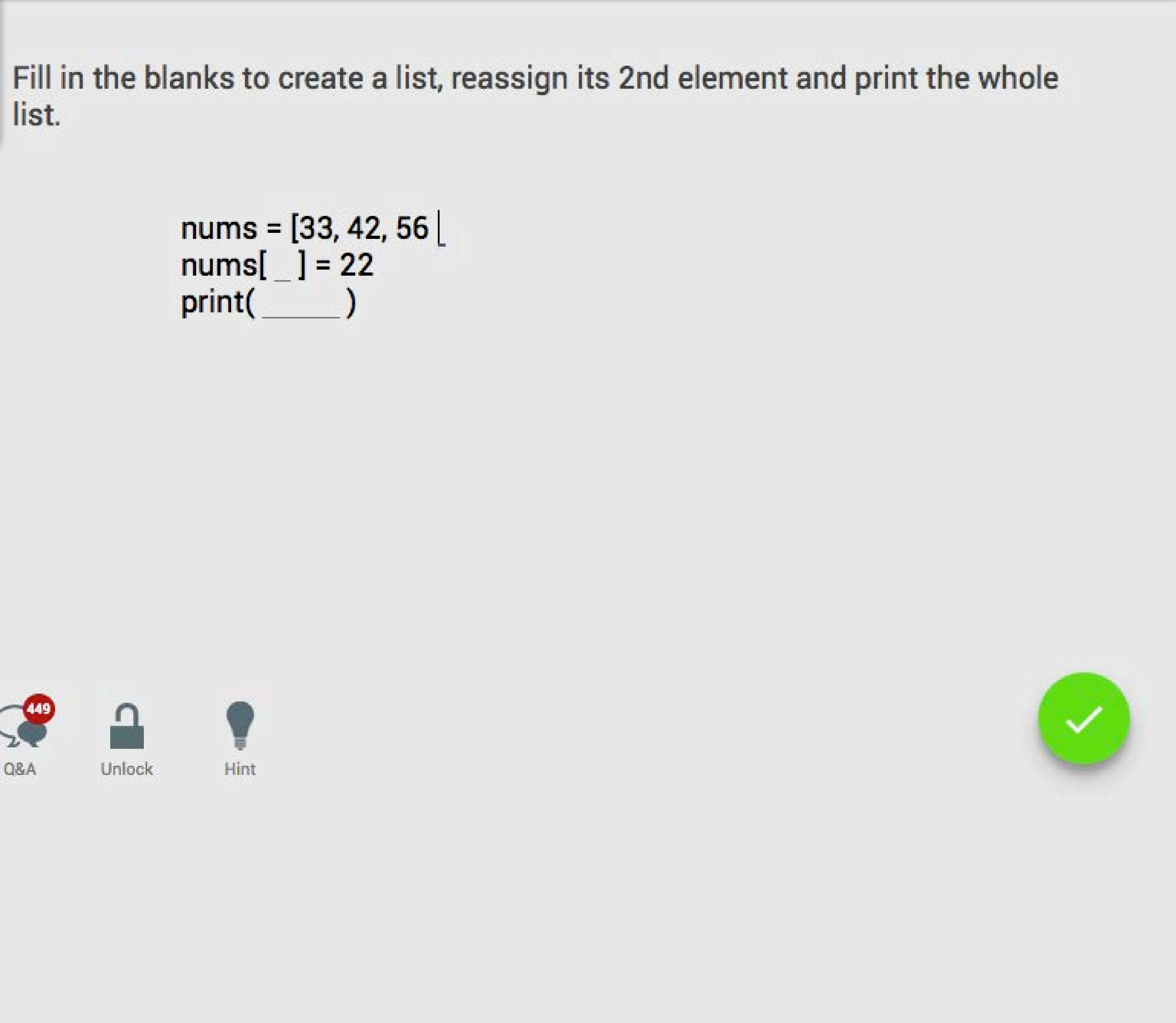
Result:

```
>>>
[1, 2, 3, 4, 5, 6]
[1, 2, 3, 1, 2, 3, 1, 2, 3]
>>>
```

Lists and strings are similar in many ways - strings can be thought of as lists of characters that can't be changed.

76 COMMENTS

449
Q&A


Fill in the blanks to create a list, reassign its 2nd element and print the whole list.

```
nums = [33, 42, 56 _
nums[ _ ] = 22
print( _____ )
```

List Operations

To check if an item is in a list, the **in** operator can be used. It returns **True** if the item occurs one or more times in the list, and **False** if it doesn't.

```
words = ["spam", "egg", "spam", "sausage"]
print("spam" in words)
print("egg" in words)
print("tomato" in words)
```

Try It Yourself

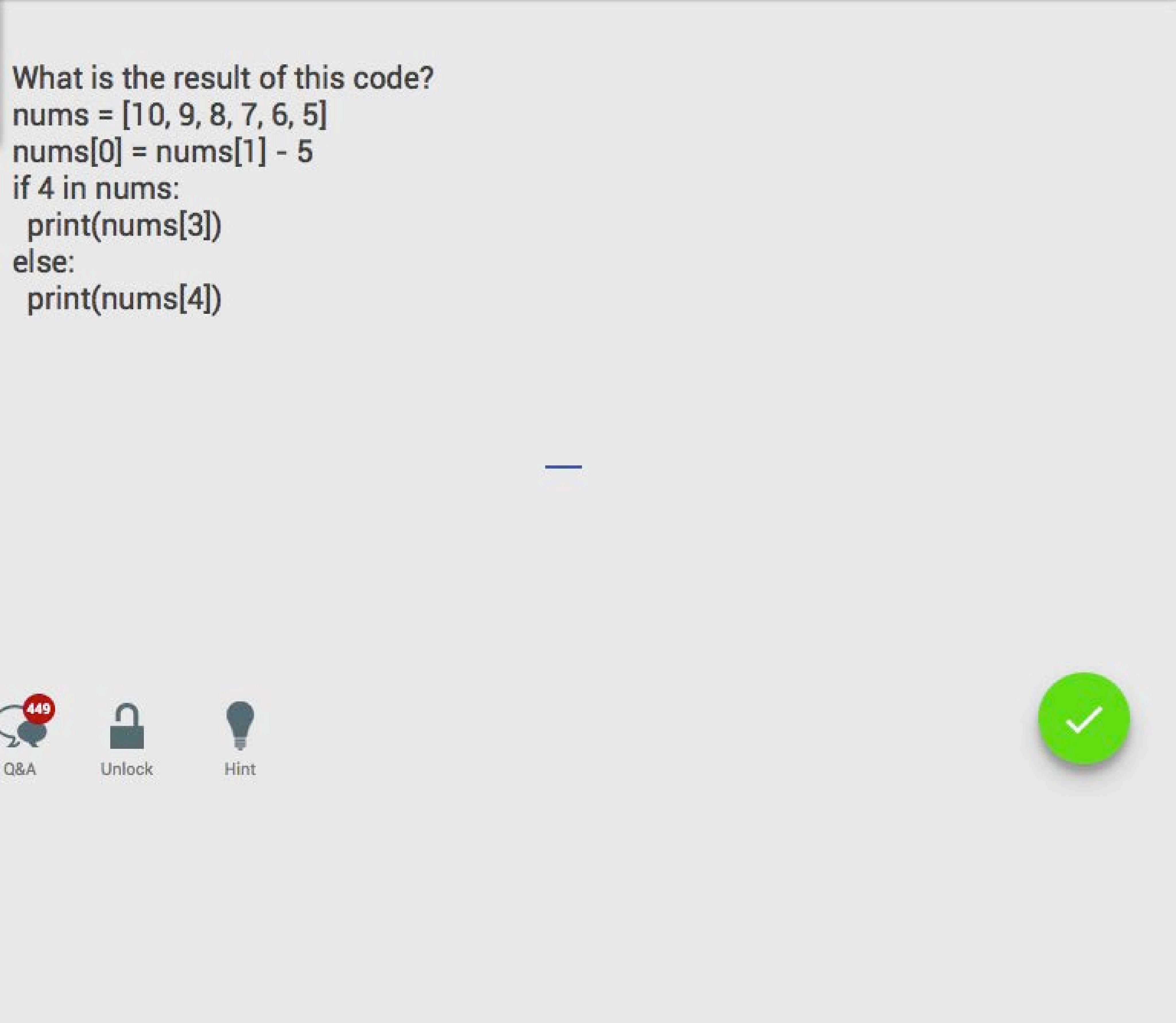
Result:

```
>>>
True
True
False
>>>
```

The **in** operator is also used to determine whether or not a string is a substring of another string.

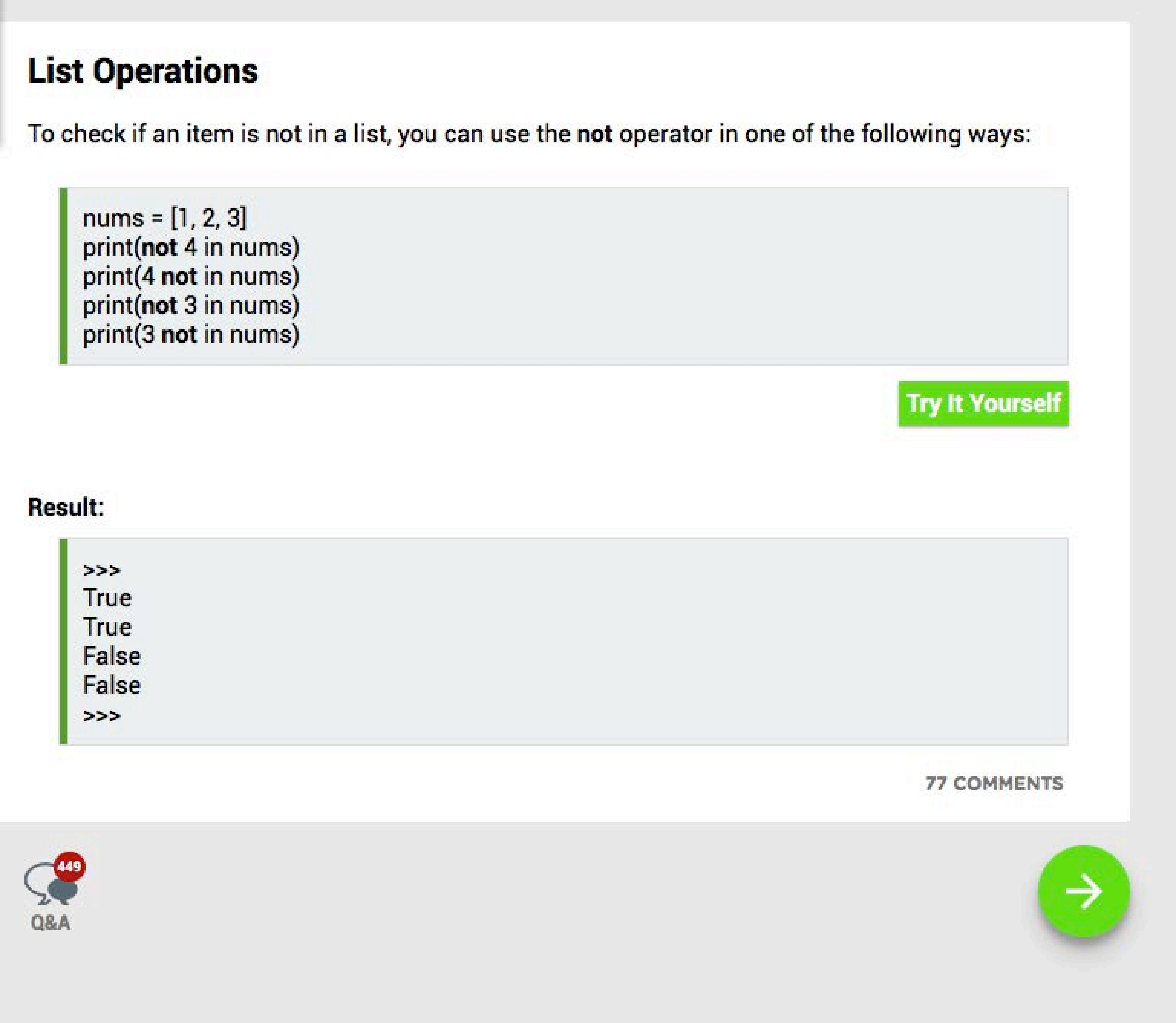
102 COMMENTS

449



What is the result of this code?

```
nums = [10, 9, 8, 7, 6, 5]
nums[0] = nums[1] - 5
if 4 in nums:
  print(nums[3])
else:
  print(nums[4])
```



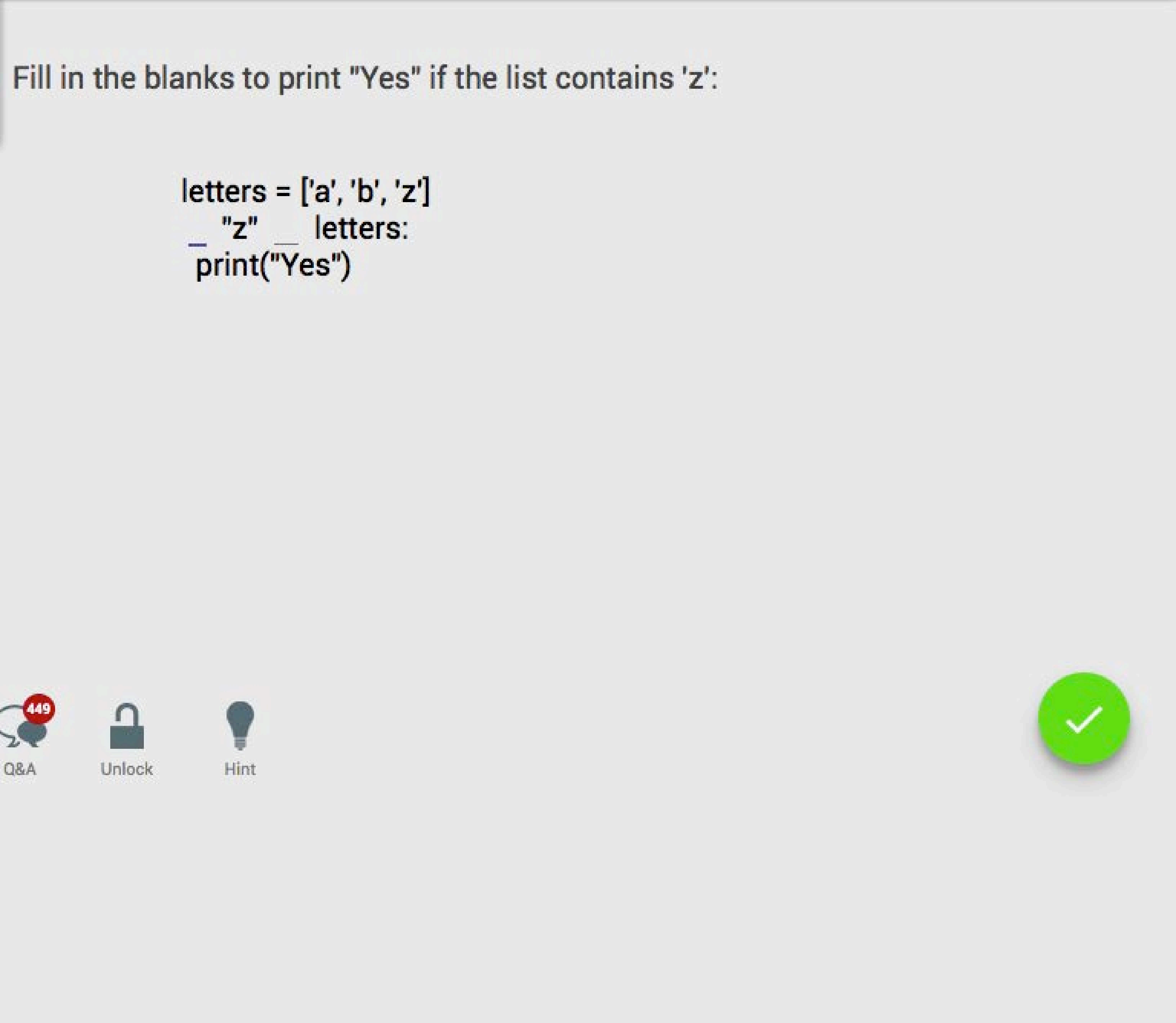
List Operations

To check if an item is not in a list, you can use the **not** operator in one of the following ways:

```
nums = [1, 2, 3]
print(not 4 in nums)
print(4 not in nums)
print(not 3 in nums)
print(3 not in nums)
```

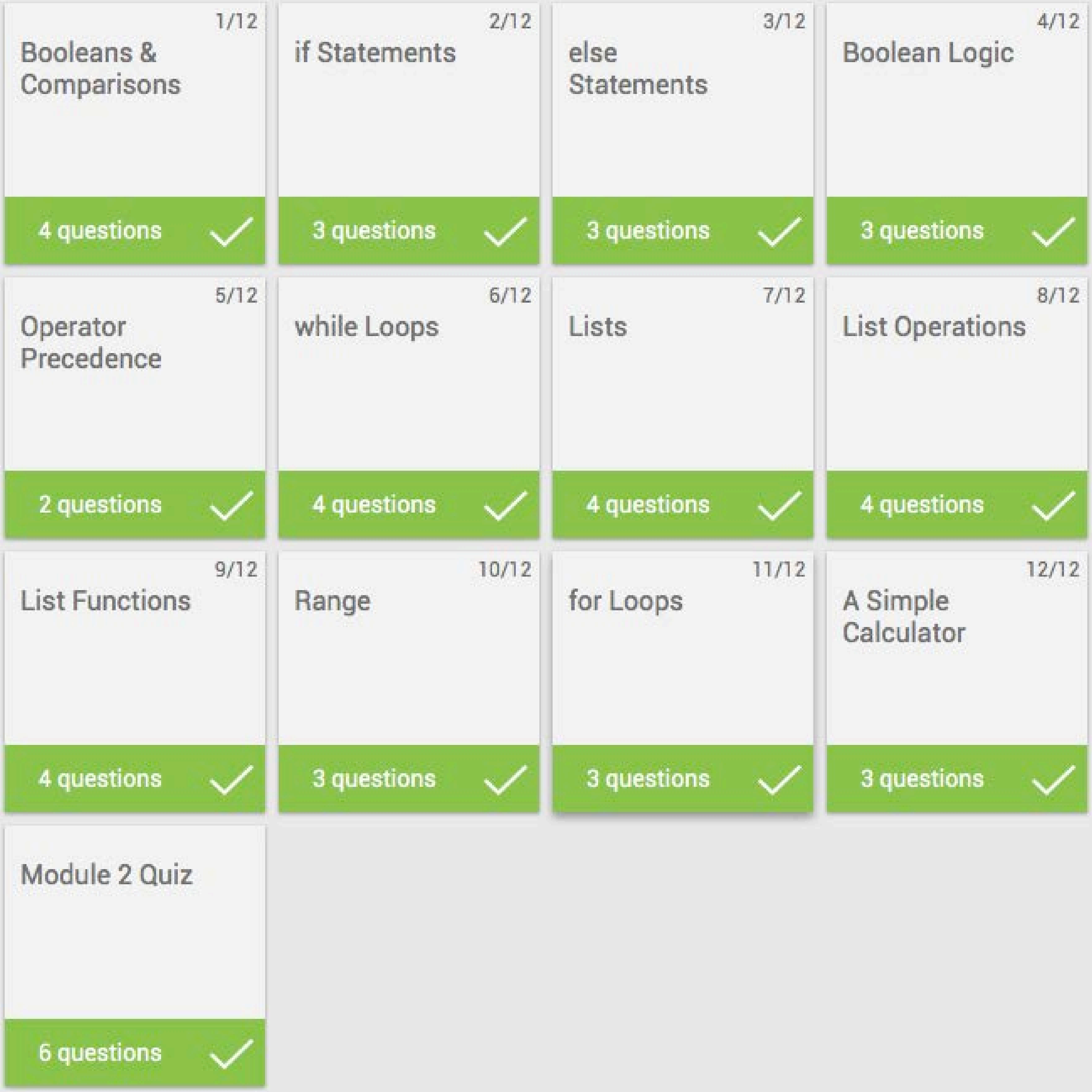
Result:

```
>>>
True
True
False
False
>>>
```



Fill in the blanks to print "Yes" if the list contains 'z':

```
letters = ['a', 'b', 'z']
_ "z" __ letters:
 print("Yes")
```



1/12
Booleans & Comparisons
4 questions ✓

2/12
if Statements
3 questions ✓

3/12
else Statements
3 questions ✓

4/12
Boolean Logic
3 questions ✓

5/12
Operator Precedence
2 questions ✓

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while Loops
4 questions ✓

7/12
Lists
4 questions ✓

8/12
List Operations
4 questions ✓

9/12
List Functions
4 questions ✓

10/12
Range
3 questions ✓

11/12
for Loops
3 questions ✓

12/12
A Simple Calculator
3 questions ✓

Module 2 Quiz
6 questions ✓

List Functions

Another way of altering lists is using the **append** method. This adds an item to the end of an existing list.

```
nums = [1, 2, 3]
nums.append(4)
print(nums)
```

Try It Yourself

Result:

```
>>>
[1, 2, 3, 4]
>>>
```

The **dot** before append is there because it is a **method** of the list class. Methods will be explained in a later lesson.

72 COMMENTS

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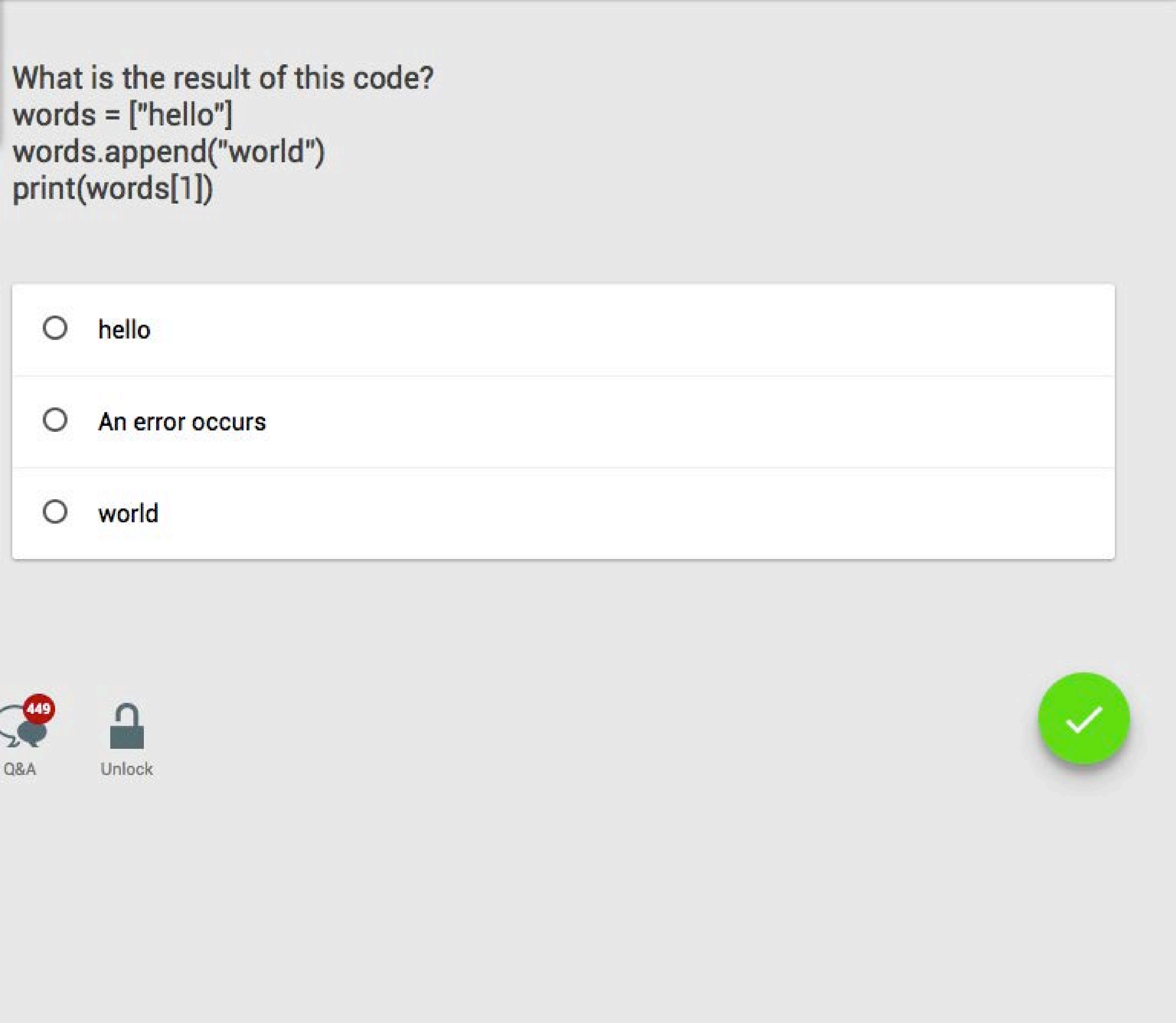
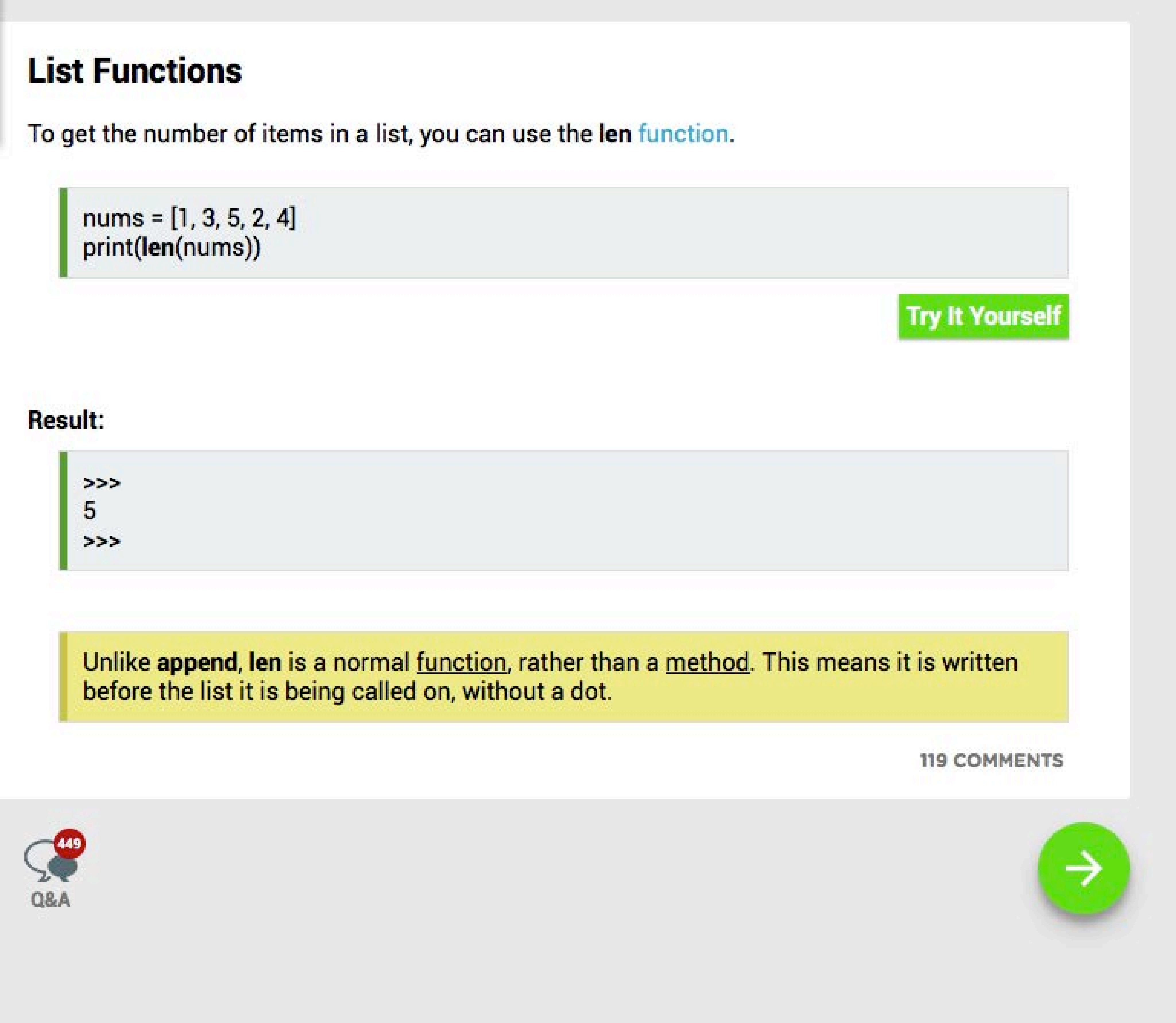
Q&A



What is the result of this code?

```
words = ["hello"]
words.append("world")
print(words[1])
```

- hello
- An error occurs
- world



List Functions

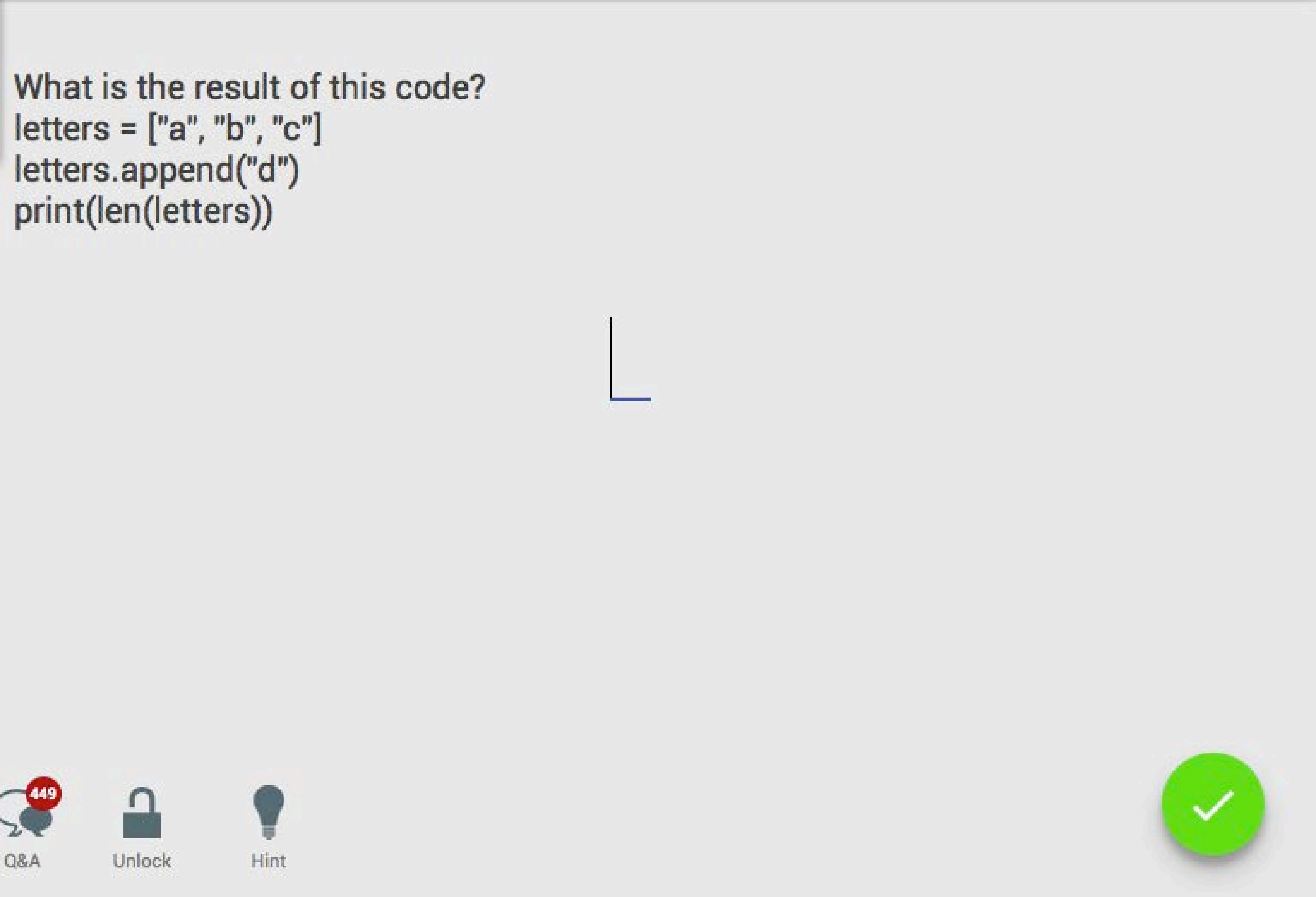
To get the number of items in a list, you can use the **len** function.

```
nums = [1, 3, 5, 2, 4]
print(len(nums))
```

Result:

```
>>>
5
>>>
```

Unlike **append, len** is a normal function, rather than a method. This means it is written before the list it is being called on, without a dot.



What is the result of this code?

```
letters = ["a", "b", "c"]
letters.append("d")
print(len(letters))
```

List Functions

The **insert** method is similar to **append**, except that it allows you to insert a new item at any position in the list, as opposed to just at the end.

```
words = ["Python", "fun"]
index = 1
words.insert(index, "is")
print(words)
```

Try It Yourself

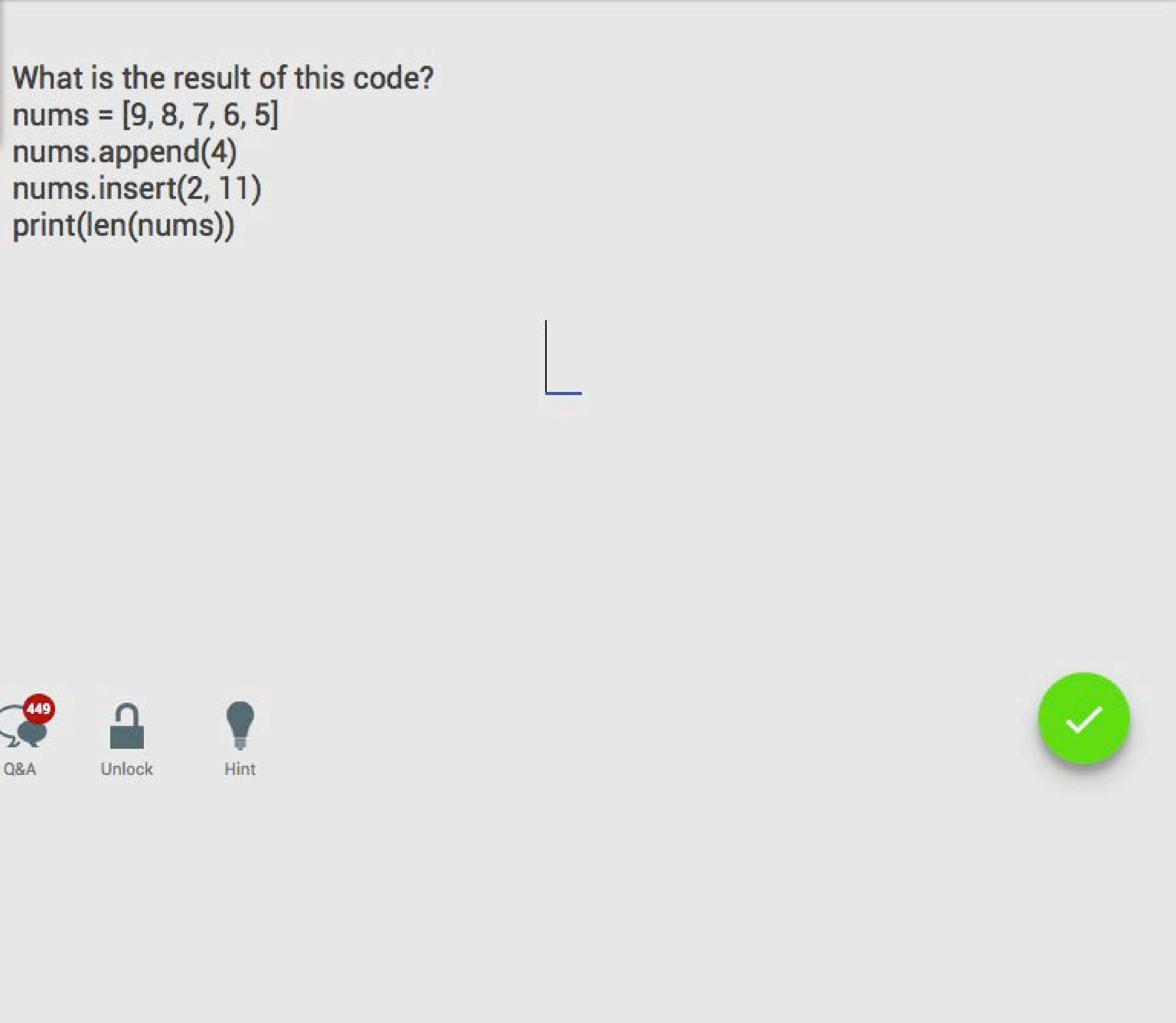
Result:

```
>>>
['Python', 'is', 'fun']
>>>
```

146 COMMENTS

449

Q&A



What is the result of this code?

```
nums = [9, 8, 7, 6, 5]
nums.append(4)
nums.insert(2, 11)
print(len(nums))
```

List Functions

The **index** method finds the first occurrence of a list item and returns its index.
If the item isn't in the list, it raises a ValueError.

```
letters = ['p', 'q', 'r', 's', 'p', 'u']
print(letters.index('r'))
print(letters.index('p'))
print(letters.index('z'))
```

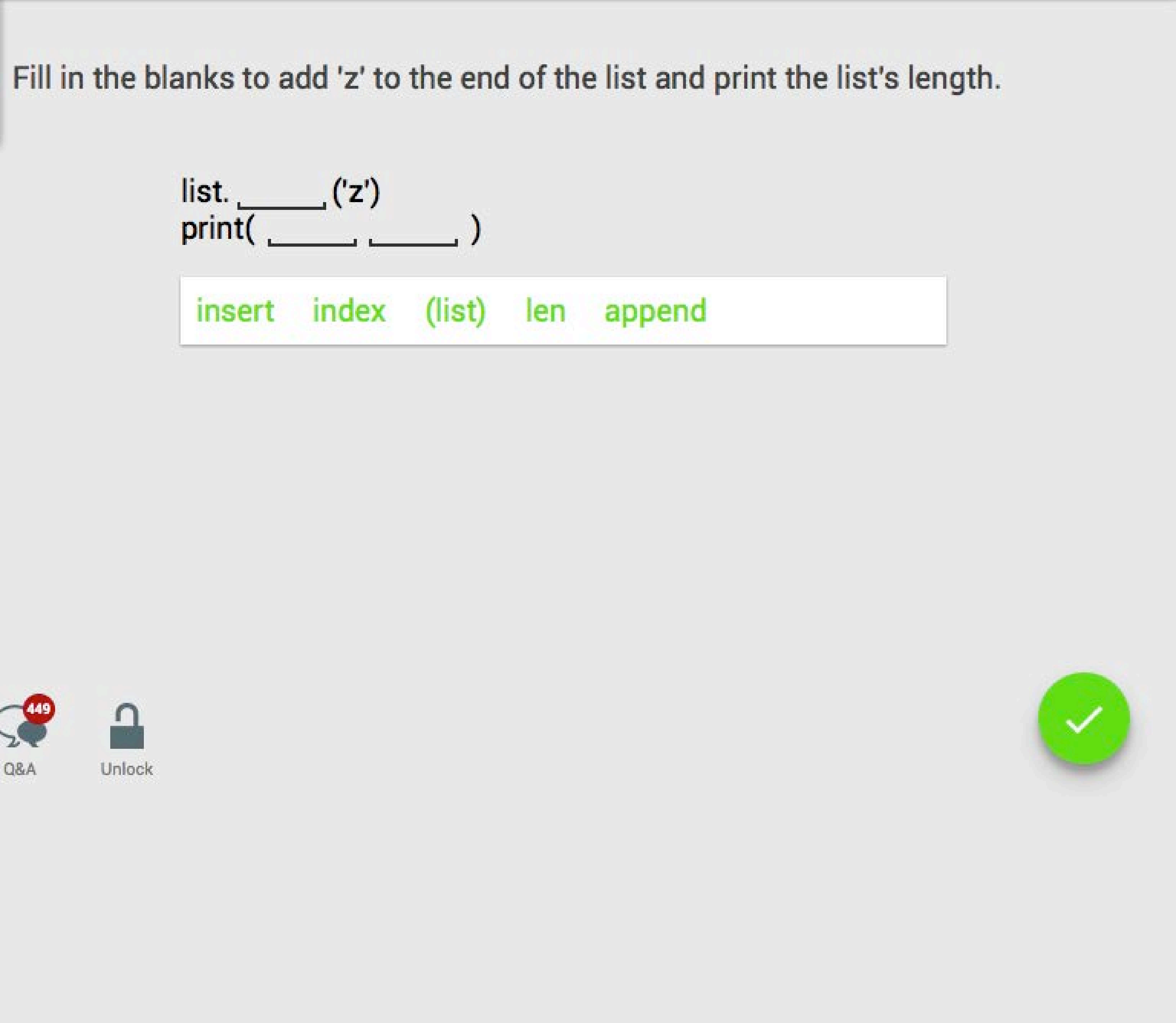
Try It Yourself

Result:

```
>>>
2
0
ValueError: 'z' is not in list
>>>
```

There are a few more useful functions and methods for lists.
max(list): Returns the list item with the maximum value
min(list): Returns the list item with minimum value
list.**count**(obj): Returns a count of how many times an item occurs in a list
list.**remove**(obj): Removes an object from a list
list.**reverse**(): Reverses objects in a list

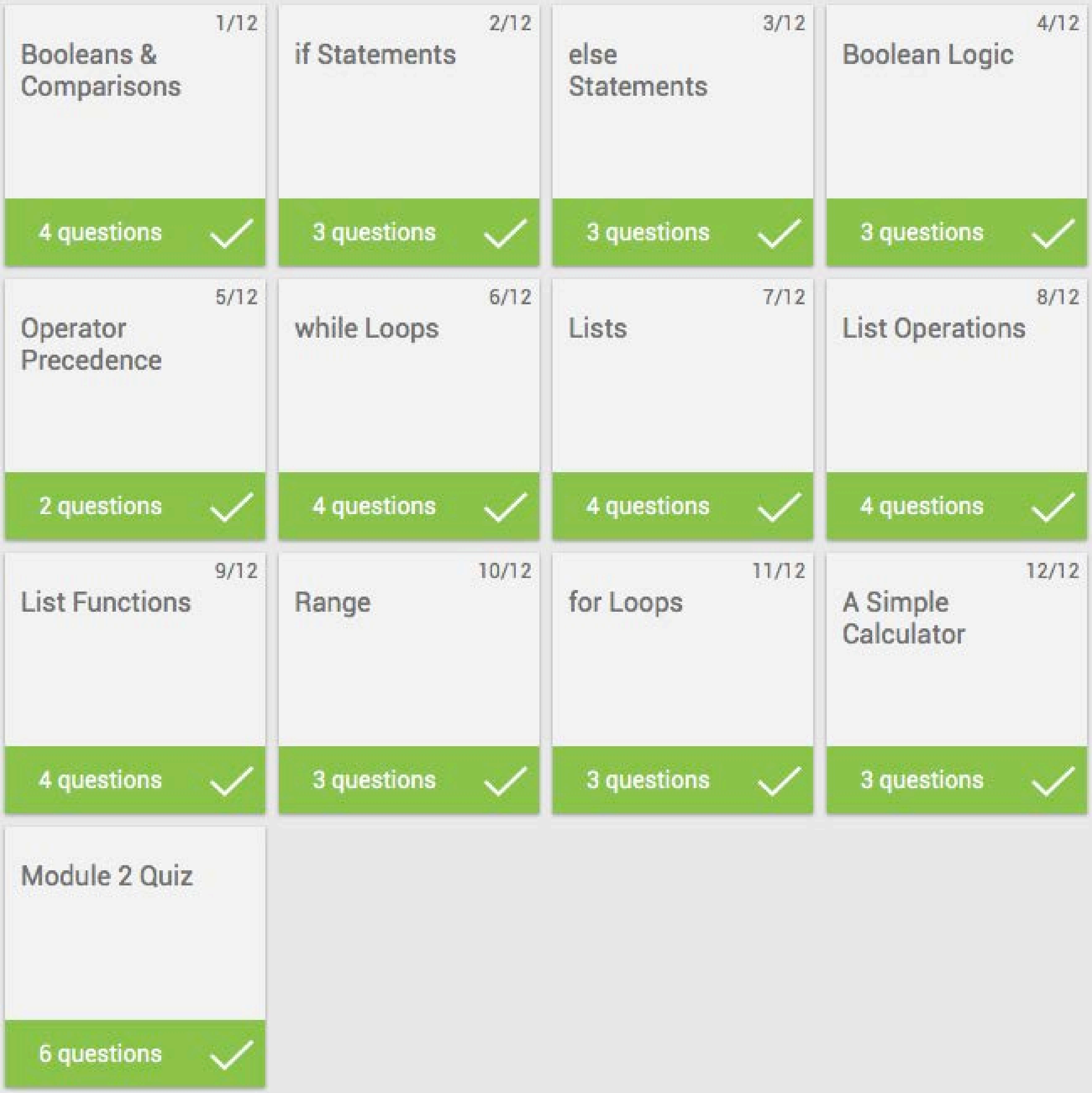
153 COMMENTS



Fill in the blanks to add 'z' to the end of the list and print the list's length.

```
list. _____('z')
print( _____ _____ )
```

insert index (list) len append



1/12
Booleans & Comparisons
4 questions ✓

2/12
if Statements
3 questions ✓

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else Statements
3 questions ✓

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Boolean Logic
3 questions ✓

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Operator Precedence
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List Operations
4 questions ✓

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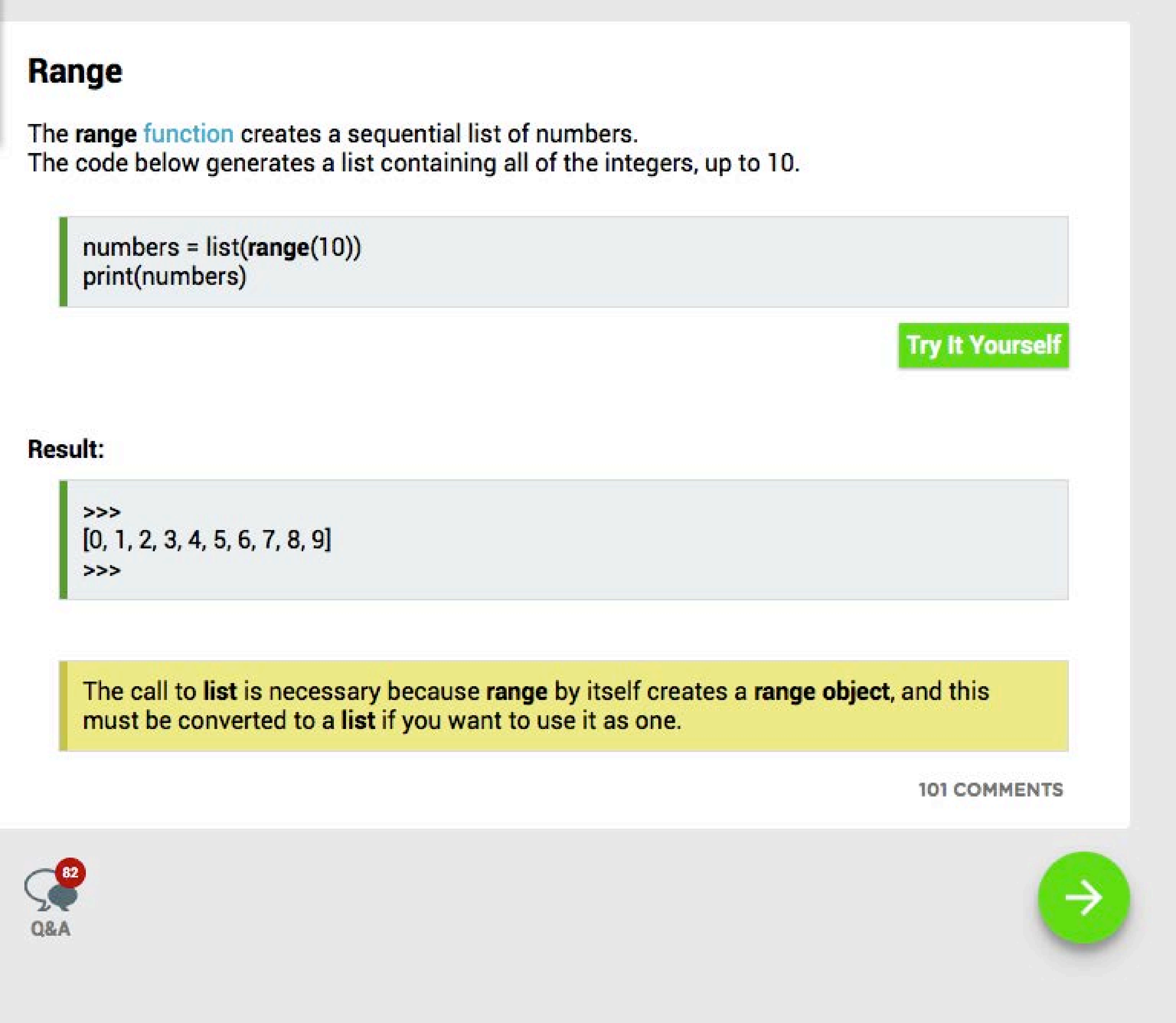
List Functions
4 questions ✓

10/12
Range
3 questions ✓

11/12
for Loops
3 questions ✓

12/12
A Simple Calculator
3 questions ✓

Module 2 Quiz
6 questions ✓



Range

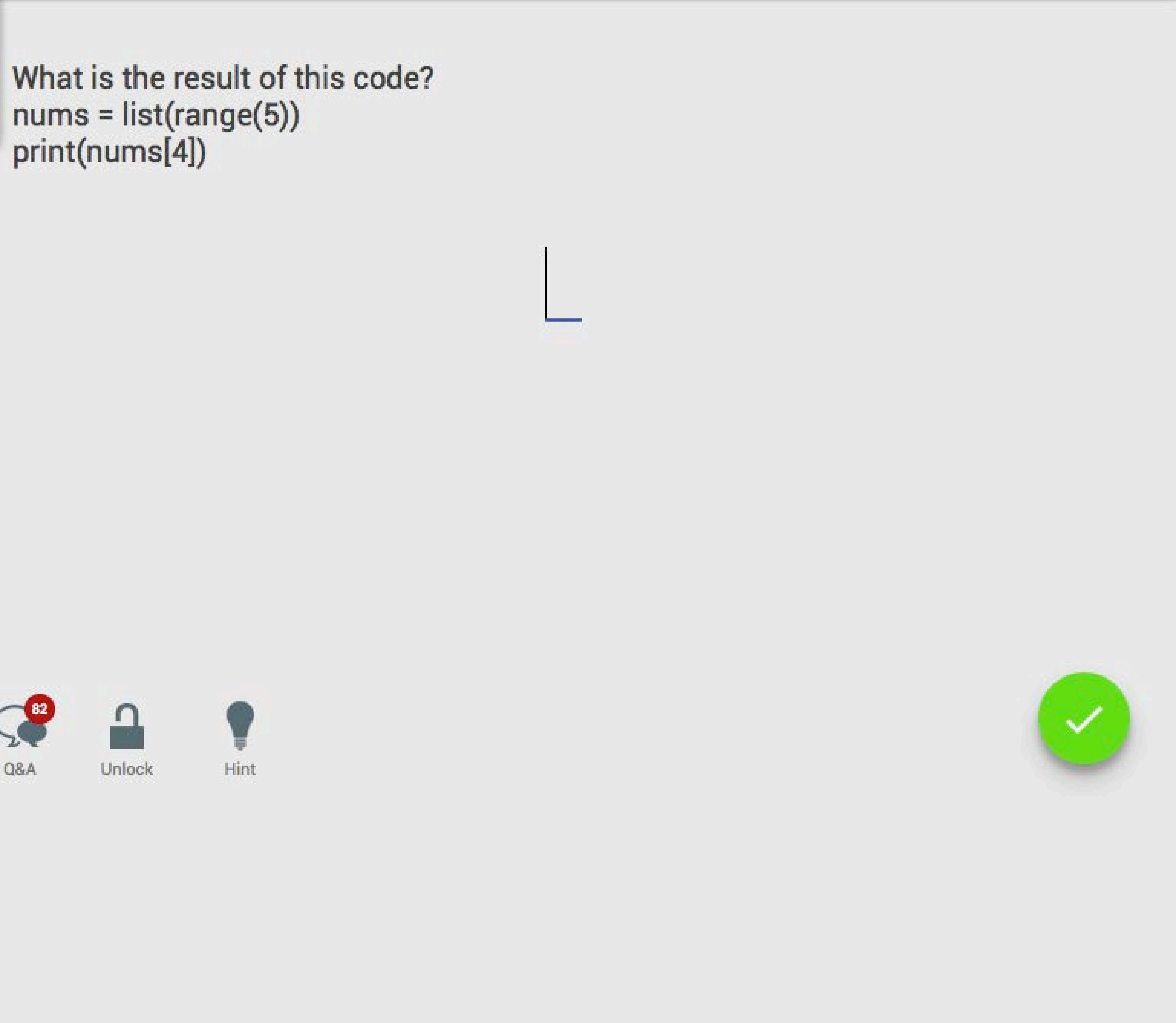
The **range** function creates a sequential list of numbers.
The code below generates a list containing all of the integers, up to 10.

```
numbers = list(range(10))
print(numbers)
```

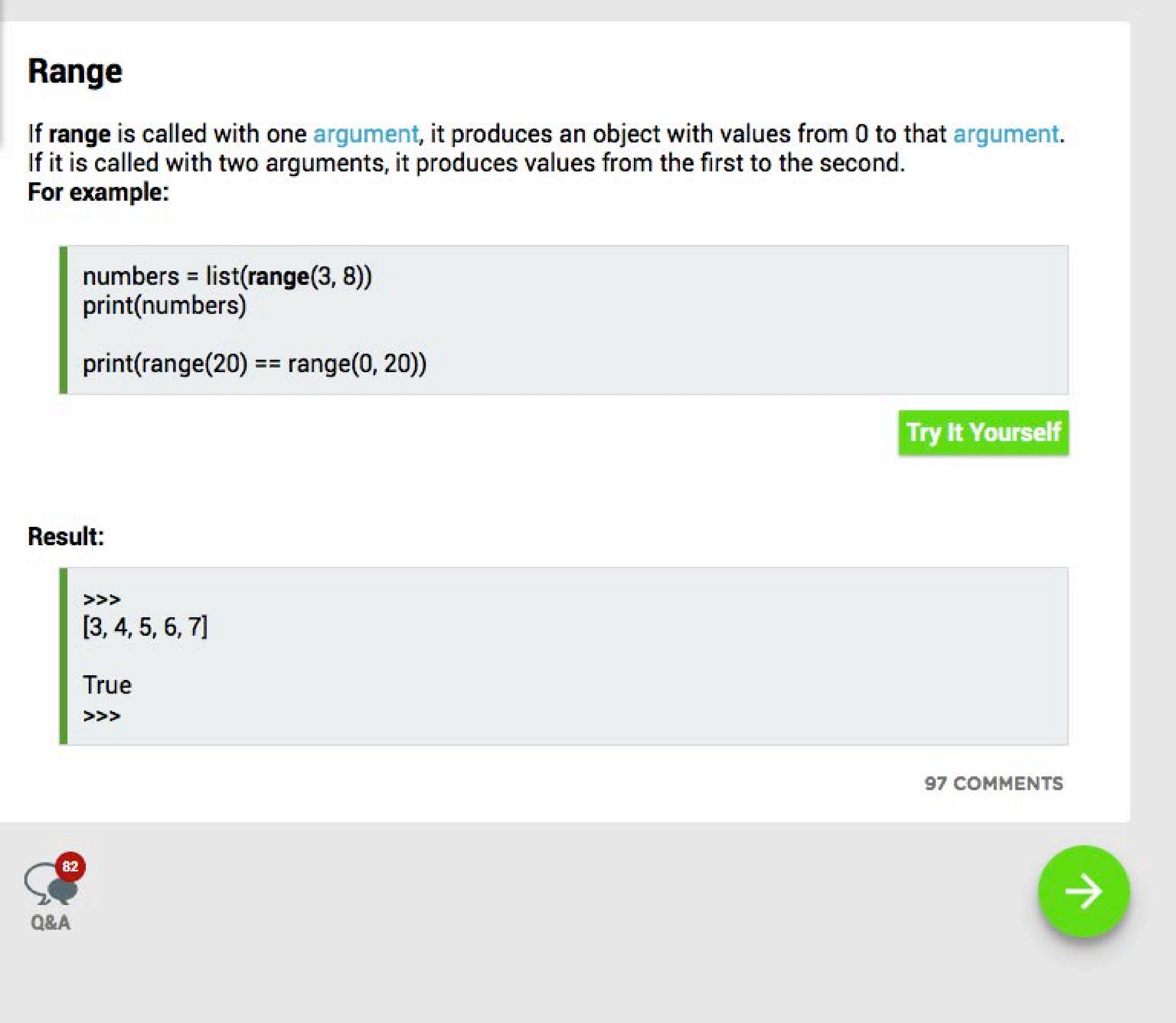
Result:

```
>>>
[0, 1, 2, 3, 4, 5, 6, 7, 8, 9]
>>>
```

The call to **list** is necessary because **range** by itself creates a **range object**, and this must be converted to a **list** if you want to use it as one.


What is the result of this code?

```
nums = list(range(5))
print(nums[4])
```



Range

If **range** is called with one argument, it produces an object with values from 0 to that argument.
If it is called with two arguments, it produces values from the first to the second.
For example:

```
numbers = list(range(3, 8))
print(numbers)

print(range(20) == range(0, 20))
```

Result:

```
>>>
[3, 4, 5, 6, 7]

True
>>>
```

What is the result of this code?

```
nums = list(range(5, 8))
print(len(nums))
```

82

Q&A Unlock Hint

Range

range can have a third argument, which determines the interval of the sequence produced. This third argument must be an integer.

```
numbers = list(range(5, 20, 2))
print(numbers)
```

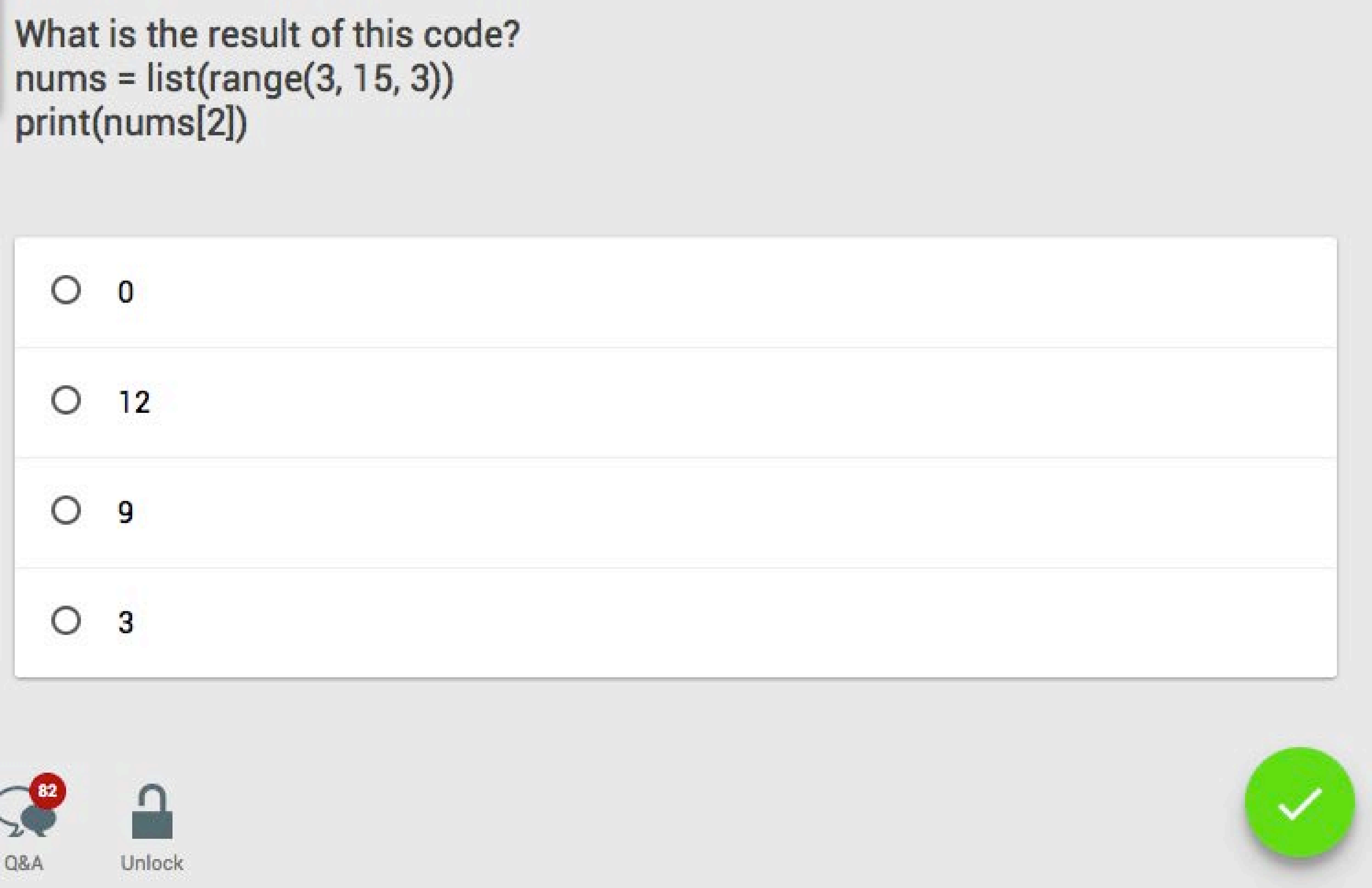
Try It Yourself

Result:

```
>>>
[5, 7, 9, 11, 13, 15, 17, 19]
>>>
```

63 COMMENTS

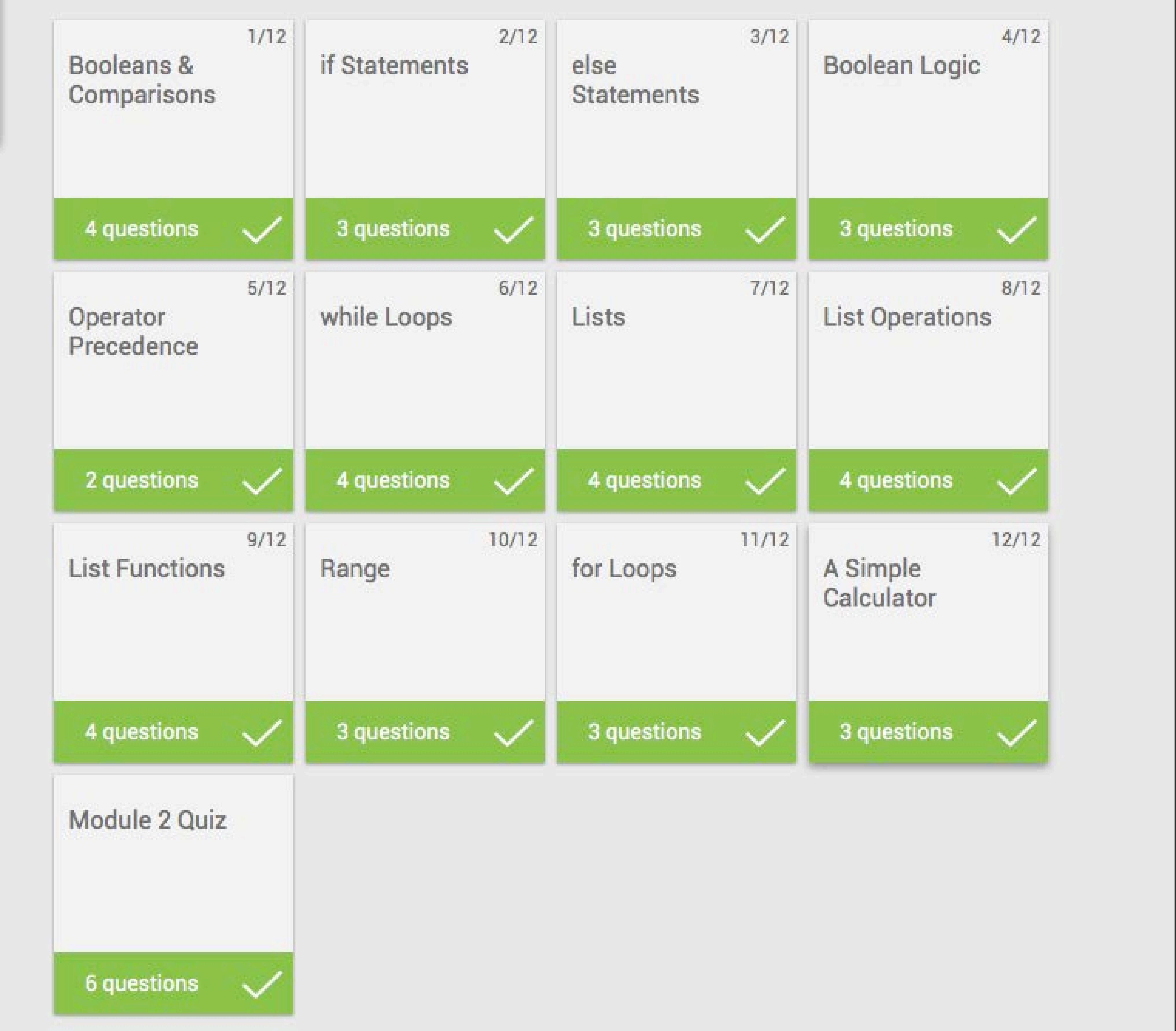
82
Q&A



What is the result of this code?

```
nums = list(range(3, 15, 3))
print(nums[2])
```

- ○ 0
- ○ 12
- ○ 9
- ○ 3



1/12
Booleans & Comparisons
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2/12
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4 questions ✓

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for Loops
3 questions ✓

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A Simple Calculator
3 questions ✓

Module 2 Quiz
6 questions ✓

Loops

Sometimes, you need to perform code on each item in a list. This is called iteration, and it can be accomplished with a **while** loop and a counter variable.
For example:

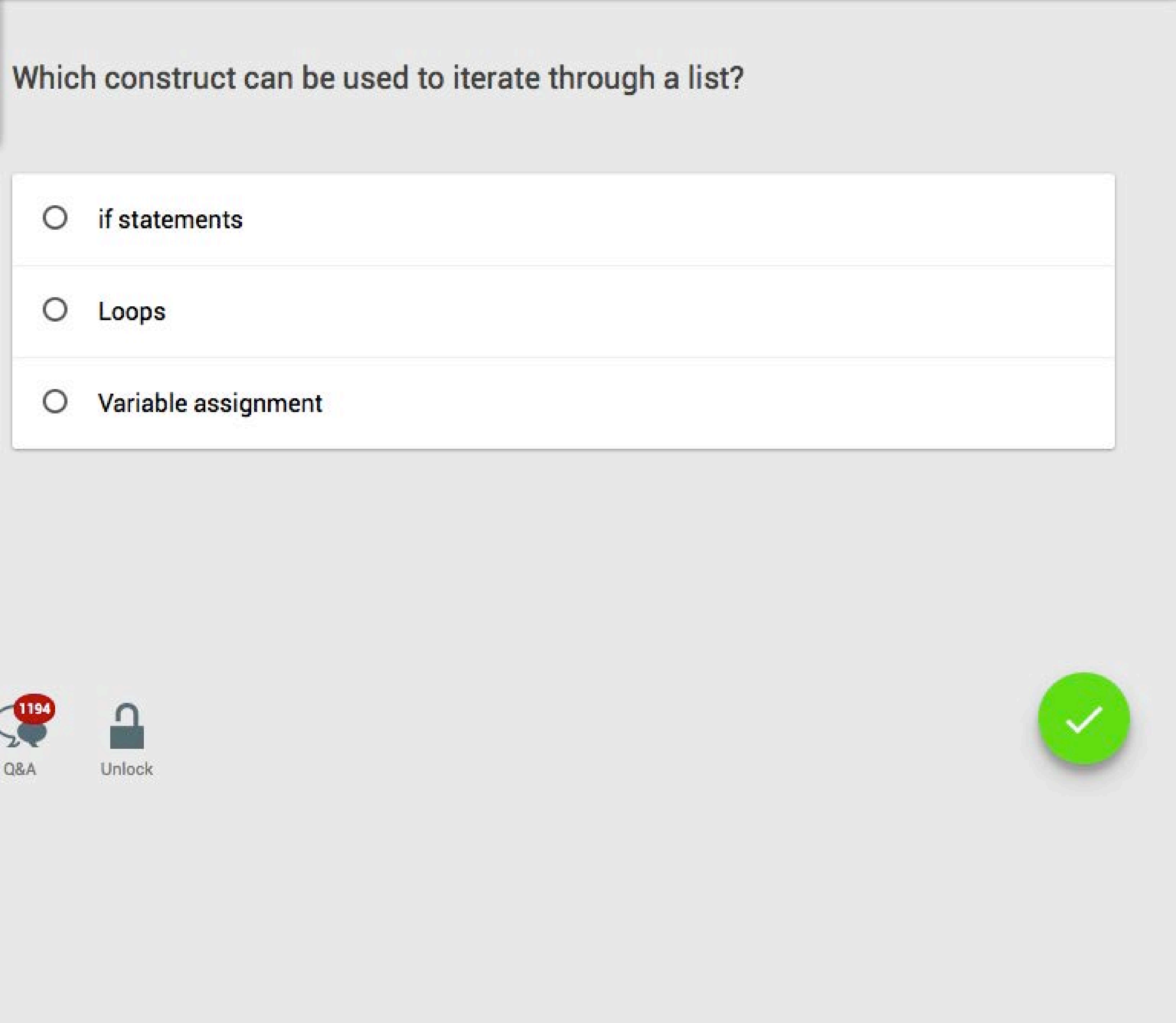
```
words = ["hello", "world", "spam", "eggs"]
counter = 0
max_index = len(words) - 1

while counter <= max_index:
  word = words[counter]
  print(word + "!")
  counter = counter + 1
```

Try It Yourself

Result:

```
>>>
hello!
world!
spam!
eggs!
>>>
```

The example above iterates through all items in the list, accesses them using their indices, and prints them with exclamation marks.



Which construct can be used to iterate through a list?

- ○ if statements
- ○ Loops
- ○ Variable assignment

for Loop

Iterating through a list using a **while** loop requires quite a lot of code, so Python provides the **for** loop as a shortcut that accomplishes the same thing.
The same code from the previous example can be written with a **for** loop, as follows:

```
words = ["hello", "world", "spam", "eggs"]
for word in words:
  print(word + "!")
```

Try It Yourself

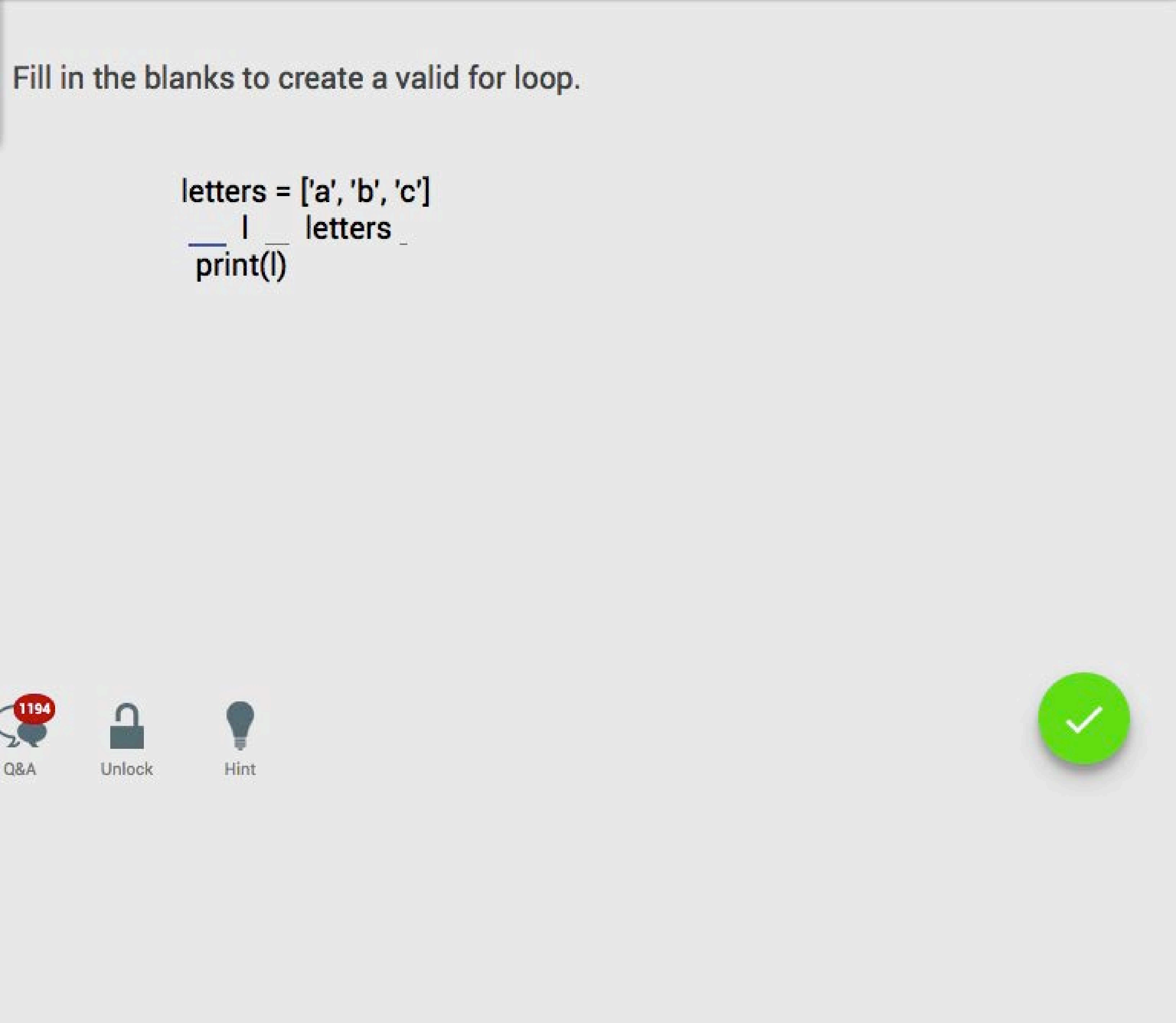
Result:

```
>>>
hello!
world!
spam!
eggs!
>>>
```

The **for** loop in Python is like the **foreach** loop in other languages.

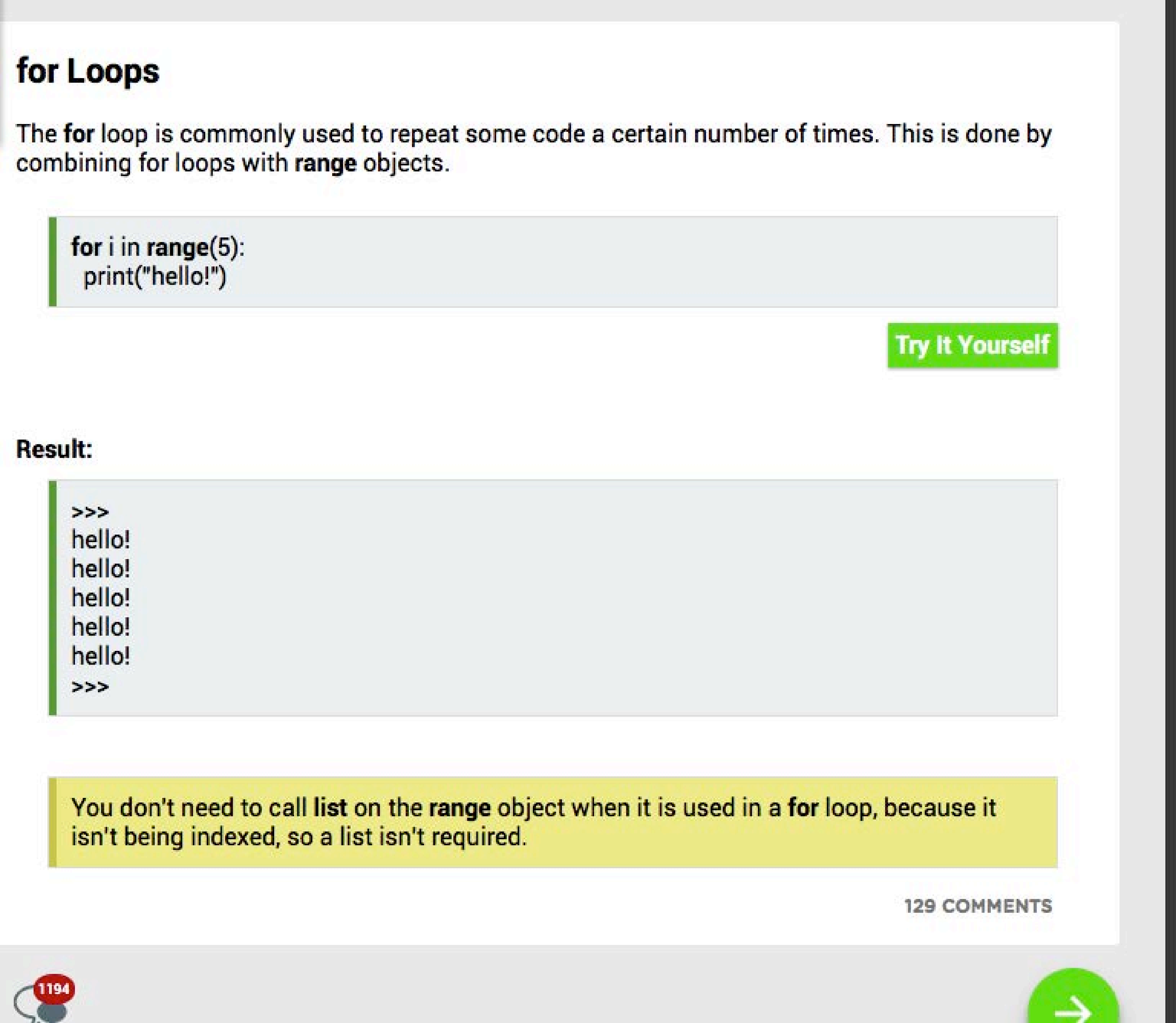
189 COMMENTS

1194



Fill in the blanks to create a valid for loop.

```
letters = ['a', 'b', 'c']
___ l ___ letters _
 print(l)
```



for Loops

The **for** loop is commonly used to repeat some code a certain number of times. This is done by combining for loops with **range** objects.

```
for i in range(5):
  print("hello!")
```

Result:

```
>>>
hello!
hello!
hello!
hello!
hello!
>>>
```

You don't need to call **list** on the **range** object when it is used in a **for** loop, because it isn't being indexed, so a list isn't required.

Fill in the blanks to create a for loop that prints only the even values in the range:

```
__ i in range(0, 20, _):
print(_)
```

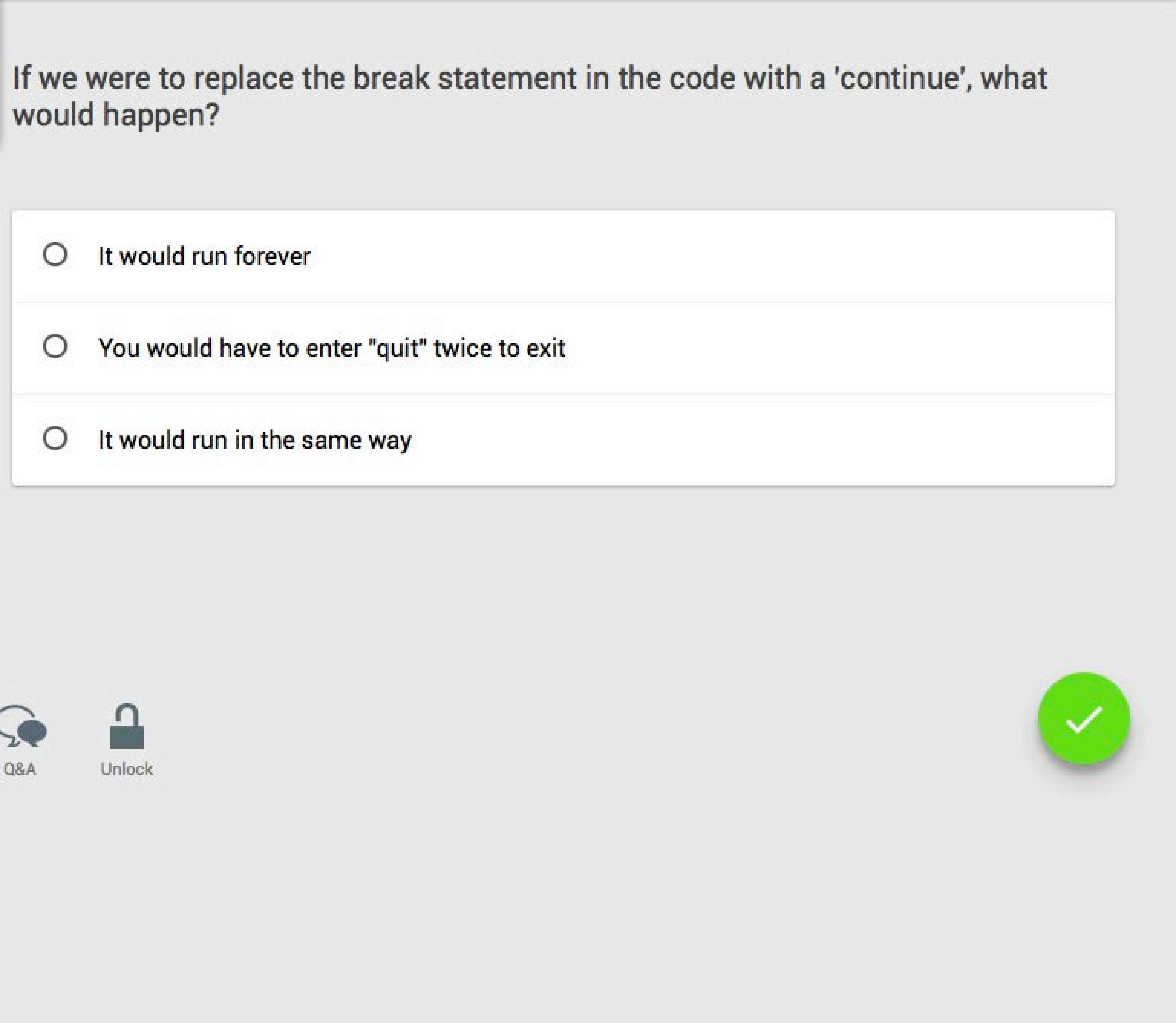
1194
Q&A
Unlock
Hint

Creating a Calculator

This lesson is about an example Python project: a simple calculator.
Each part explains a different section of the program.
The first section is the overall menu. This keeps on accepting user input until the user enters "quit", so a **while** loop is used.

```
while True:
  print("Options:")
  print("Enter 'add' to add two numbers")
  print("Enter 'subtract' to subtract two numbers")
  print("Enter 'multiply' to multiply two numbers")
  print("Enter 'divide' to divide two numbers")
  print("Enter 'quit' to end the program")
  user_input = input(": ")

  if user_input == "quit":
    break
  elif user_input == "add":
    ...
  elif user_input == "subtract":
    ...
  elif user_input == "multiply":
    ...
  elif user_input == "divide":
    ...
  else:
    print("Unknown input")
```

The code above is the starting point for our program. It accepts user input, and compares it to the options in the **if/elif** statements.



If we were to replace the break statement in the code with a 'continue', what would happen?

○ It would run forever

○ You would have to enter "quit" twice to exit

○ It would run in the same way

Creating a Calculator

The next part of the program is getting the numbers the user wants to do something with.
The code below shows this for the addition section of the calculator. Similar code would have to be written for the other sections.

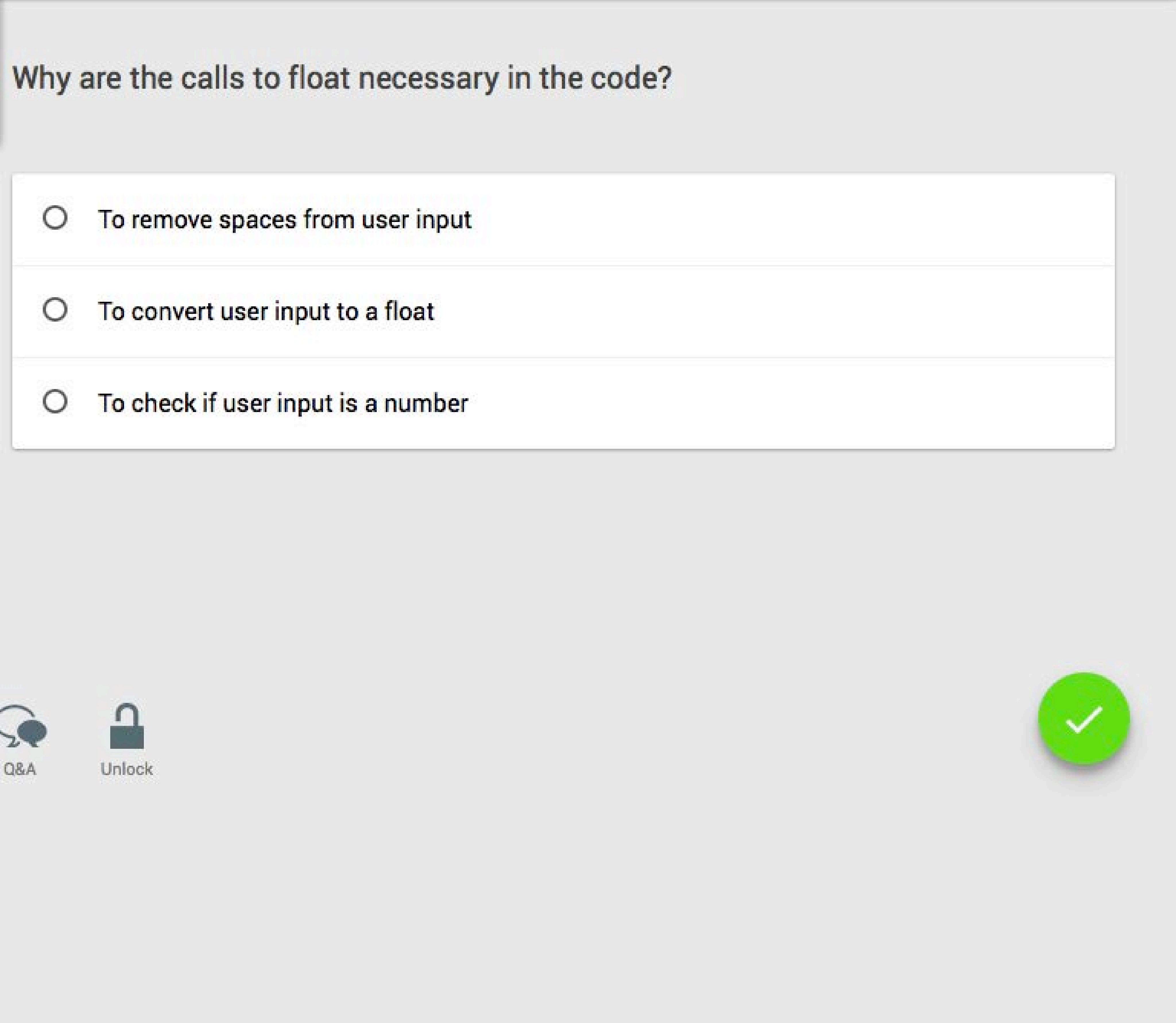
```
elif user_input == "add":
  num1 = float(input("Enter a number: "))
  num2 = float(input("Enter another number: "))
```

Now, when the user inputs "add", the program prompts to enter two numbers, and stores them in the corresponding variables.

> As it is, this code crashes if the user enters a non-numeric input when prompted to enter a number. We will look at fixing problems like this in a later module.

40 COMMENTS

Q&A



Why are the calls to float necessary in the code?

- ○ To remove spaces from user input
- ○ To convert user input to a float
- ○ To check if user input is a number

Creating a Calculator

The final part of the program processes user input and displays it.
The code for the addition part is shown here.

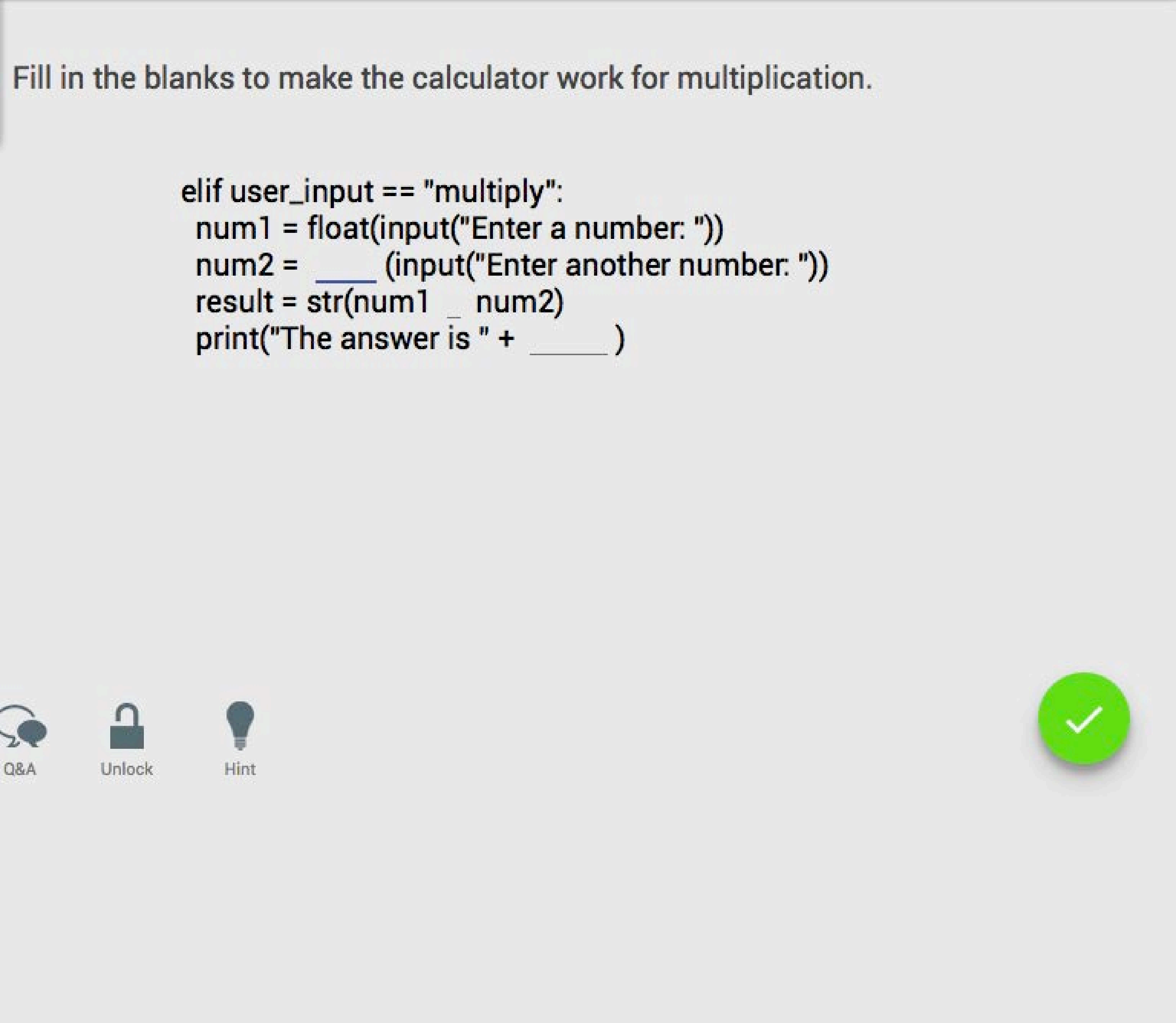
```
elif user_input == "add":
  num1 = float(input("Enter a number: "))
  num2 = float(input("Enter another number: "))
  result = str(num1 + num2)
  print("The answer is " + result)
```

We now have a working program that prompts for user input, and then calculates and prints the sum of the input.

> Similar code would have to be written for the other branches (for subtraction, multiplication and division).
> The output line could be put outside the **if** statements to omit repetition of code.

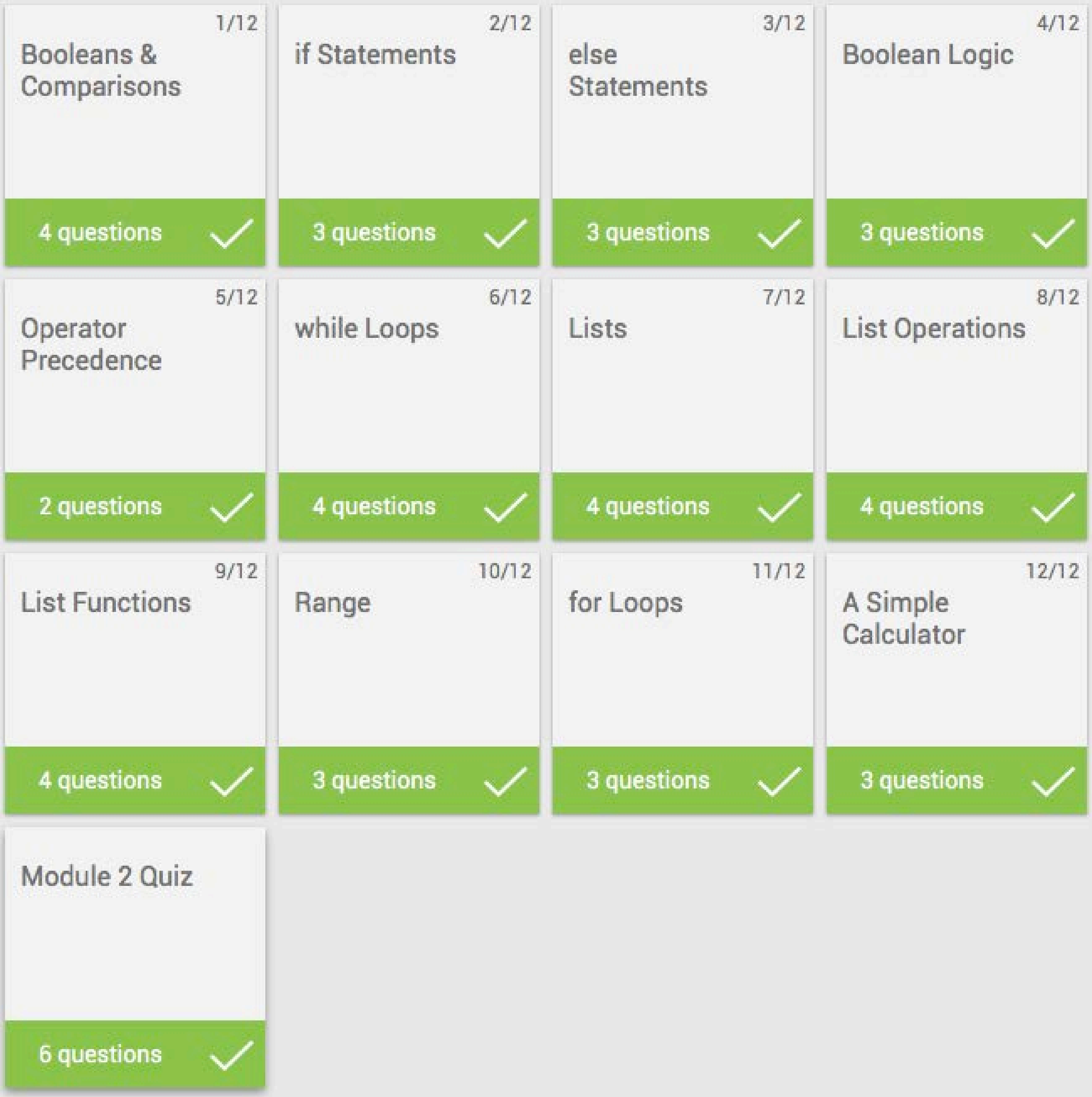
130 COMMENTS

Q&A



Fill in the blanks to make the calculator work for multiplication.

```
elif user_input == "multiply":
  num1 = float(input("Enter a number: "))
  num2 = ____ (input("Enter another number: "))
  result = str(num1 _ num2)
  print("The answer is " + _____ )
```



1/12
Booleans & Comparisons
4 questions ✓

2/12
if Statements
3 questions ✓

3/12
else Statements
3 questions ✓

4/12
Boolean Logic
3 questions ✓

5/12
Operator Precedence
2 questions ✓

6/12
while Loops
4 questions ✓

7/12
Lists
4 questions ✓

8/12
List Operations
4 questions ✓

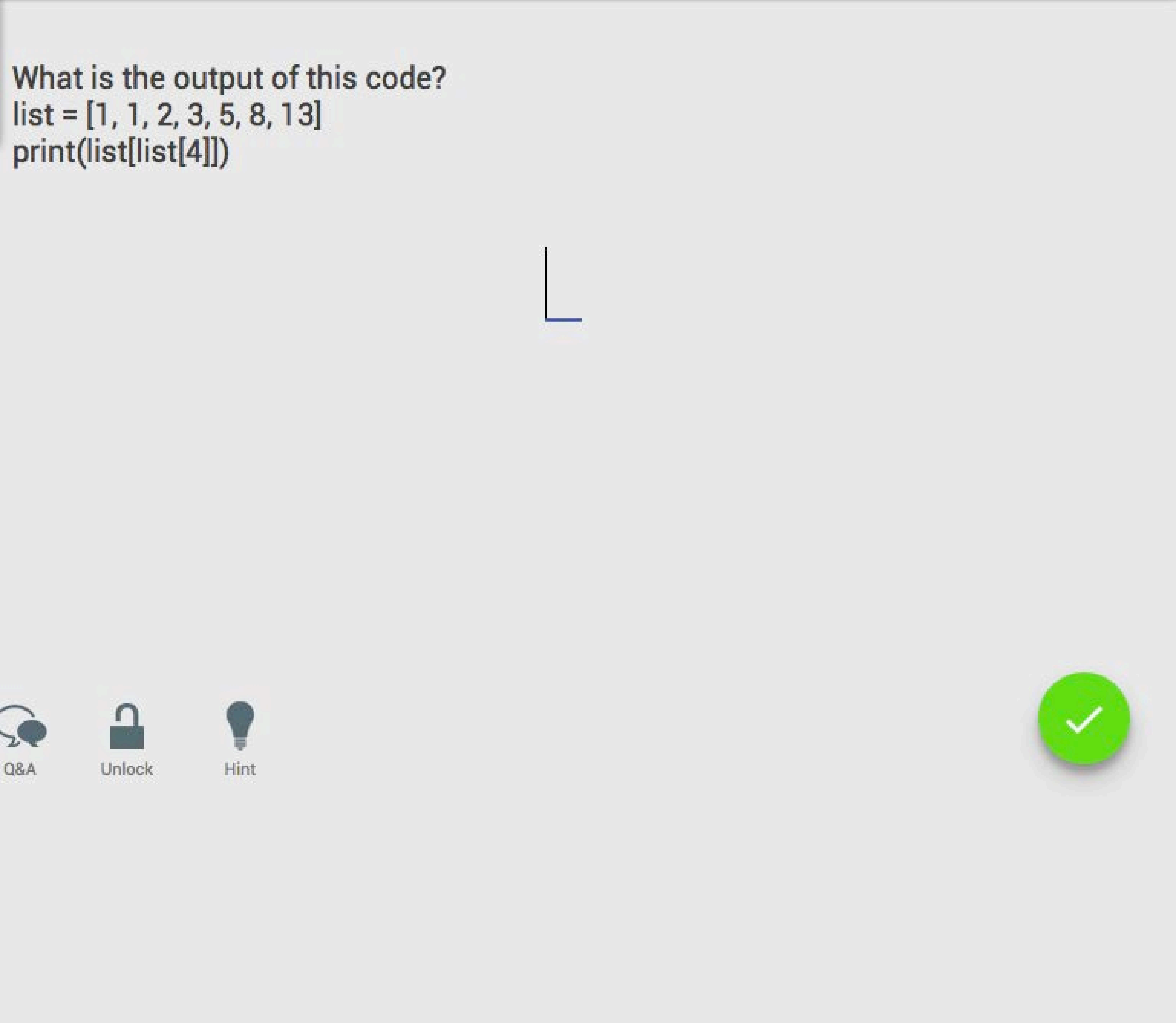
9/12
List Functions
4 questions ✓

10/12
Range
3 questions ✓

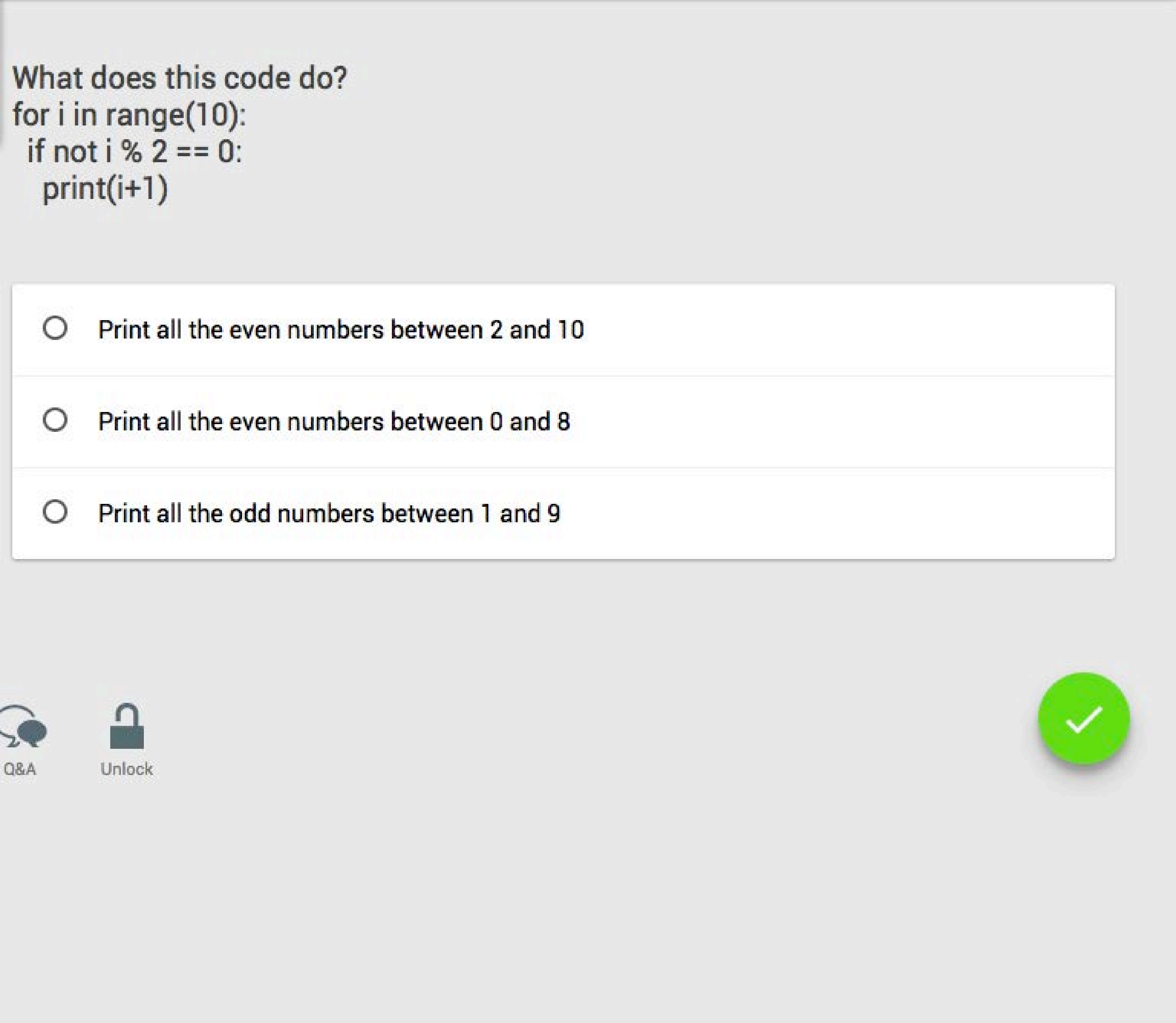
11/12
for Loops
3 questions ✓

12/12
A Simple Calculator
3 questions ✓

Module 2 Quiz
6 questions ✓


What is the output of this code?

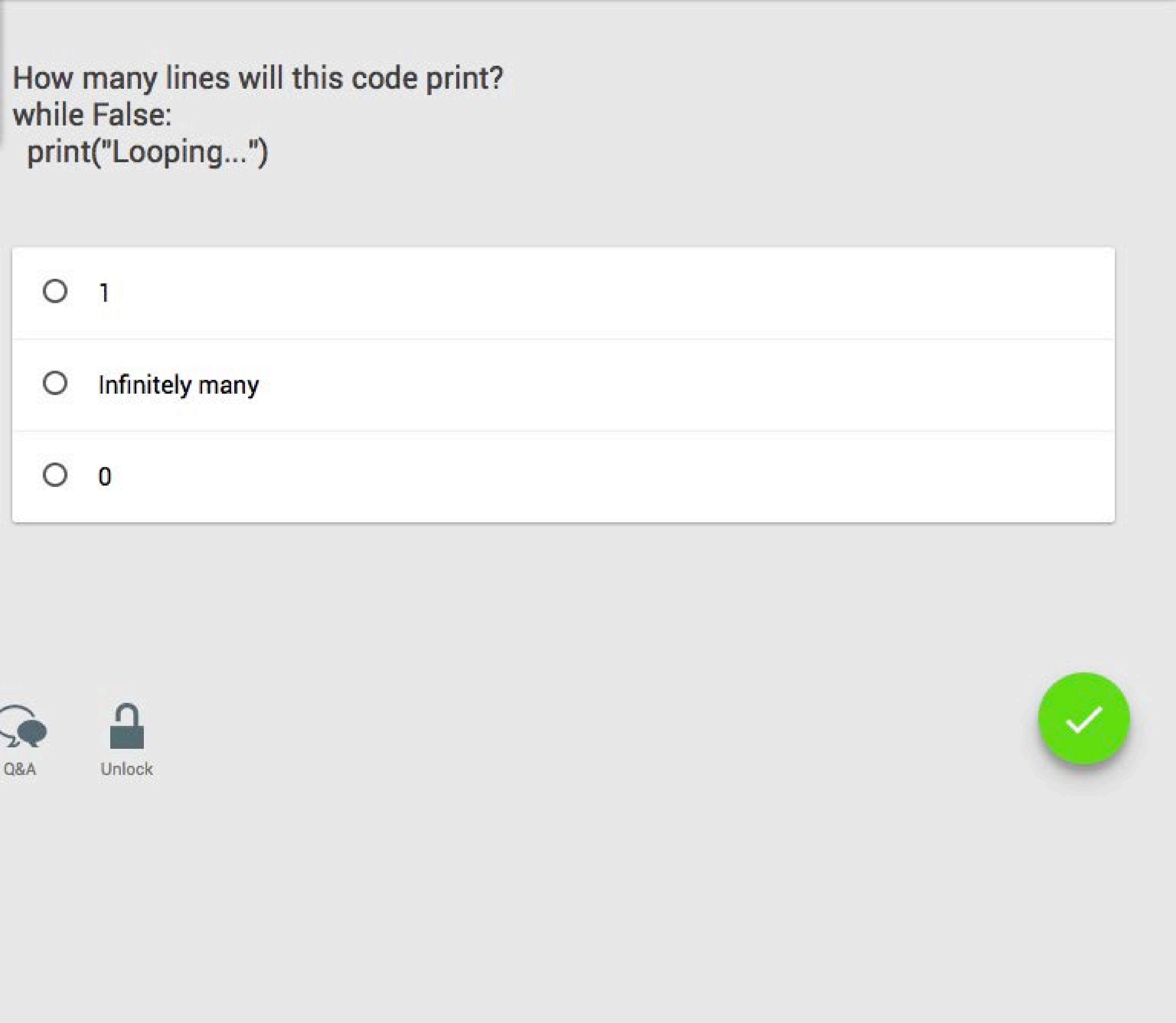
```
list = [1, 1, 2, 3, 5, 8, 13]
print(list[list[4]])
```



What does this code do?

```
for i in range(10):
 if not i % 2 == 0:
  print(i+1)
```

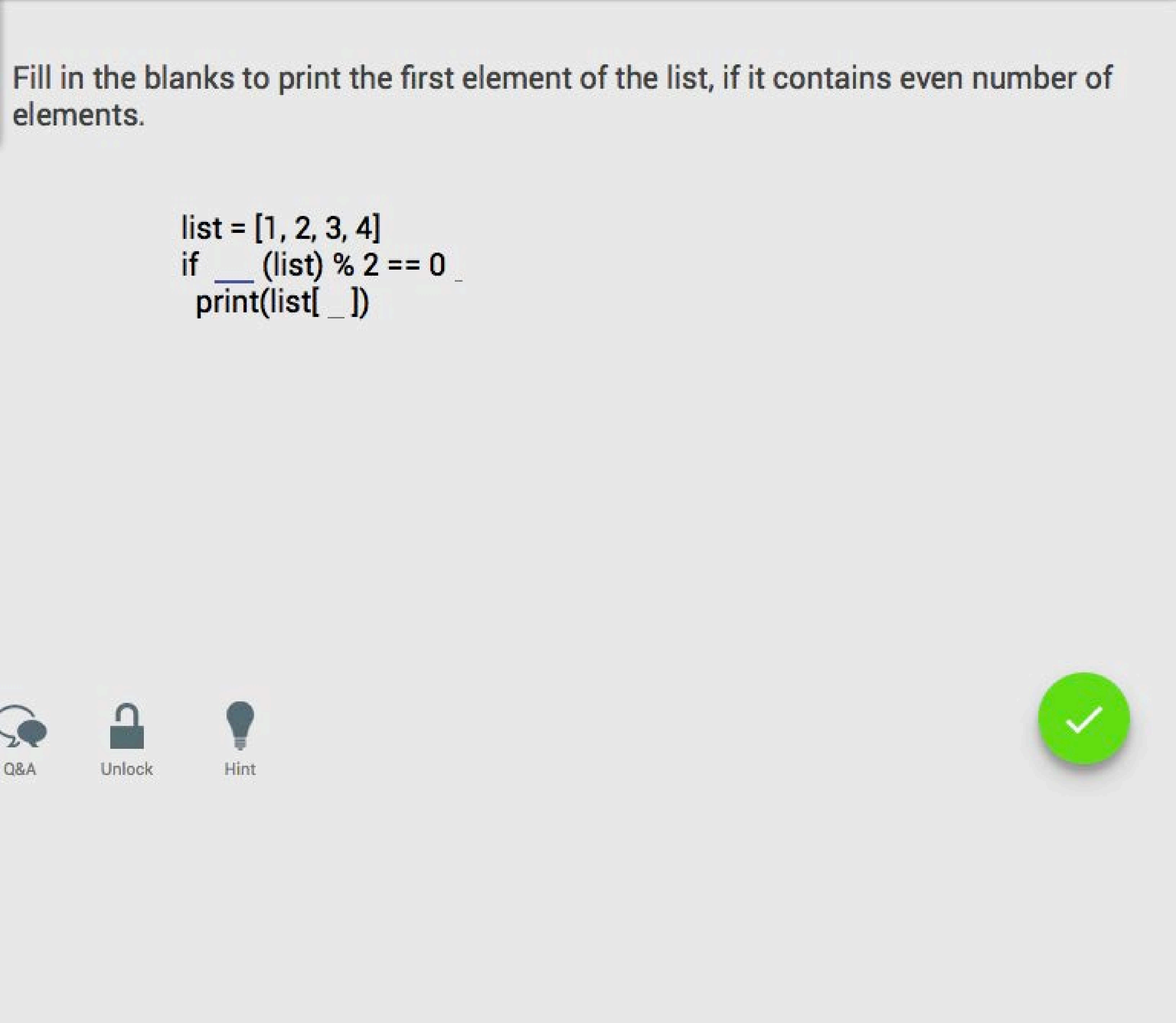
- ○ Print all the even numbers between 2 and 10
- ○ Print all the even numbers between 0 and 8
- ○ Print all the odd numbers between 1 and 9



How many lines will this code print?

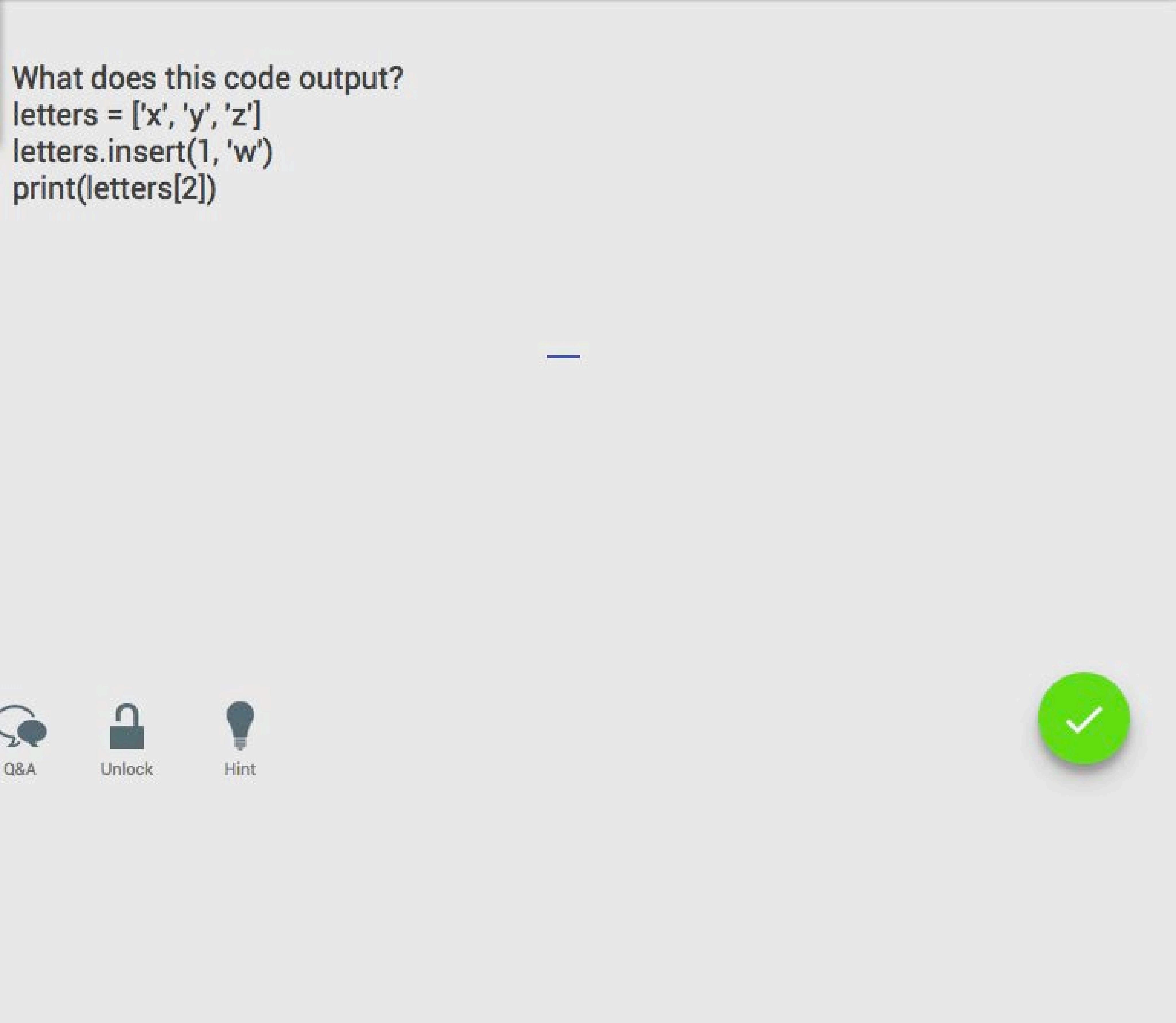
```
while False:
  print("Looping...")
```

- ○ 1
- ○ Infinitely many
- ○ 0



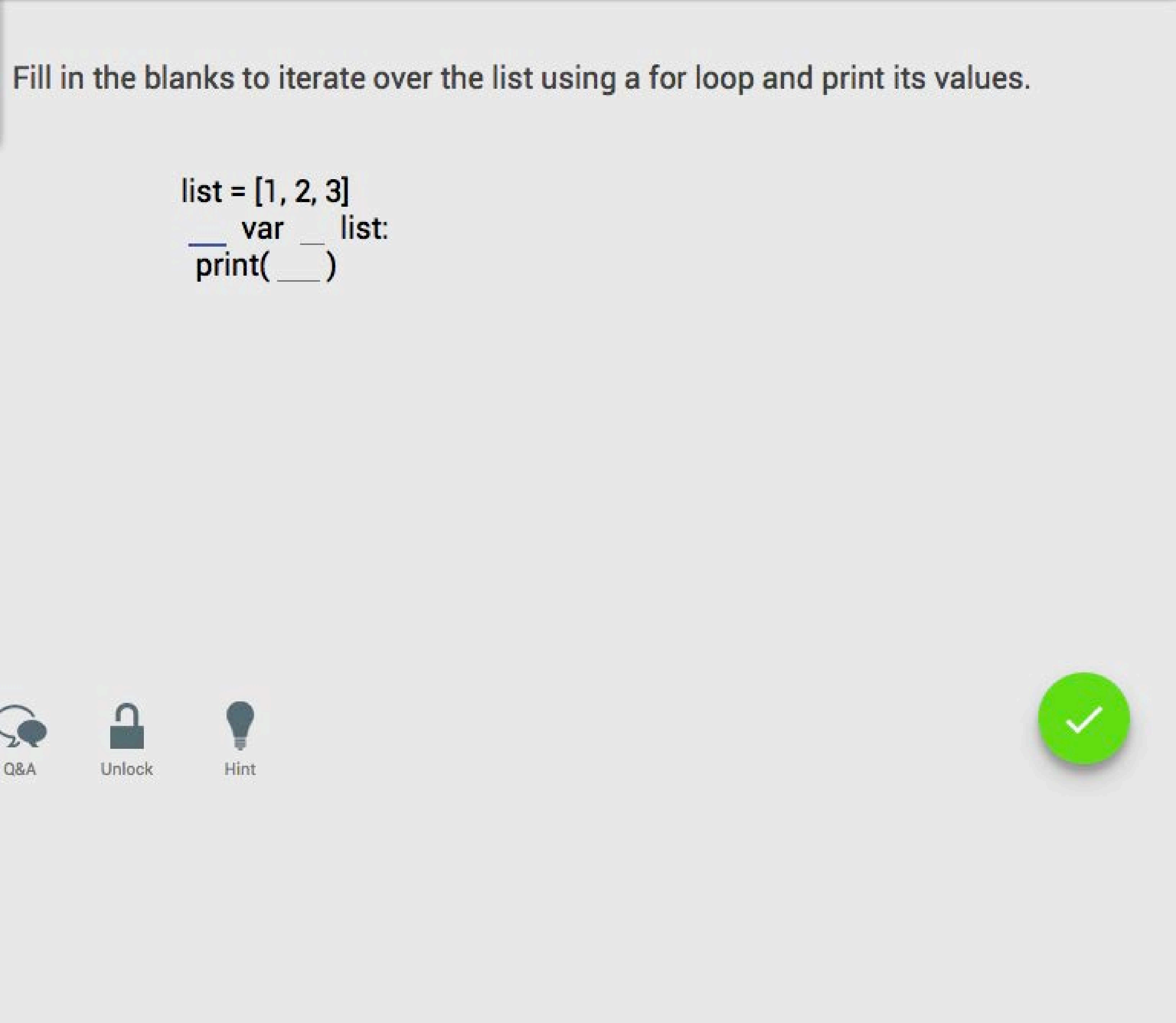
Fill in the blanks to print the first element of the list, if it contains even number of elements.

```
list = [1, 2, 3, 4]
if ___(list) % 2 == 0 _
  print(list[ _ ])
```



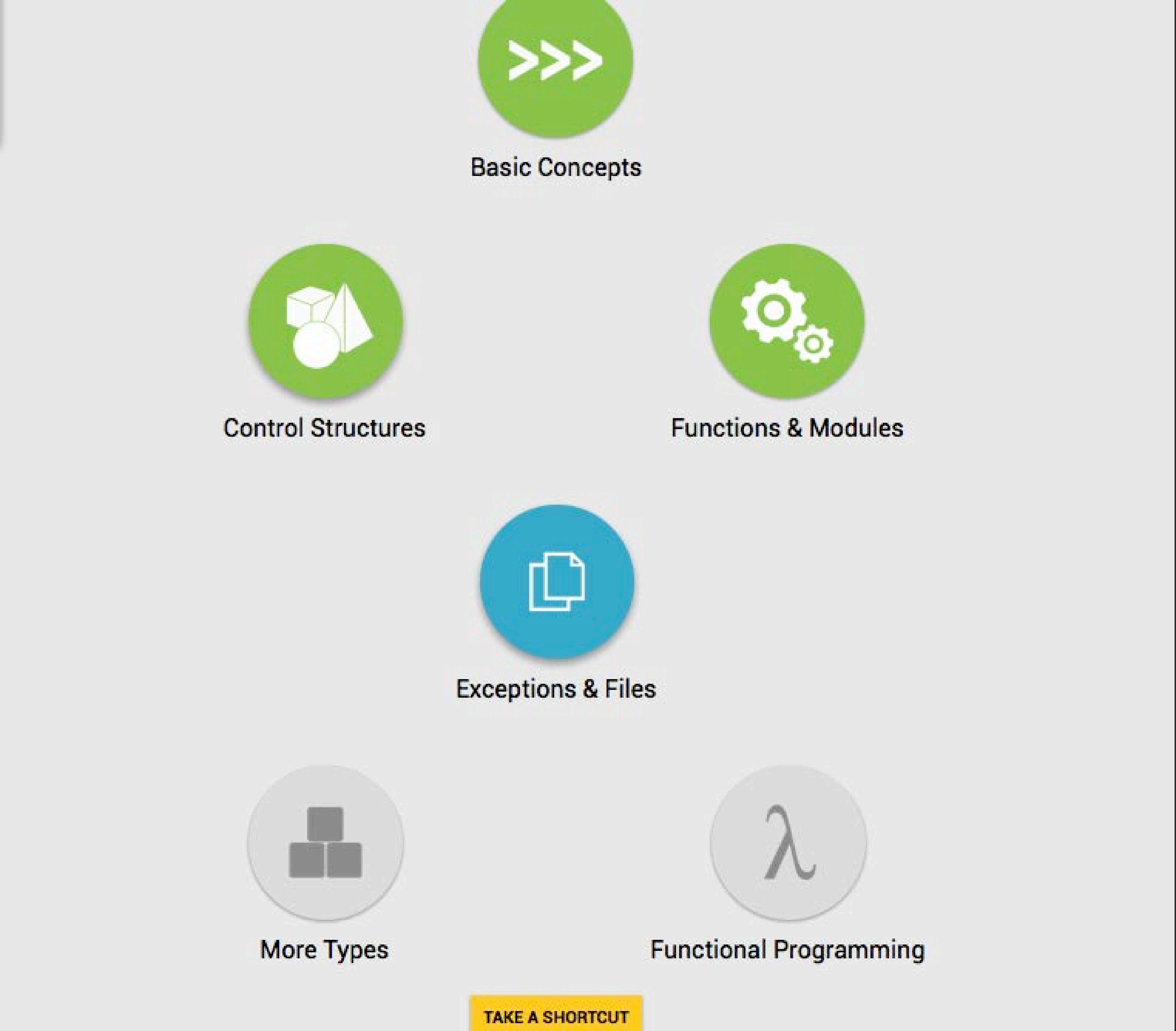
What does this code output?

```
letters = ['x', 'y', 'z']
letters.insert(1, 'w')
print(letters[2])
```



Fill in the blanks to iterate over the list using a for loop and print its values.

```
list = [1, 2, 3]
___ var _ list:
 print(___)
```


Basic Concepts
Control Structures
Functions & Modules
Exceptions & Files
More Types
Functional Programming
TAKE A SHORTCUT