

61A Lecture 2

Announcements

Names, Assignment, and User-Defined Functions

(Demo)

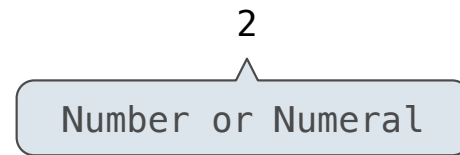
Types of Expressions

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Primitive expressions:

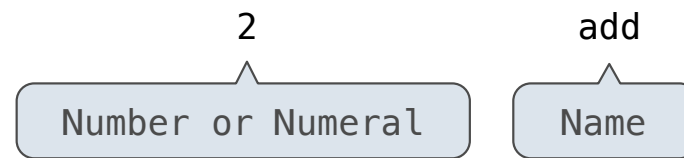
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Call expressions:

Types of Expressions

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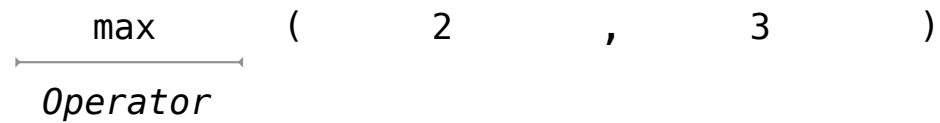
max (2 , 3)

Types of Expressions

Primitive expressions:



Call expressions:

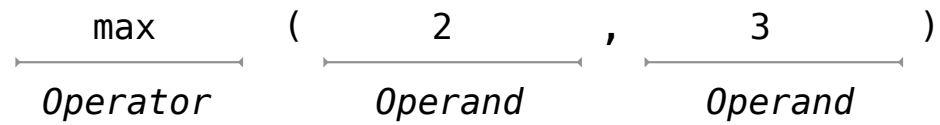


Types of Expressions

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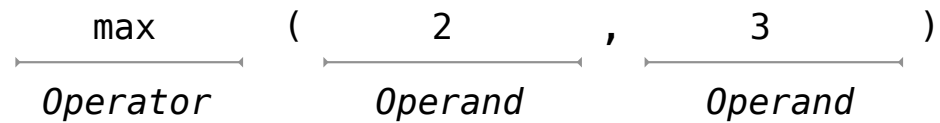


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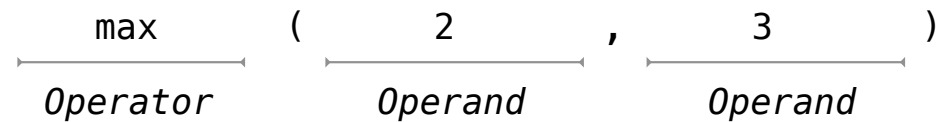
`max(min(pow(3, 5), -4), min(1, -2))`

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Primitive expressions:



Call expressions:

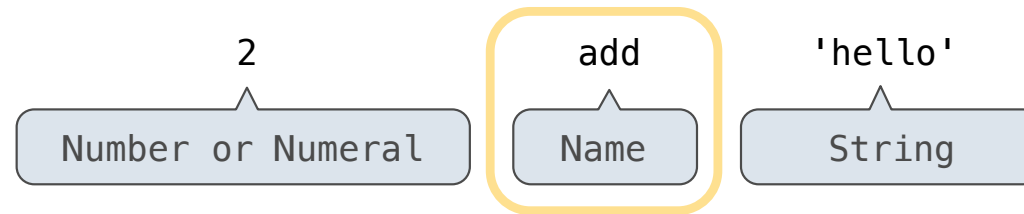


An operand can also be a call expression

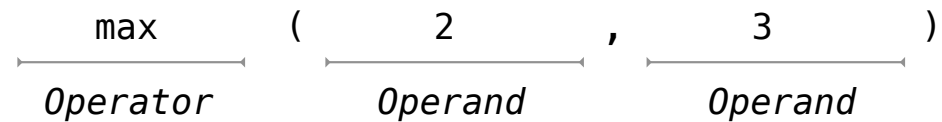
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Discussion Question 1

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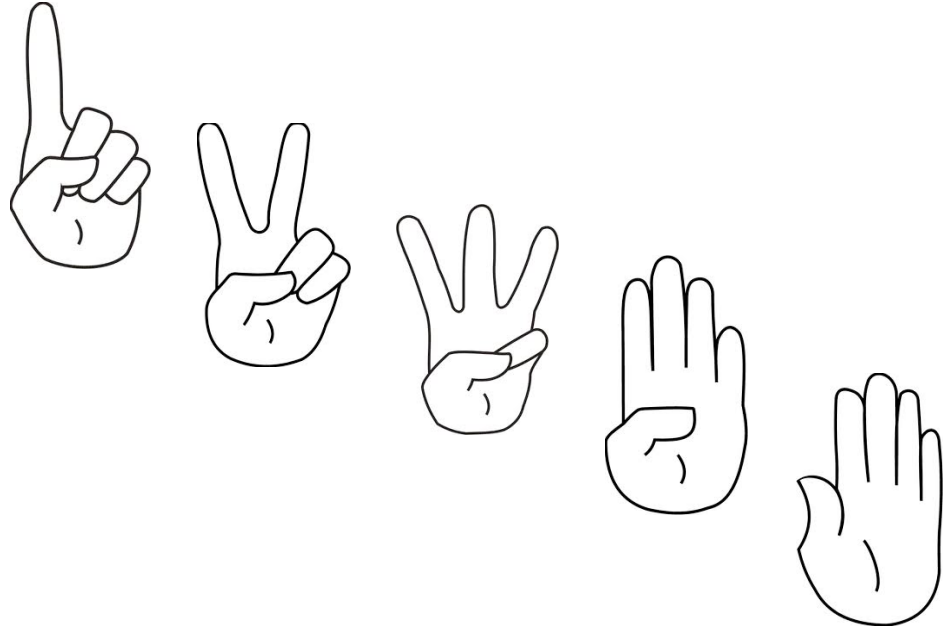
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Environment Diagrams

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Environment diagrams visualize the interpreter's process.

Interactive Diagram

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```
→ 1 from math import pi  
→ 2 tau = 2 * pi
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[Interactive Diagram](#)

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Global frame
  pi | 3.1416
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[Interactive Diagram](#)

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Code (left):

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Global frame  
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Frames (right):

[Interactive Diagram](#)

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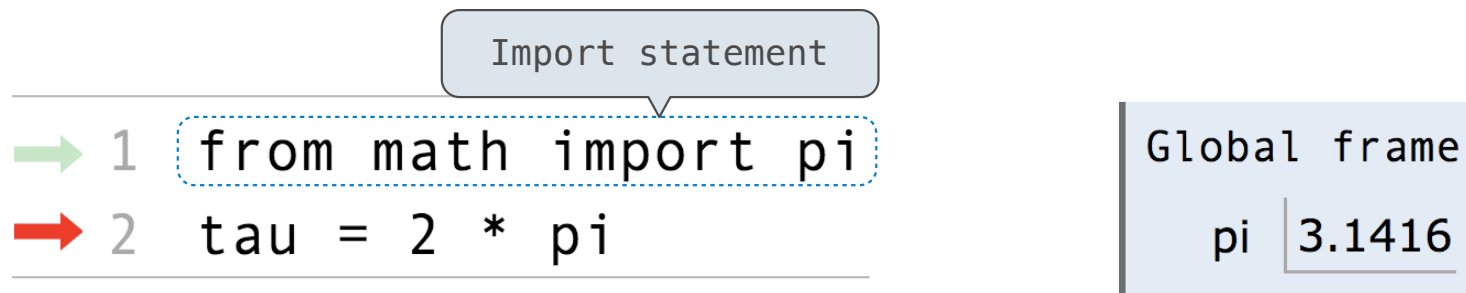
Statements and expressions

Frames (right):

[Interactive Diagram](#)

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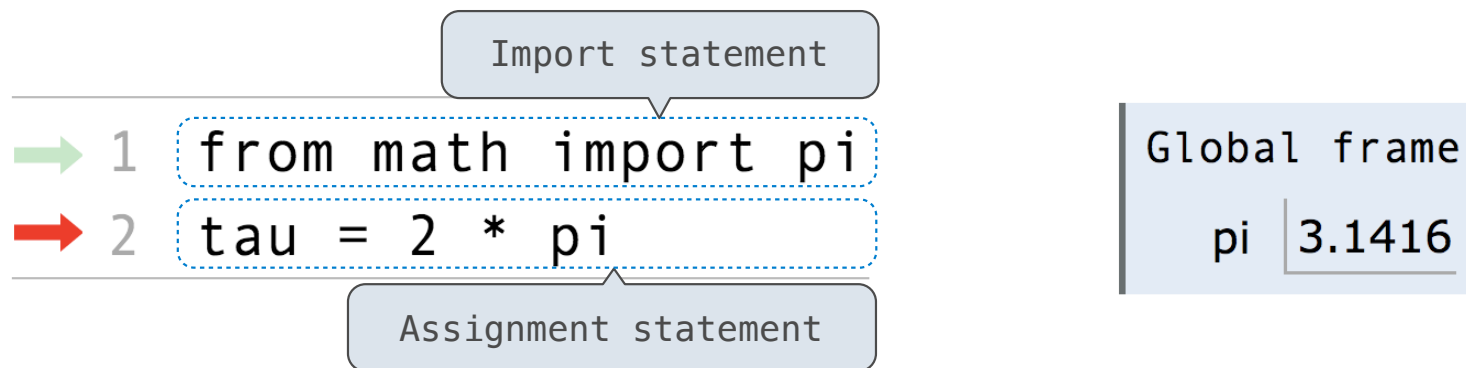
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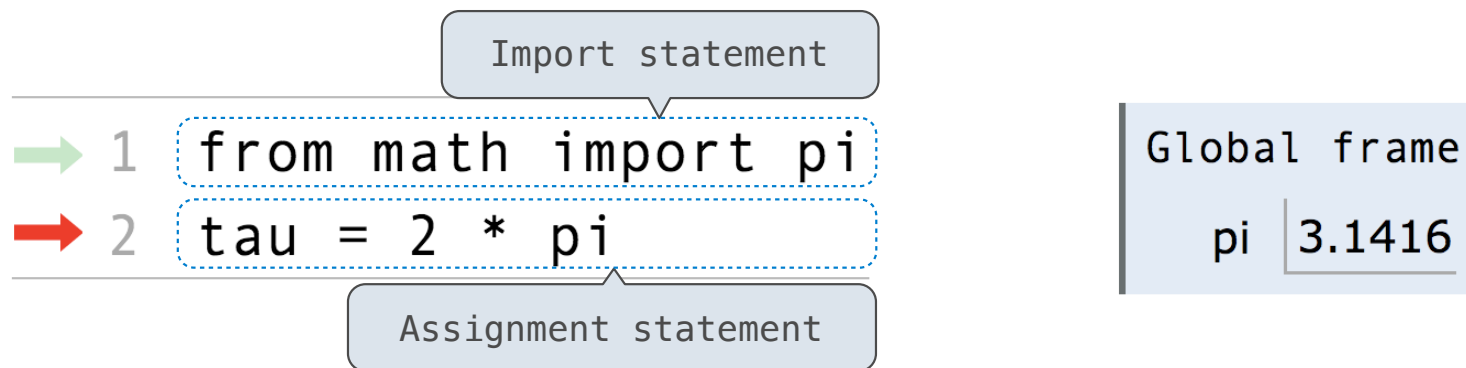
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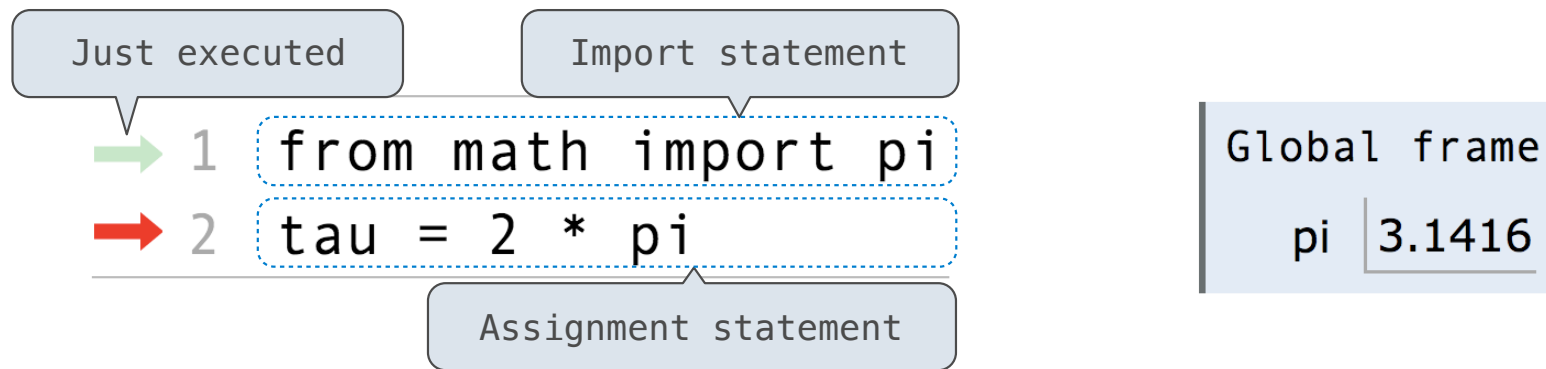
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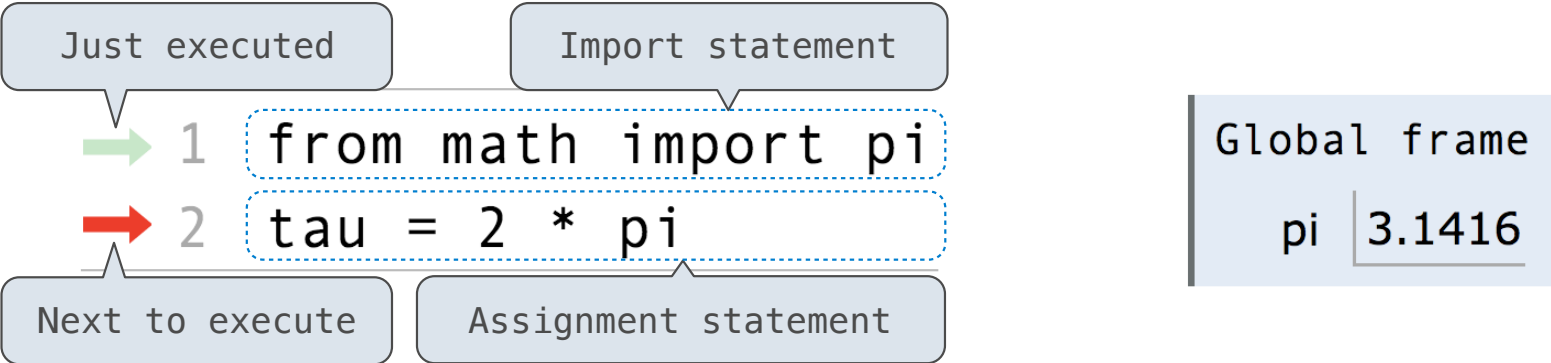
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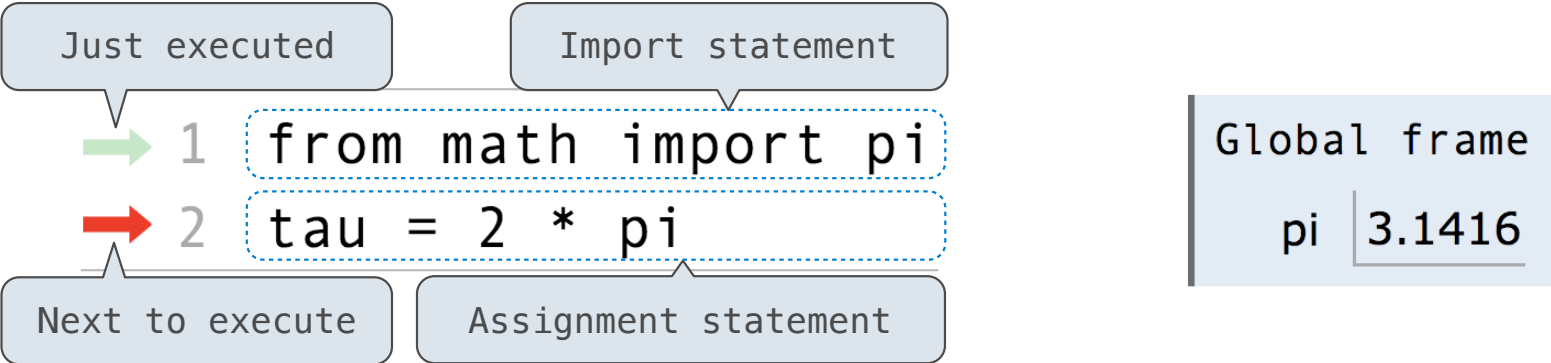
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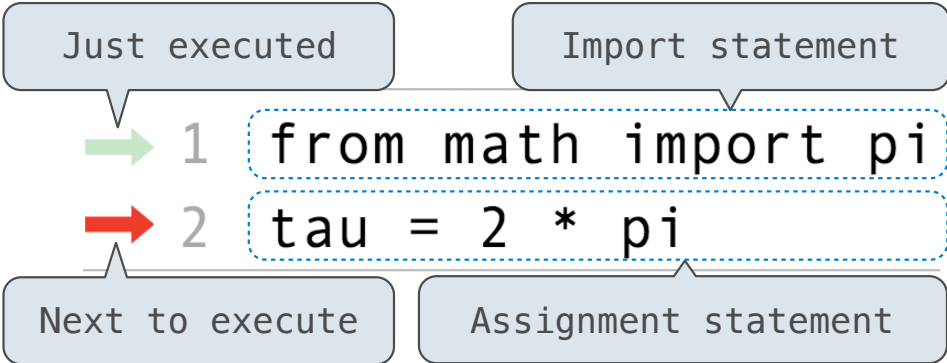
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Frames (right):

Each name is bound to a value

Environment Diagrams

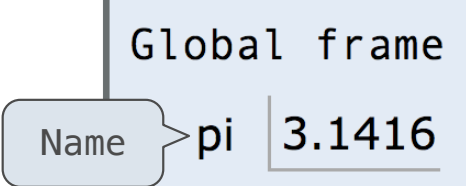
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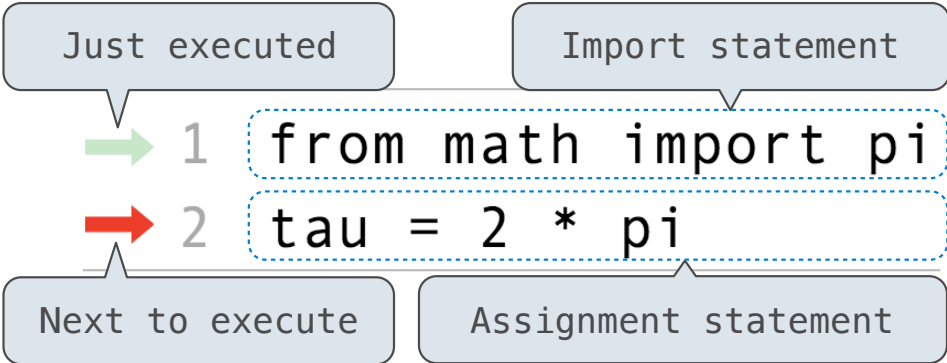


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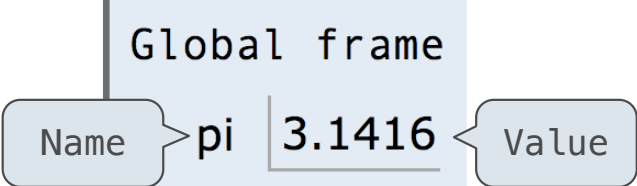
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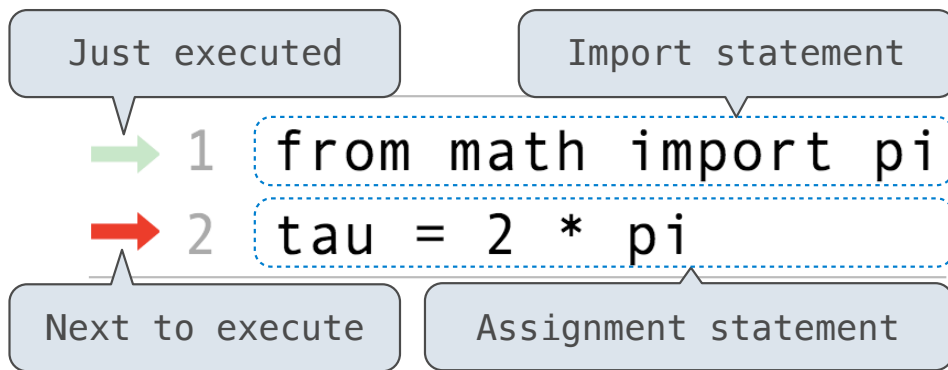


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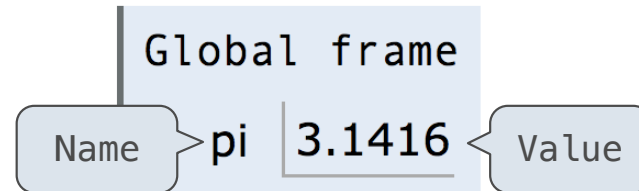
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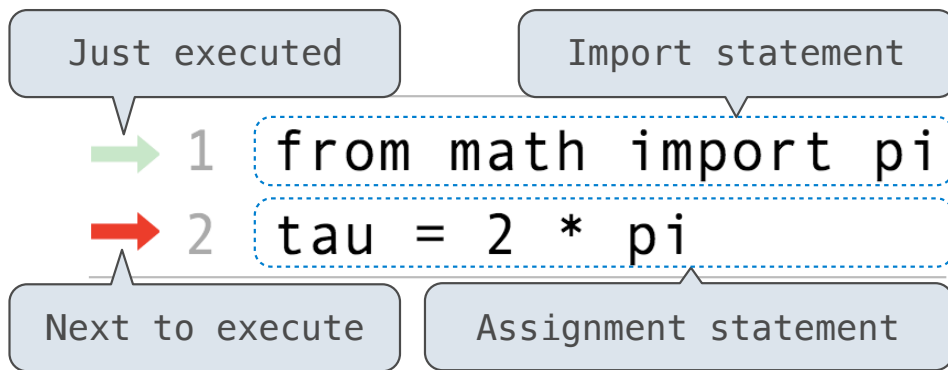
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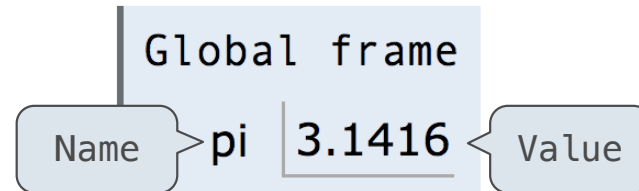
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(Demo)

[Interactive Diagram](#)

Assignment Statements

Interactive Diagram

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```
1 a = 1
→ 2 b = 2
→ 3 b, a = a + b, b
```

Interactive Diagram

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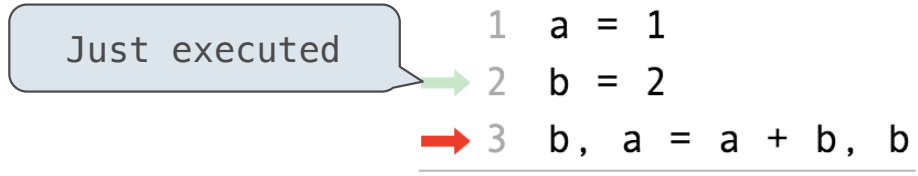
Global frame

a | 1

b | 2

Interactive Diagram

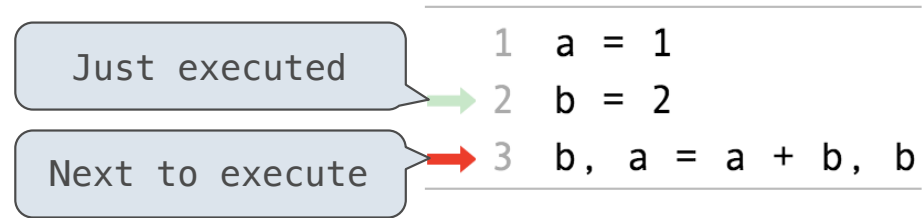
Assignment Statements



Global frame

a	1
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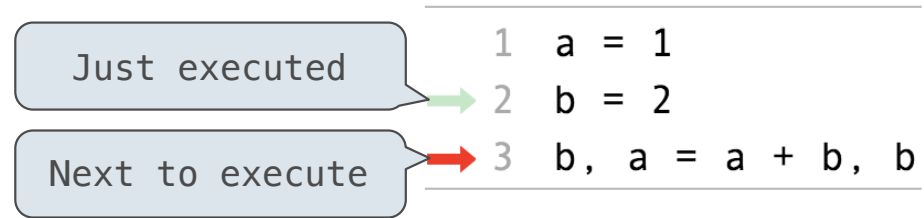
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Assignment Statements



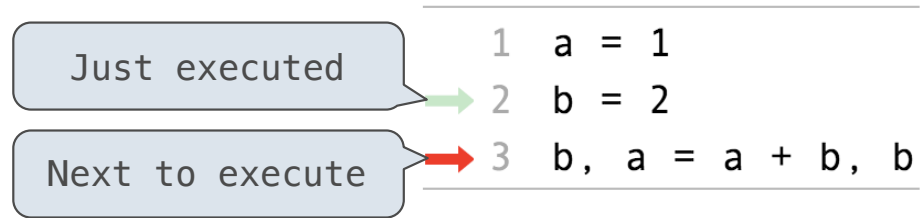
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Execution rule for assignment statements:

Interactive Diagram

Assignment Statements



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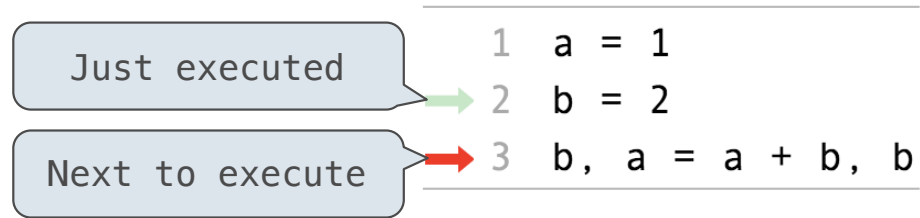
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Execution rule for assignment statements:

1. Evaluate all expressions to the right of = from left to right.

[Interactive Diagram](#)

Assignment Statements



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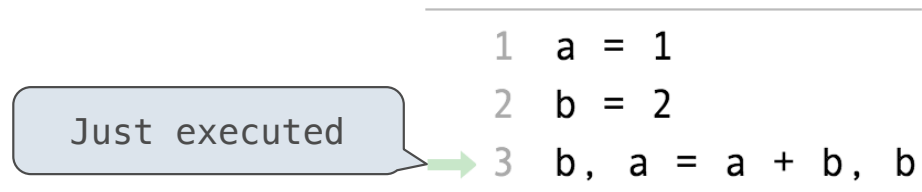
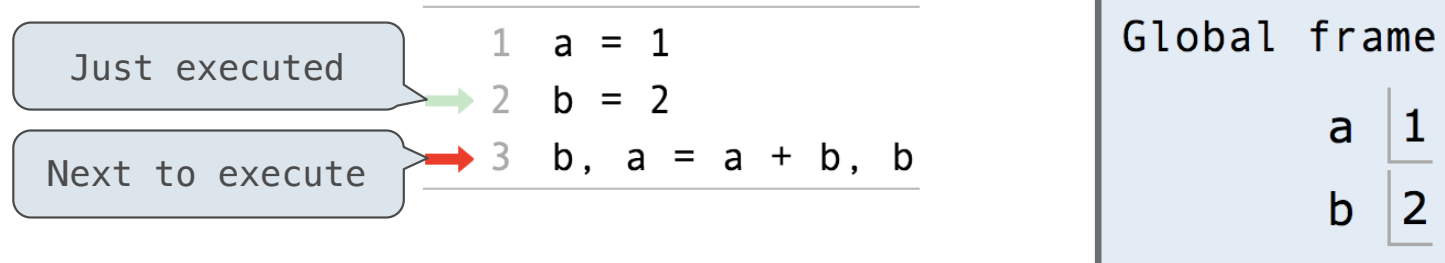
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[Interactive Diagram](#)

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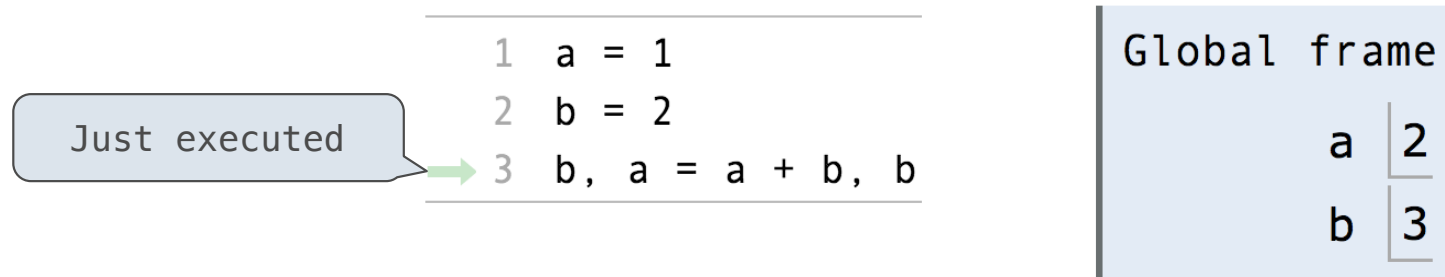
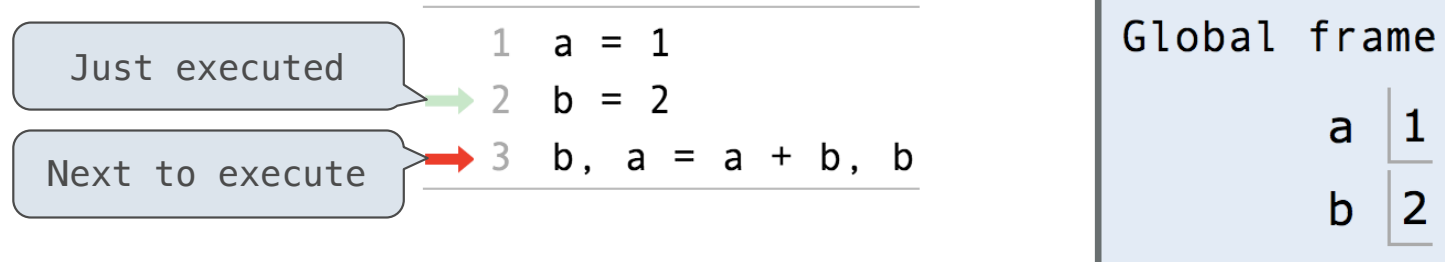


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[Interactive Diagram](#)

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[Interactive Diagram](#)

Discussion Question 1 Solution

(Demo)

Interactive Diagram

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(Demo)

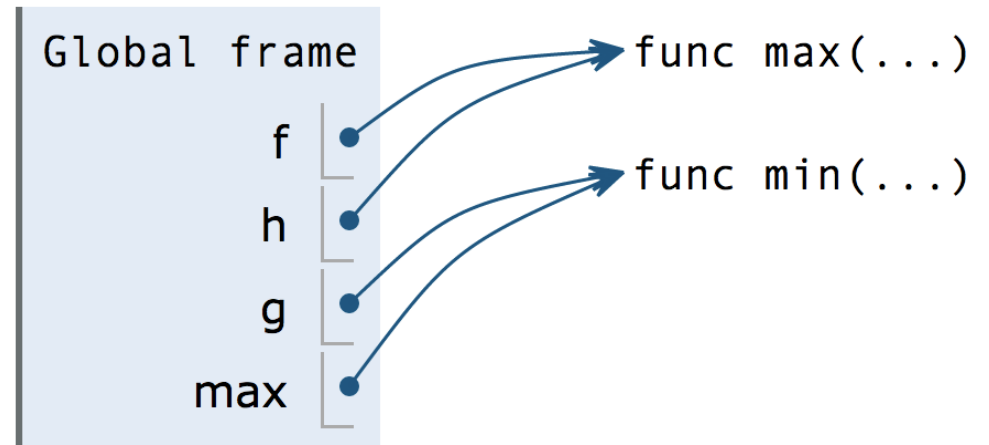
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[Interactive Diagram](#)

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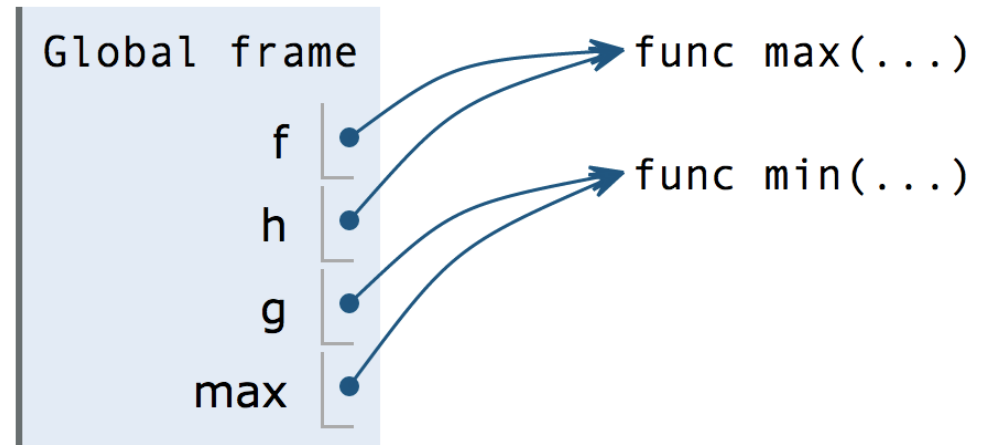


[Interactive Diagram](#)

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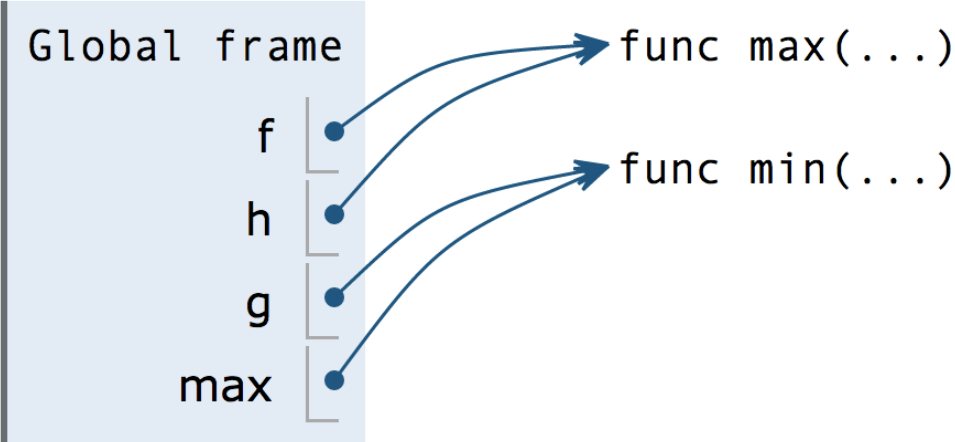
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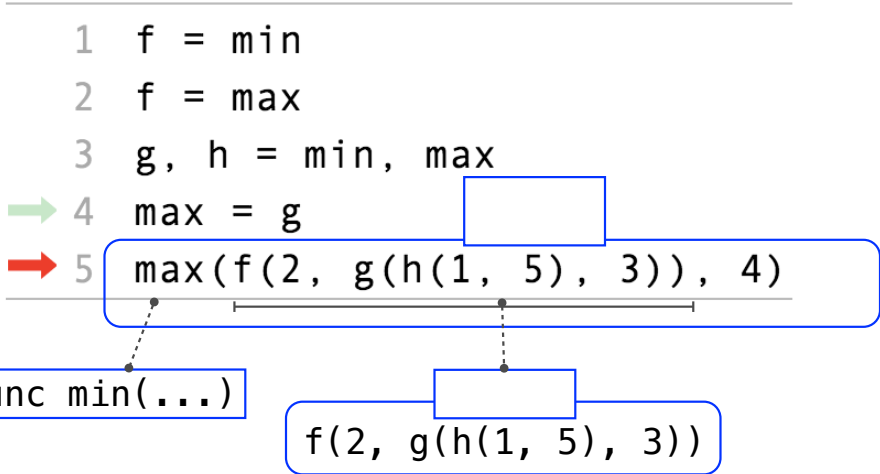
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func min(...)

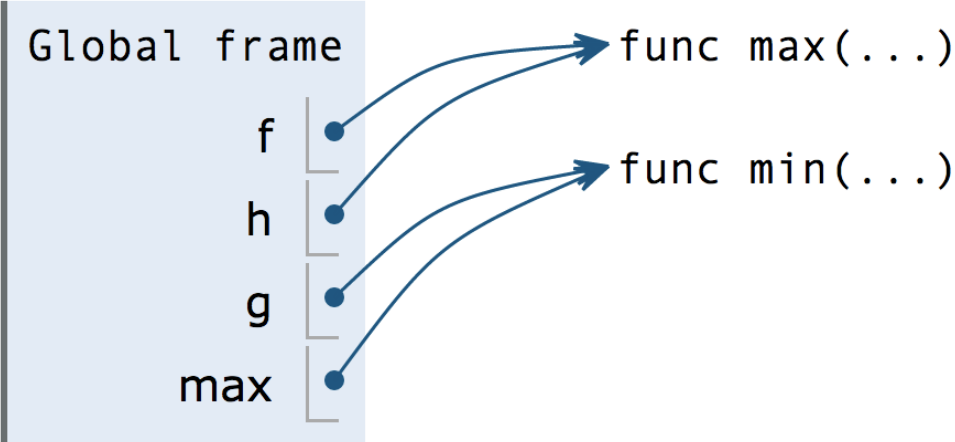
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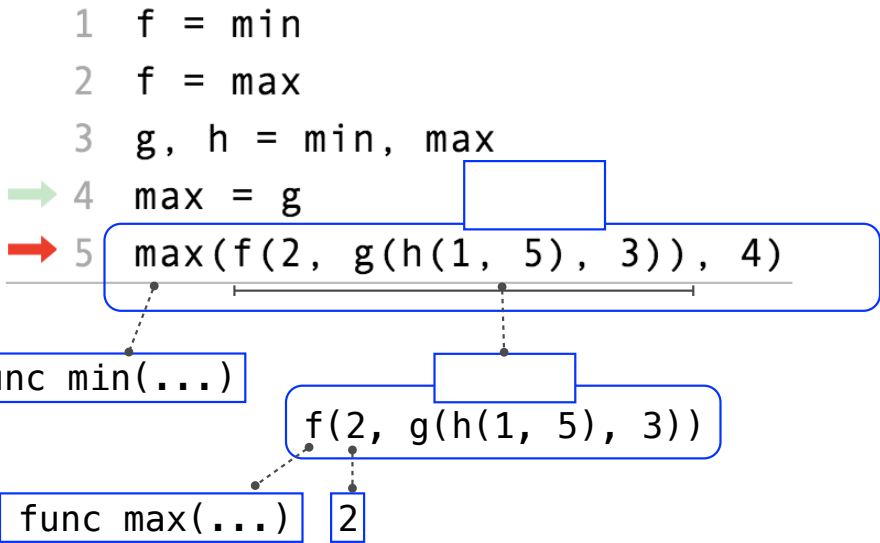
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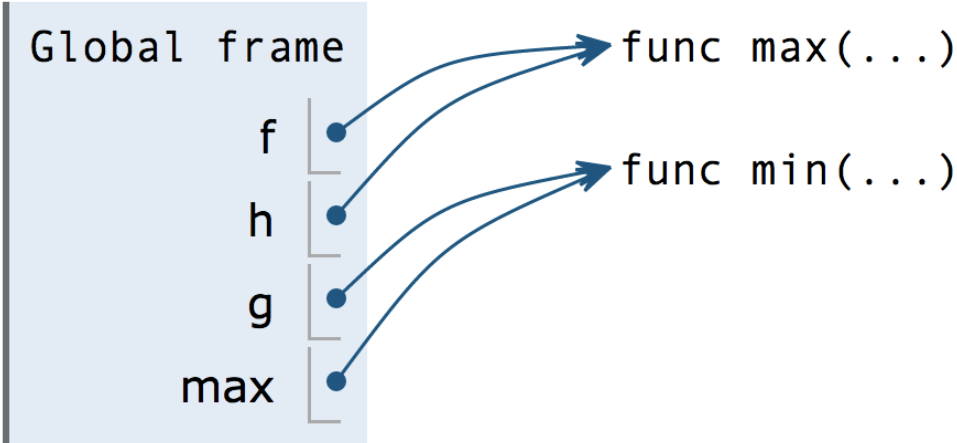
(Demo)



Discussion Question 1 Solution

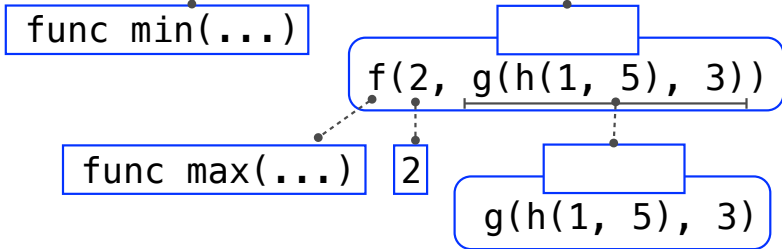


(Demo)

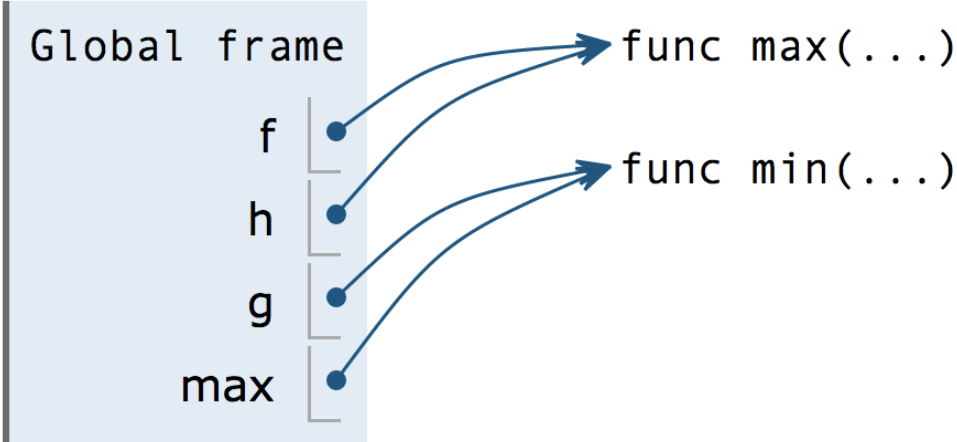


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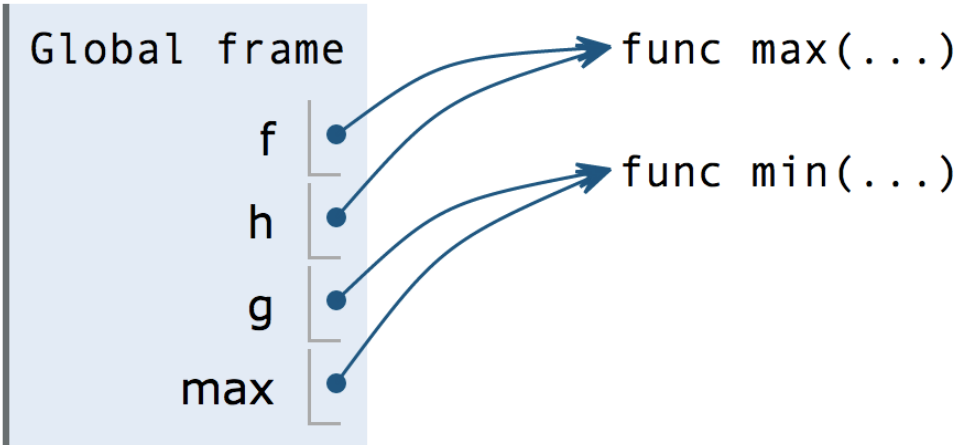
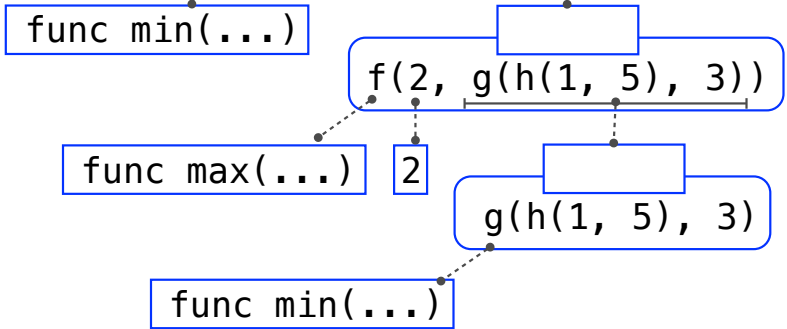
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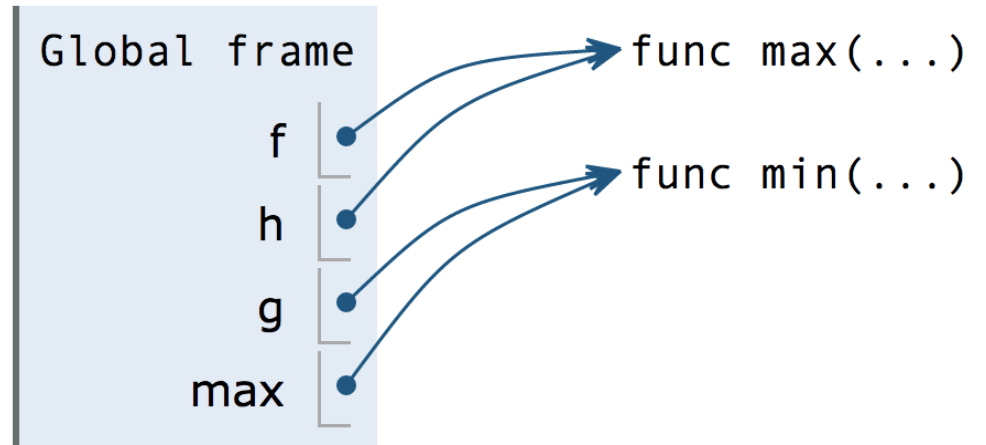
2

g(h(1, 5), 3)

func min(...)

h(1, 5)

(Demo)



Interactive Diagram

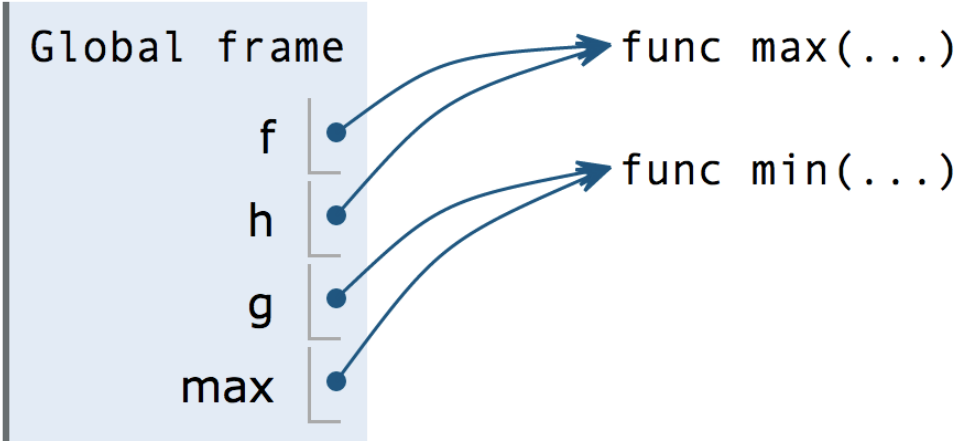
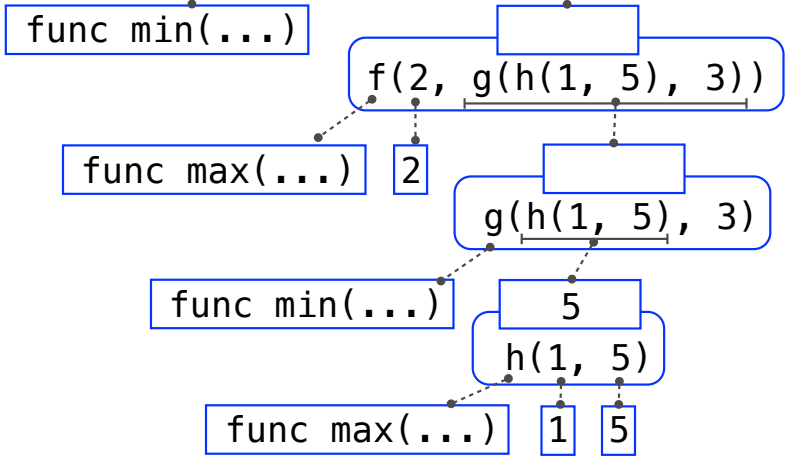
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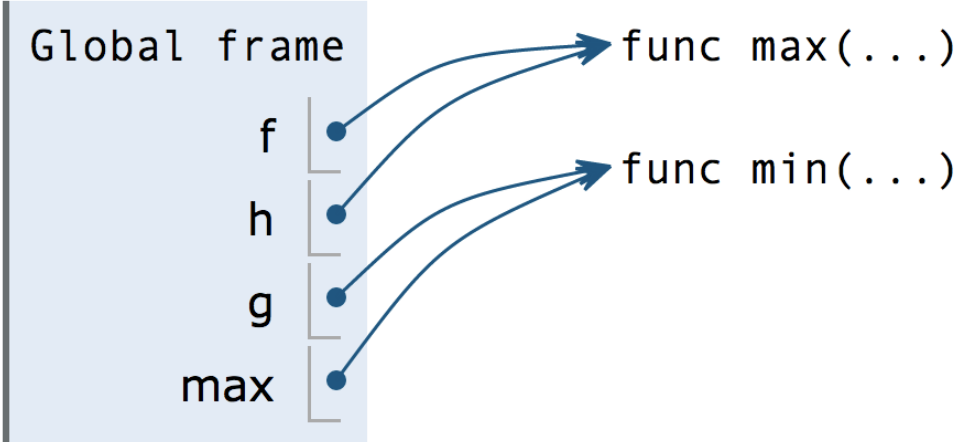
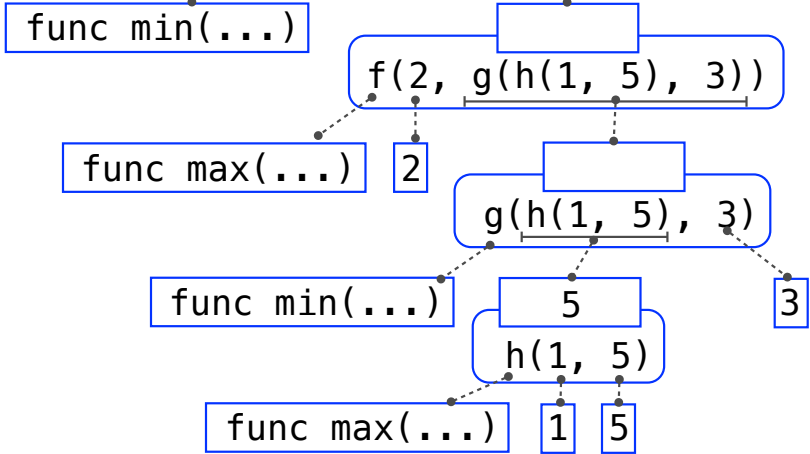
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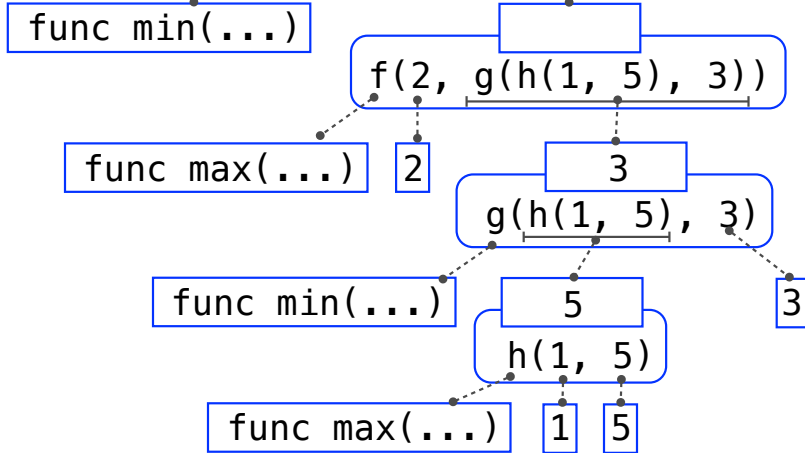
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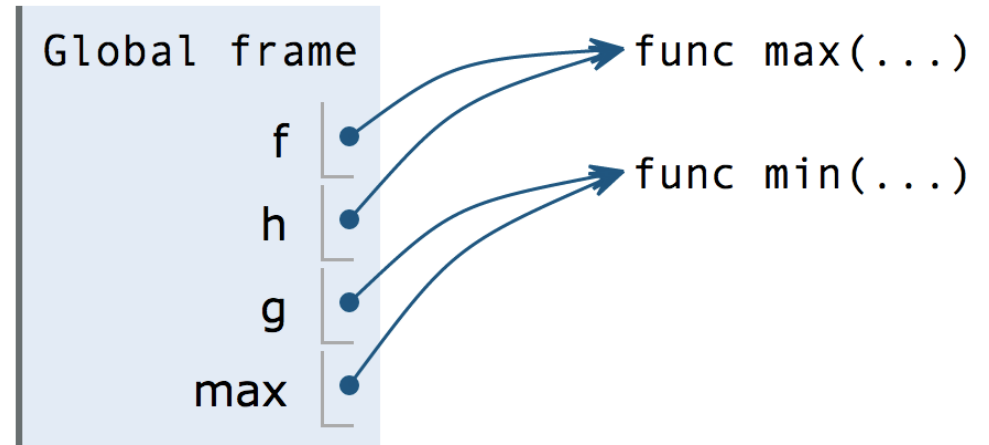


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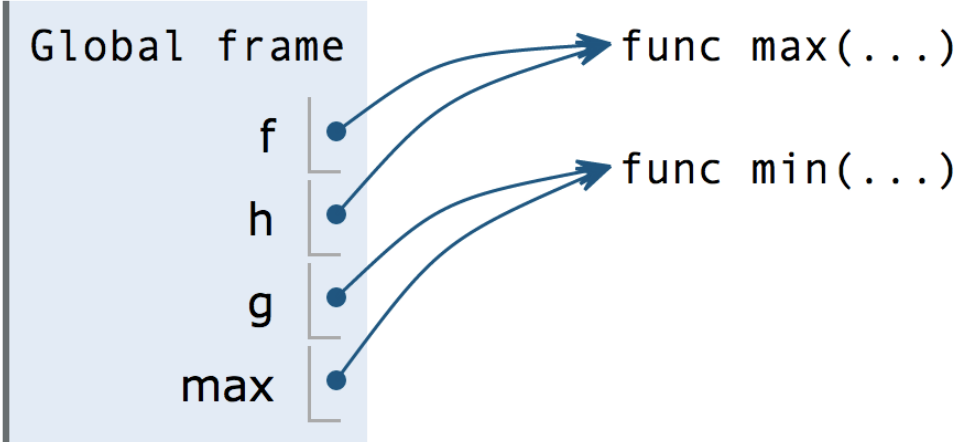
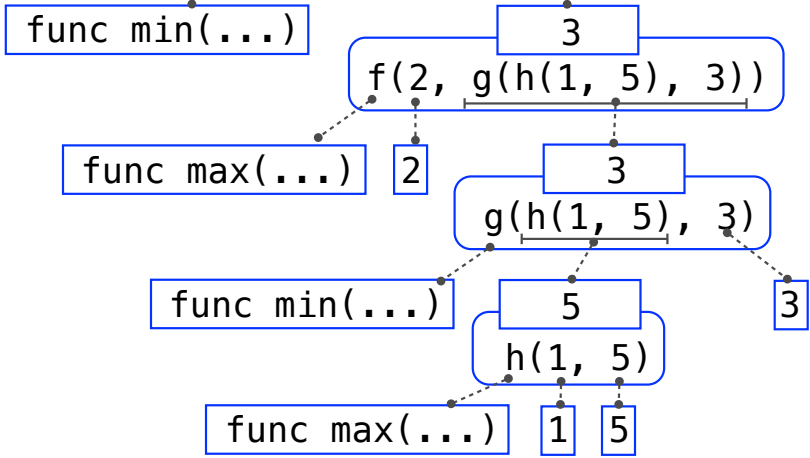
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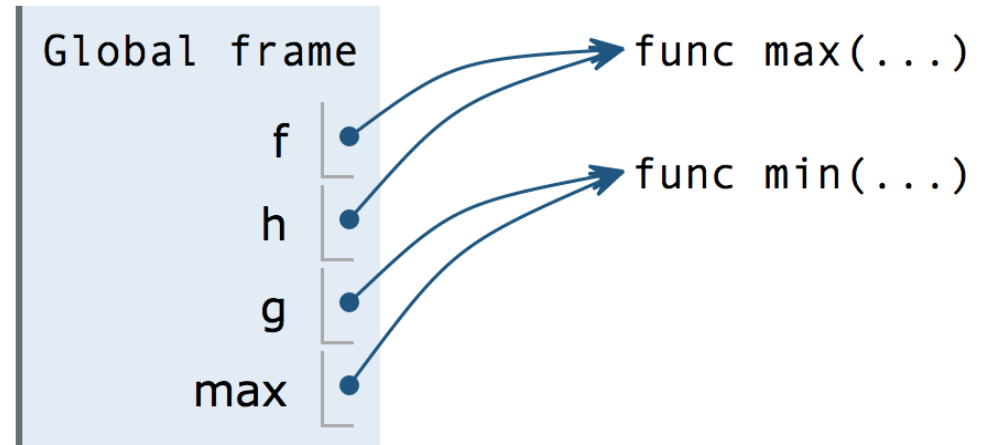
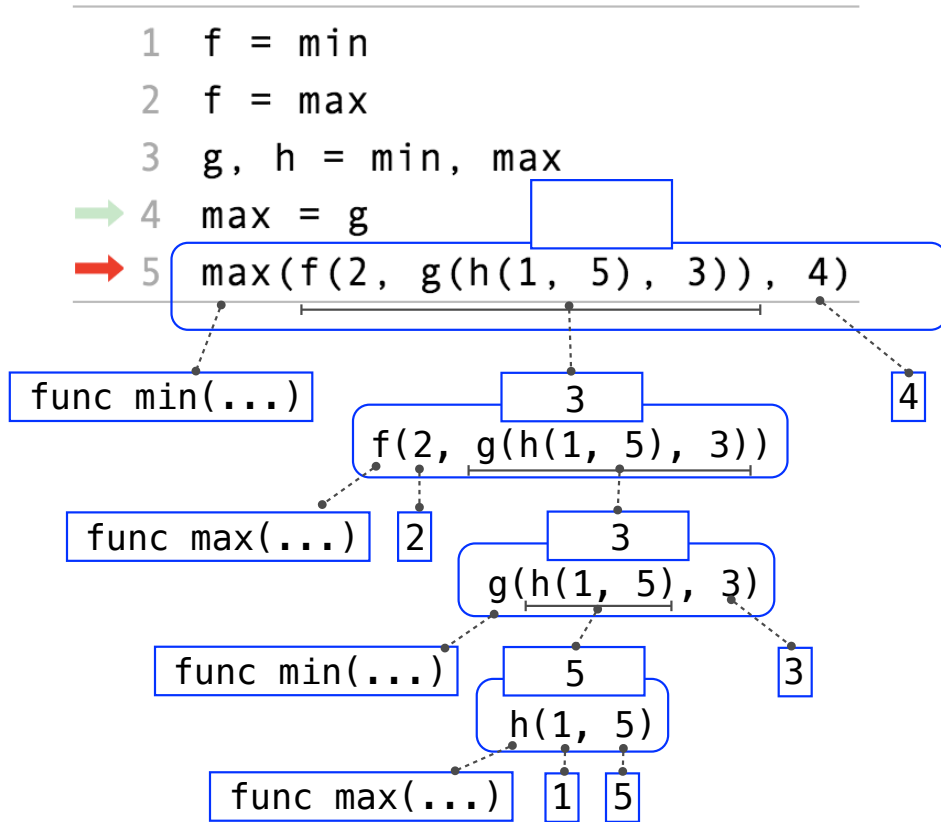
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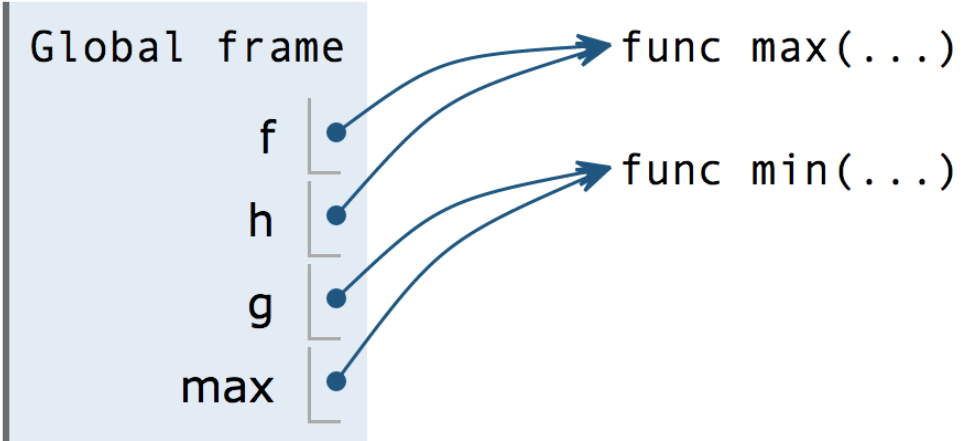
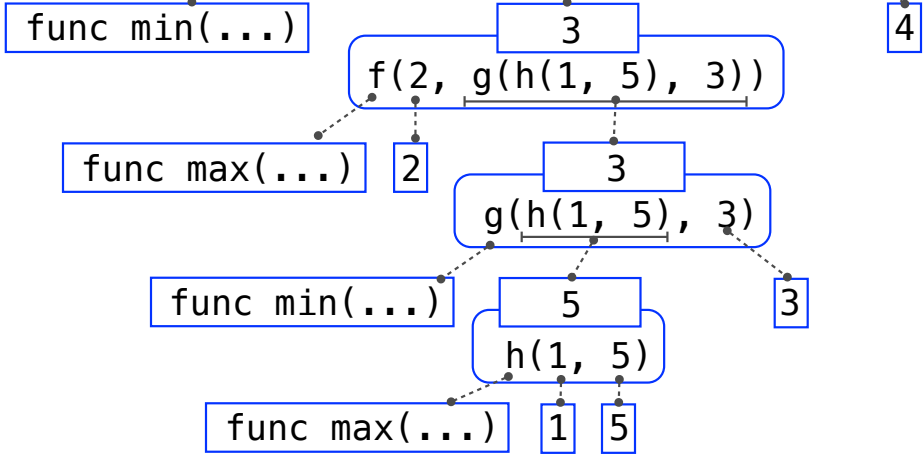
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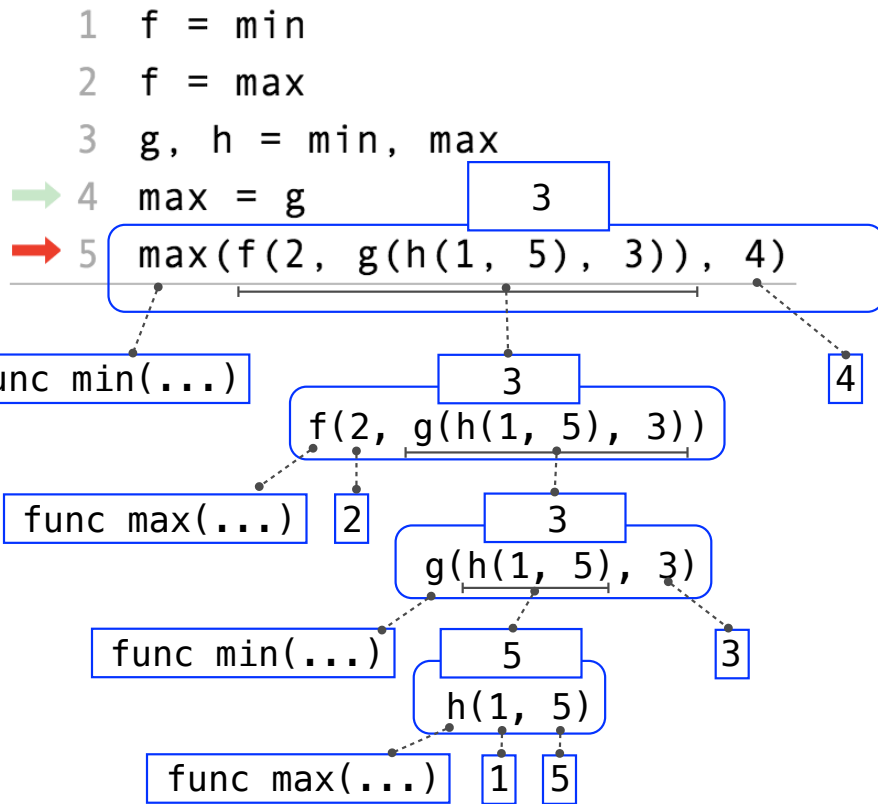
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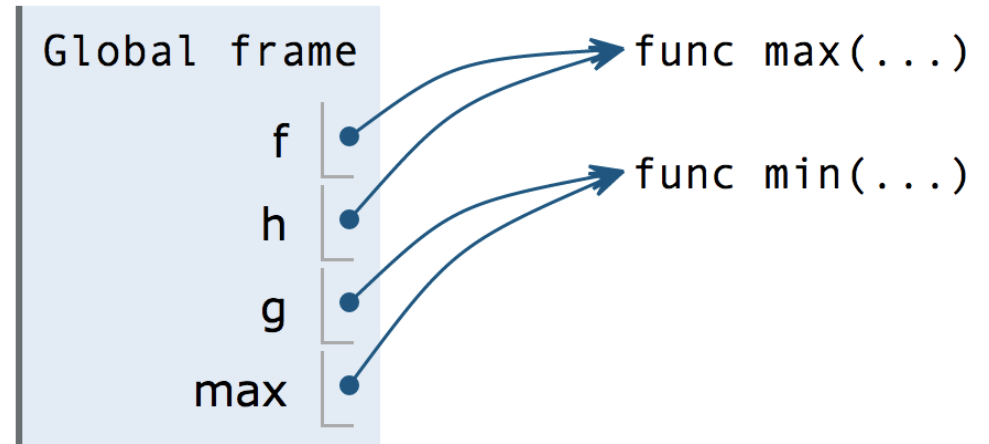
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Discussion Question 1 Solution



(Demo)



3

Interactive Diagram

Defining Functions

Defining Functions

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Function definition is a more powerful means of abstraction: binds names to expressions

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        return <return expression>
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Defining Functions

Assignment is a simple means of abstraction: binds names to values

Function definition is a more powerful means of abstraction: binds names to expressions

Function *signature* indicates how many arguments a function takes

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>>> def <name>(<formal parameters>):  
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Calling User-Defined Functions

Interactive Diagram

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Procedure for calling/applying user-defined functions (version 1):

[Interactive Diagram](#)

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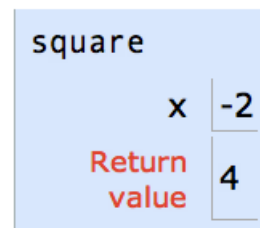
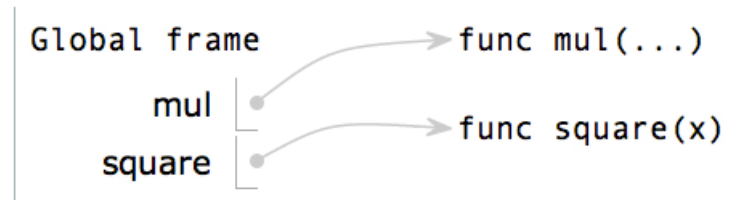
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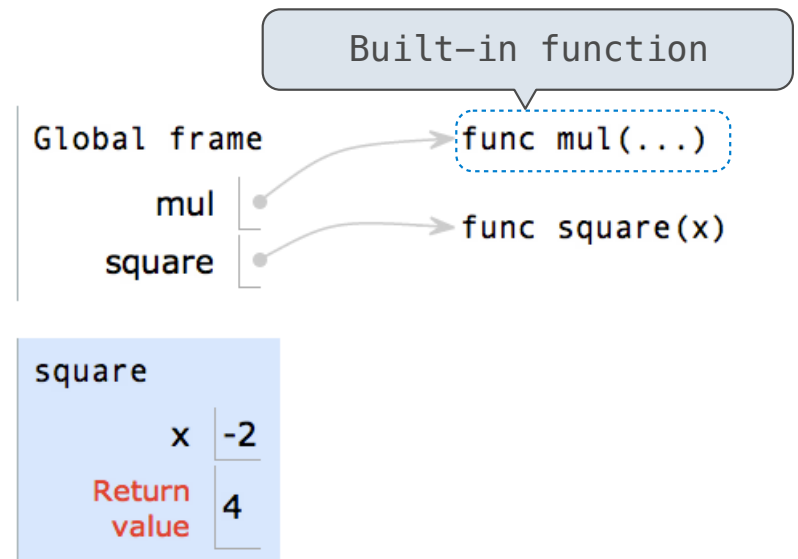
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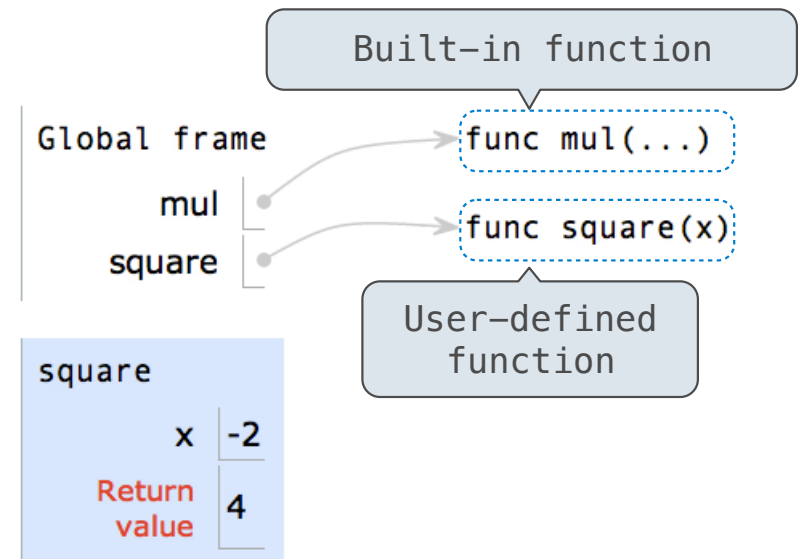
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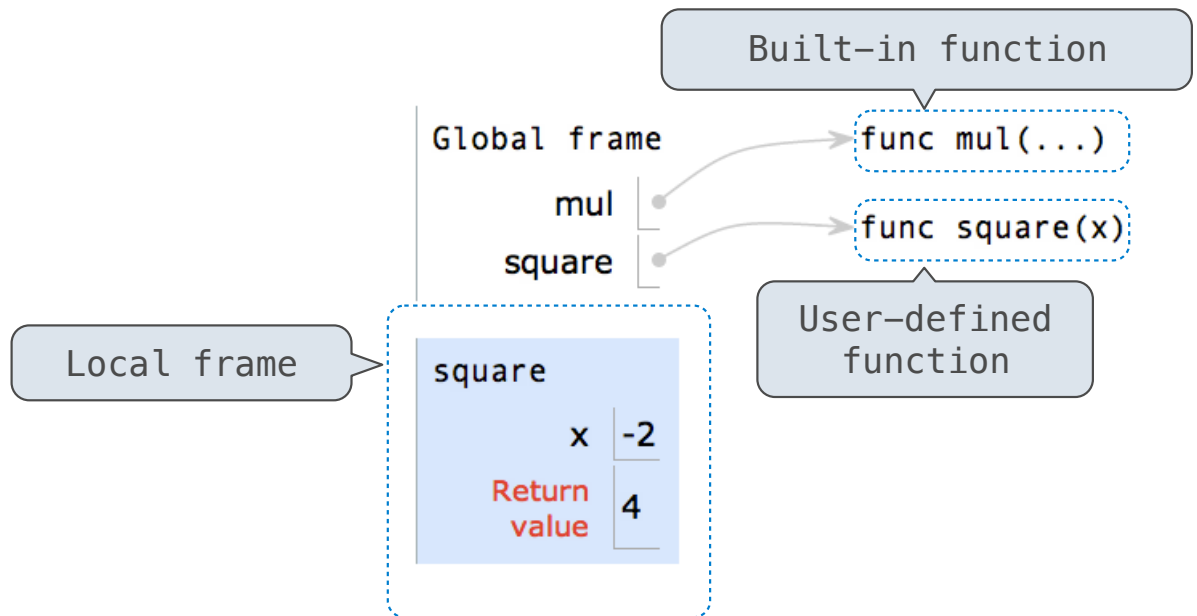
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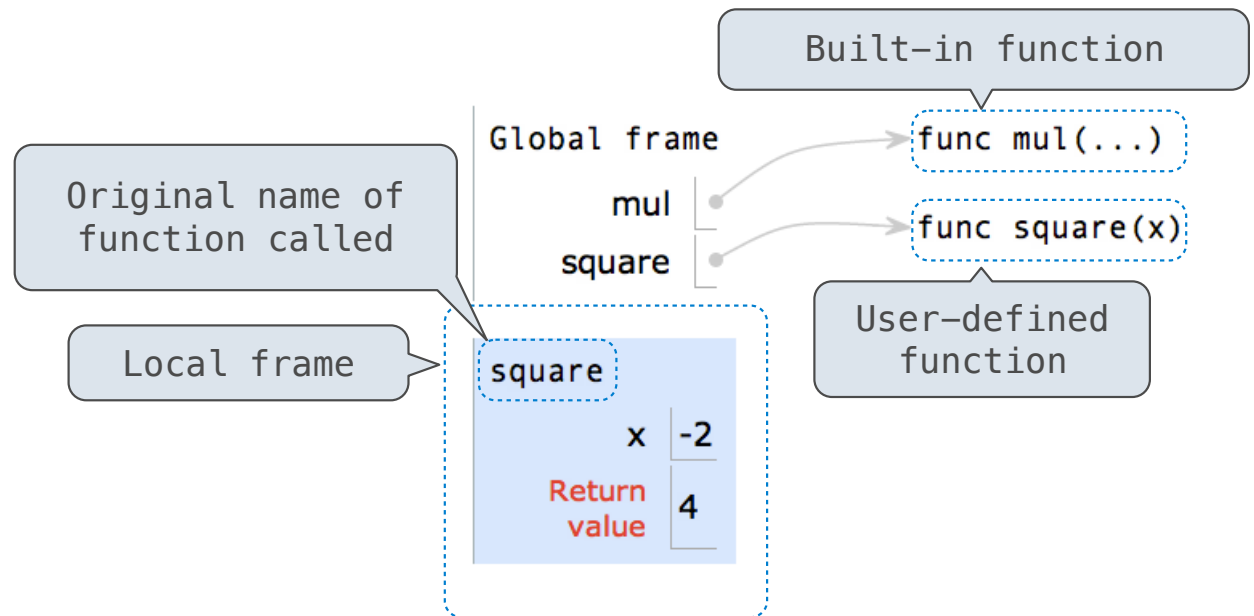
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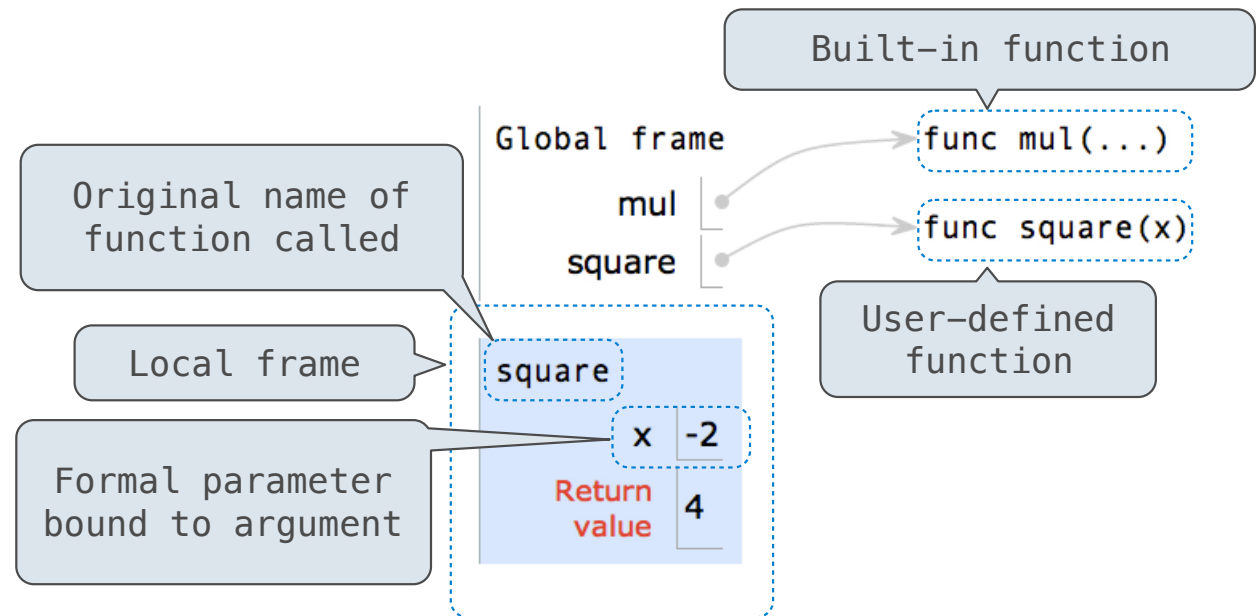
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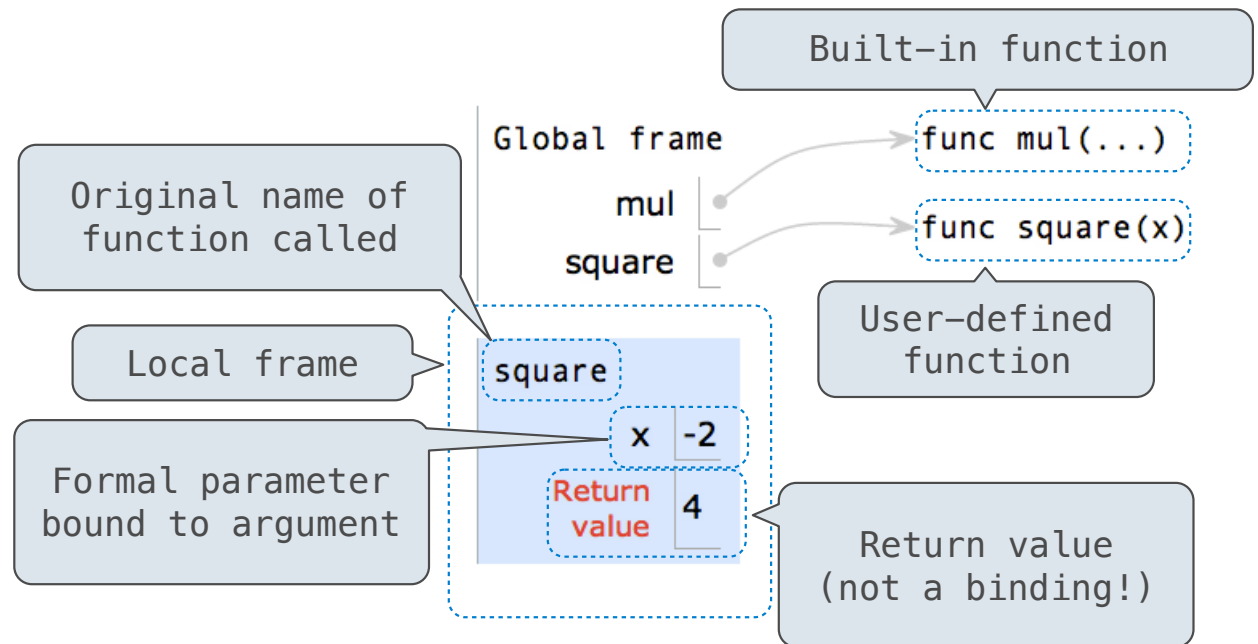
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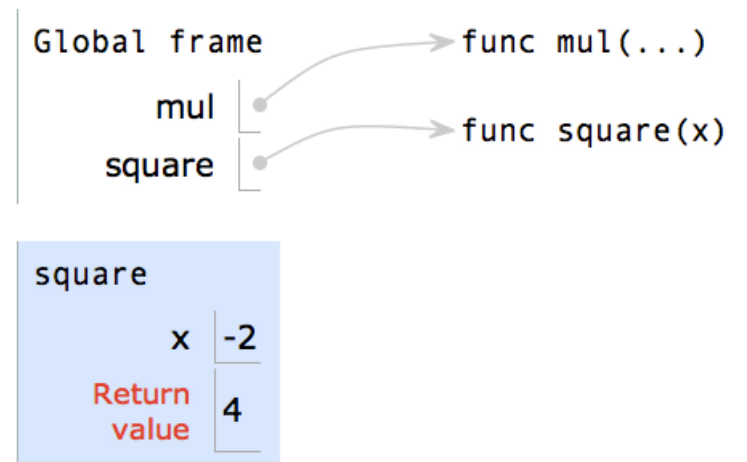
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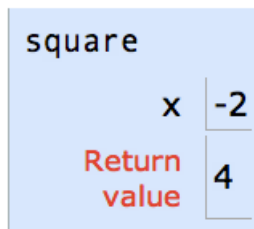
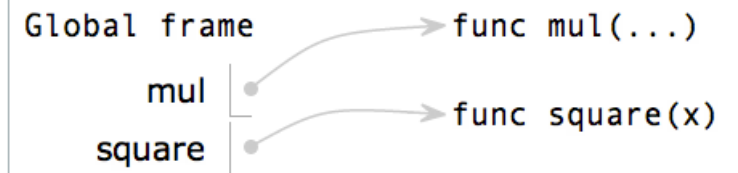
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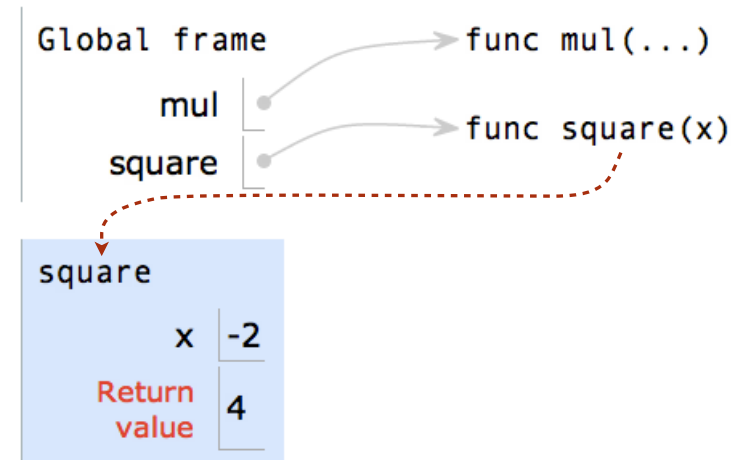
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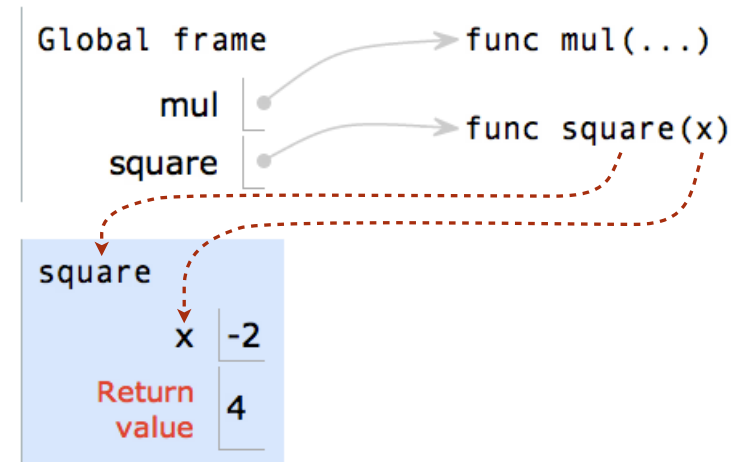
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(Demo)