Week 5

CS106R

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Objects

4 Basic Object Classes

string

Sequences of characters – text

Example

`"Hello, World!"`

int

Integers – whole numbers

Examples

`5` `3450` `0` `-17` `1`

float

Fractional numbers

Examples

`-5.0` `0.174` `3.14`

bool

True or false

Examples

`True` `False`

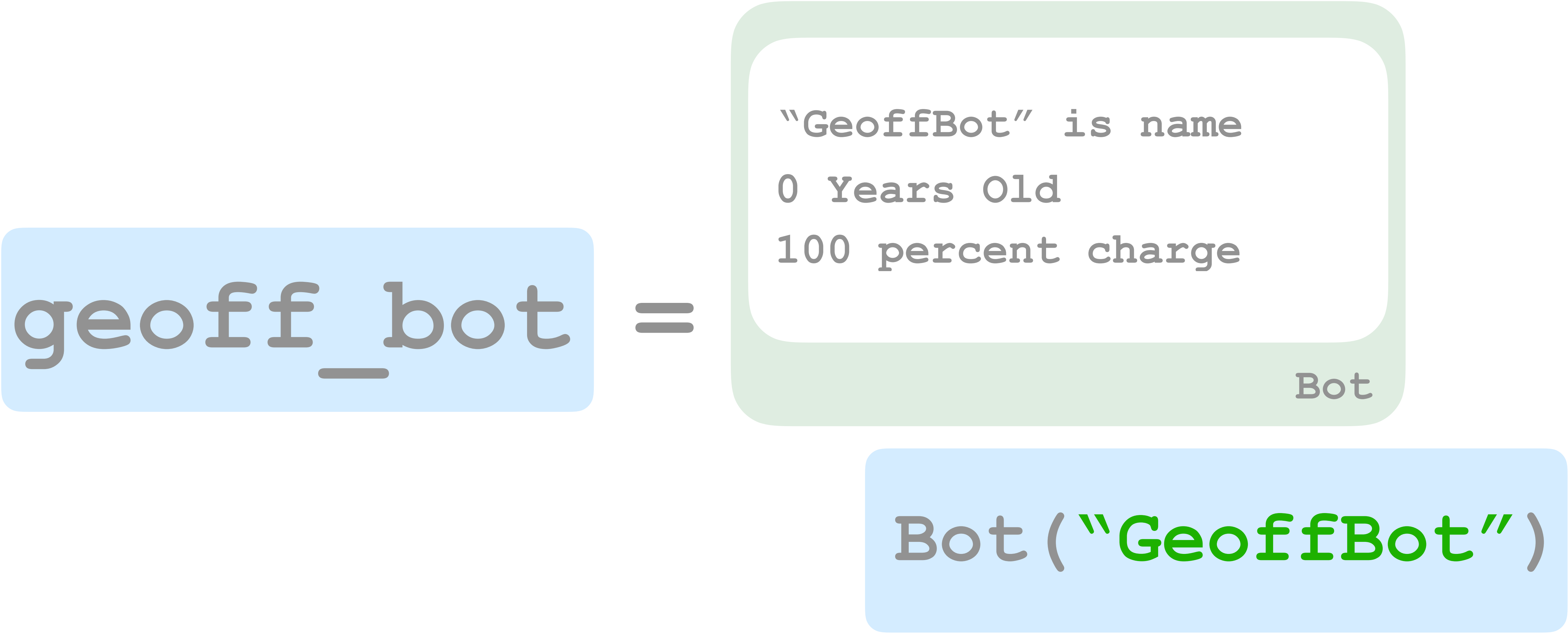
There are **more complex** objects out there…

Introducing the `Bot` class

Let’s make GeoffBot **3.0** …

```
Bot(“GeoffBot”)
```

```
geoff_bot = Bot(“GeoffBot”)
```



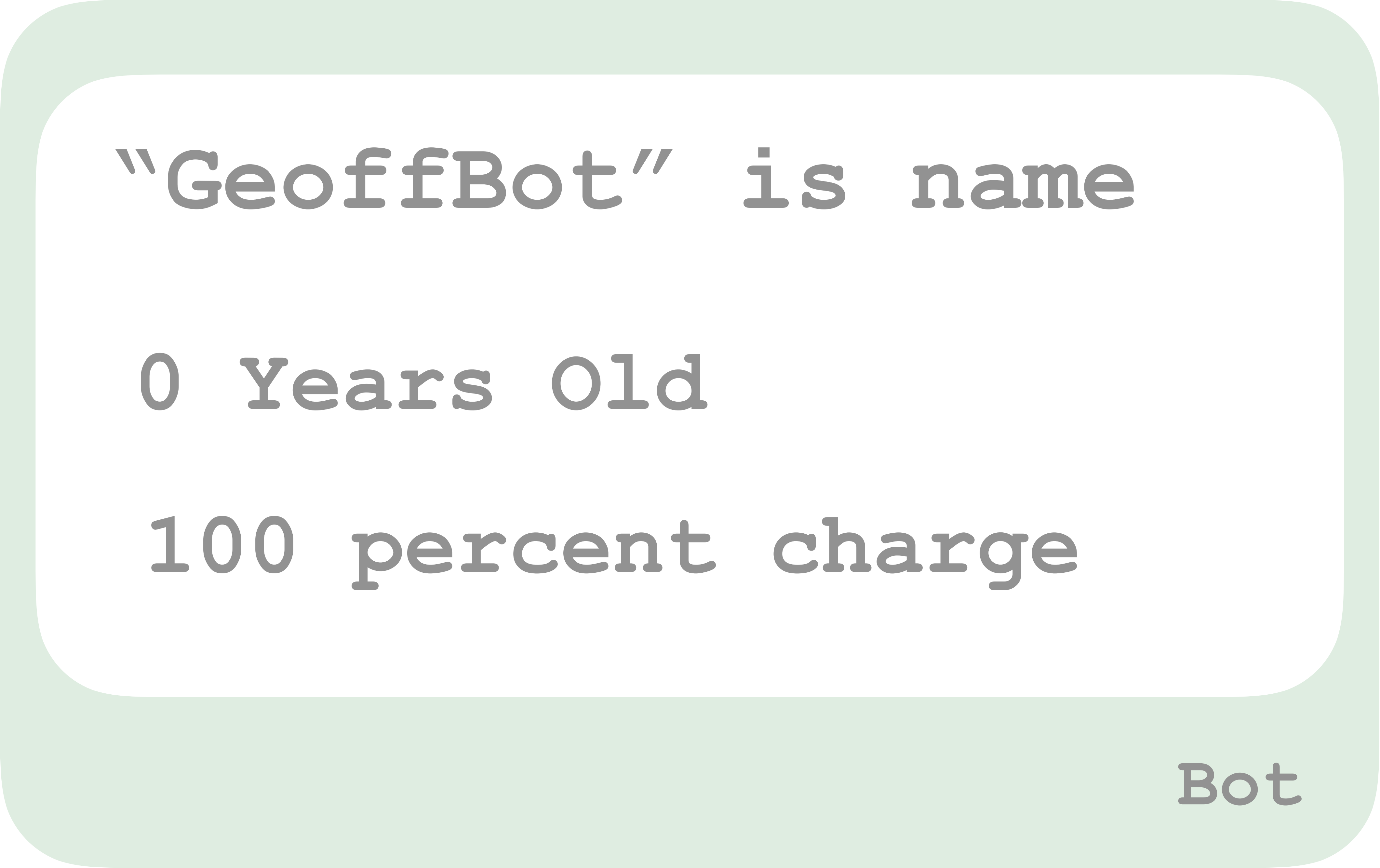
```
geoff_bot = Bot("GeoffBot")
```

"GeoffBot" is name

0 Years Old

100 percent charge

Bot

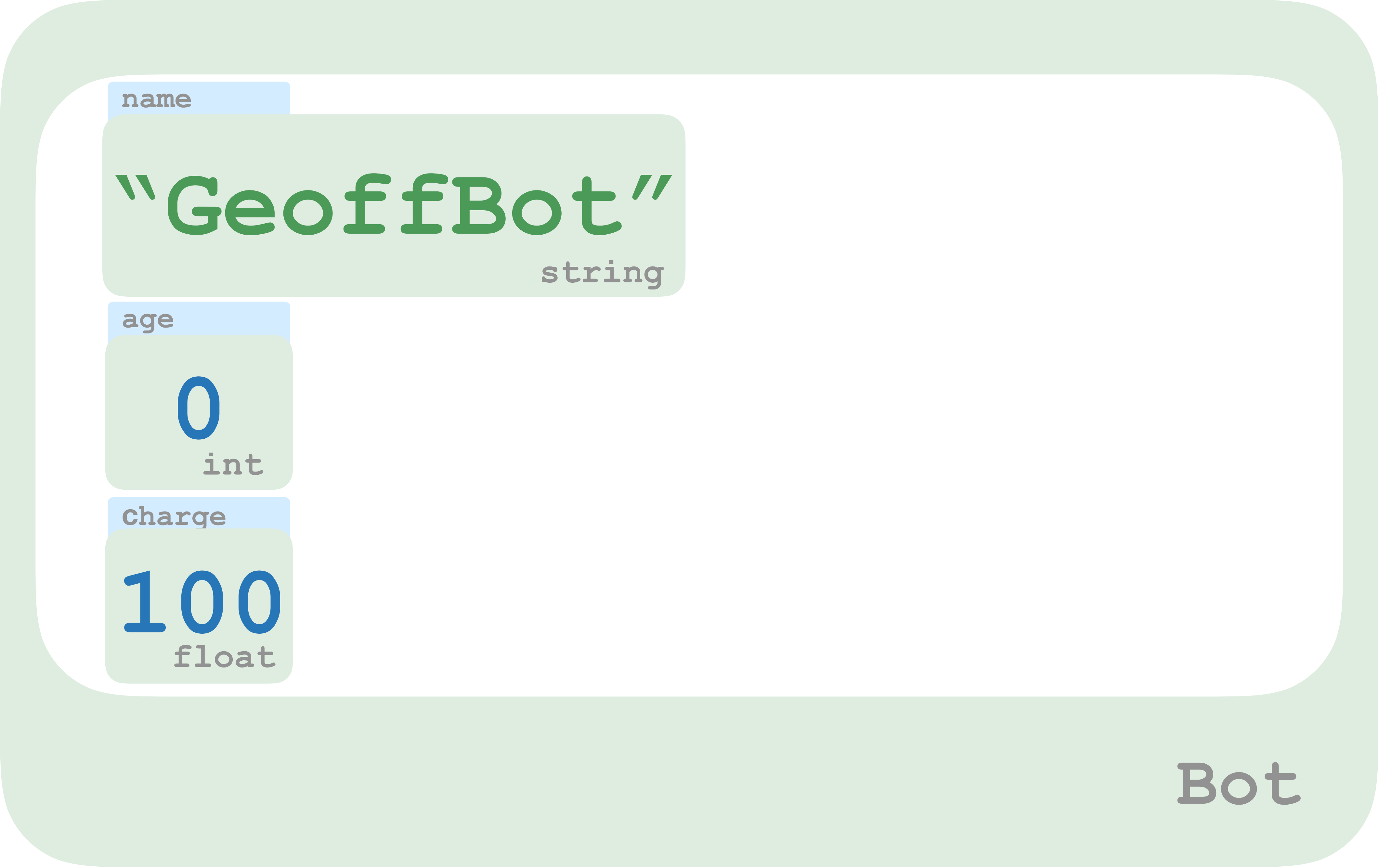


“GeoffBot” is name

0 Years Old

100 percent charge

Bot



name

“GeoffBot”

string

age

0

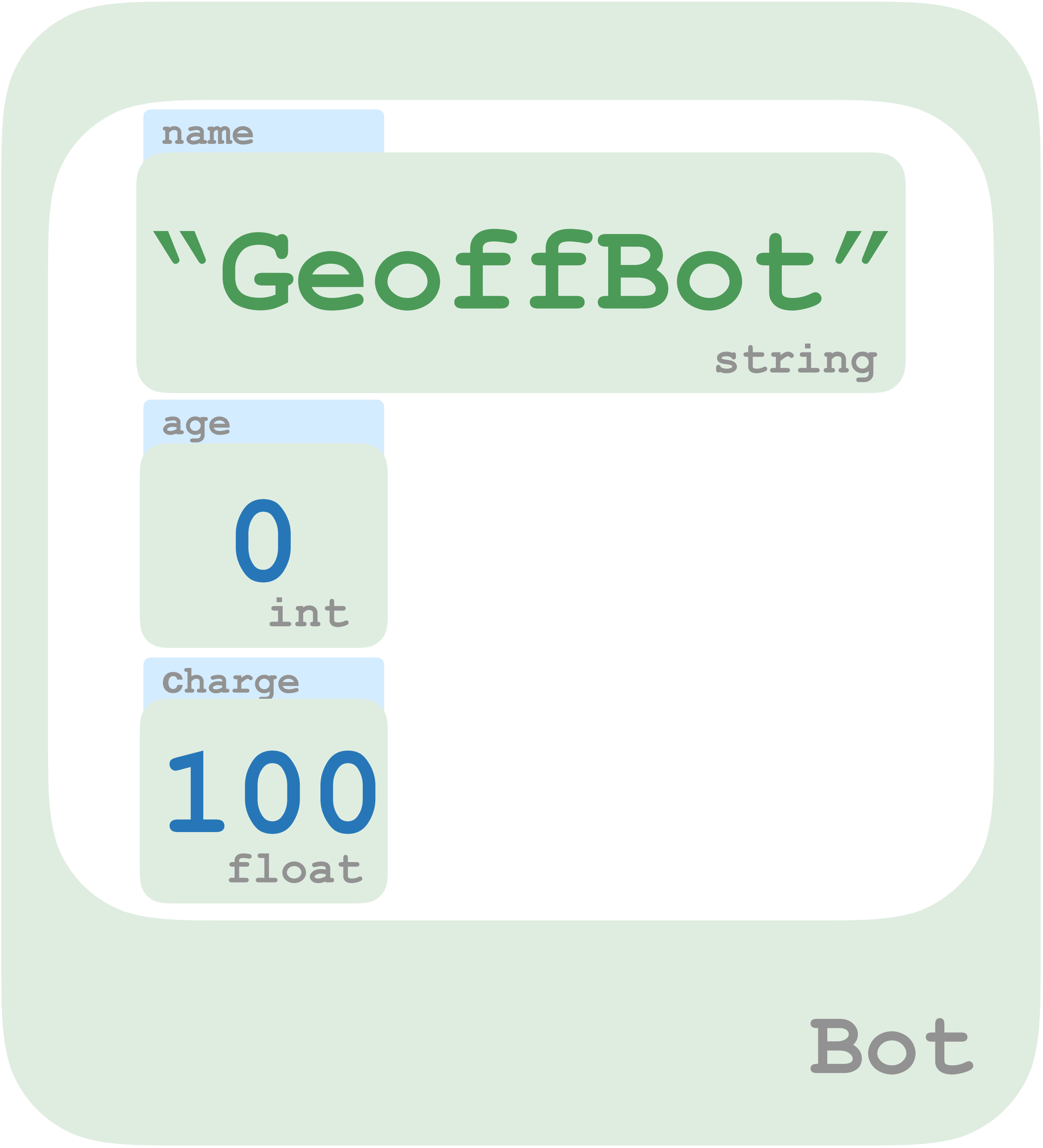
int

charge

100

float

Bot



name

“GeoffBot”

string

age

0

int

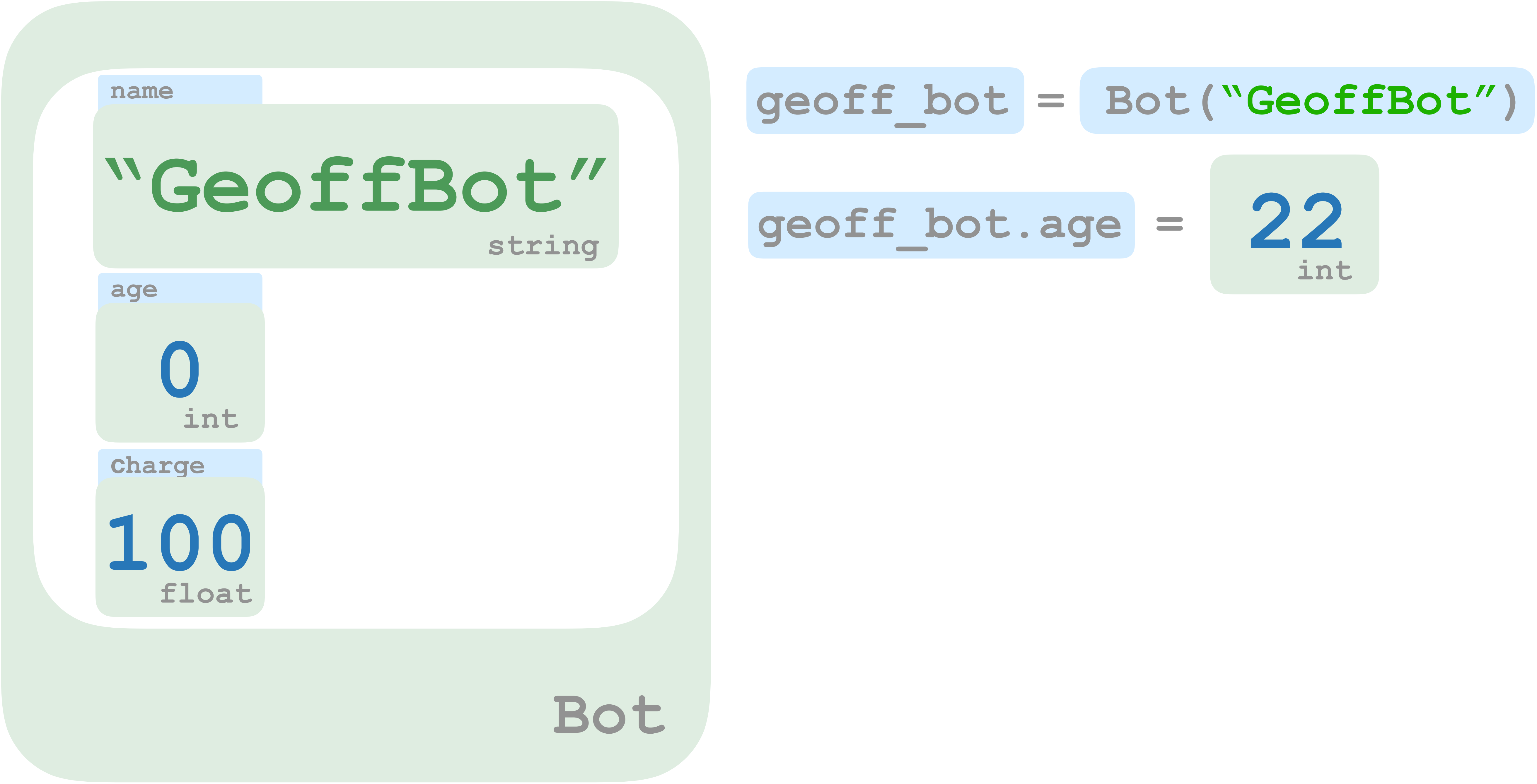
charge

100

float

Bot

```
geoff_bot = Bot(“GeoffBot”)
```



name

"GeoffBot"

string

age

0

int

charge

100

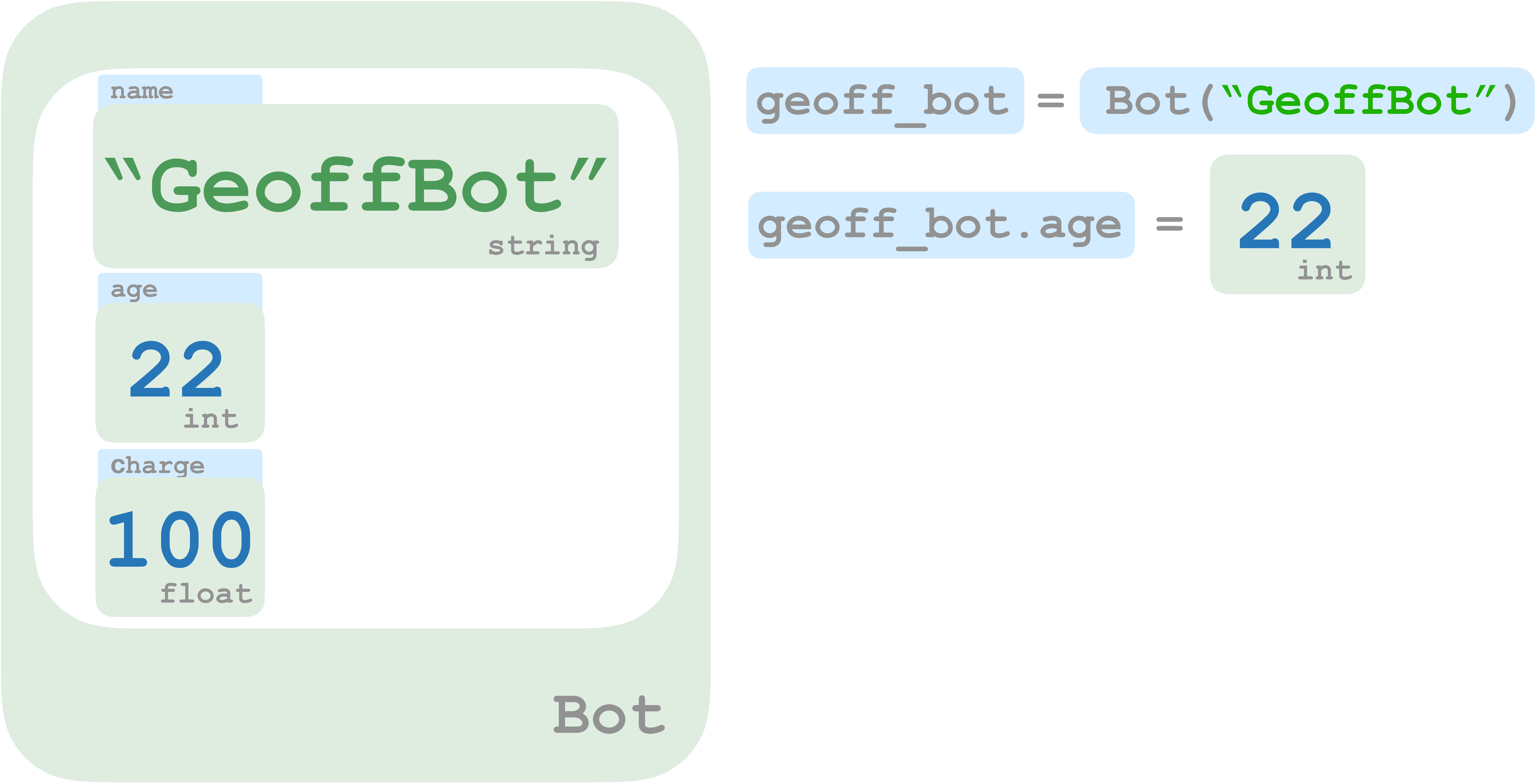
float

Bot

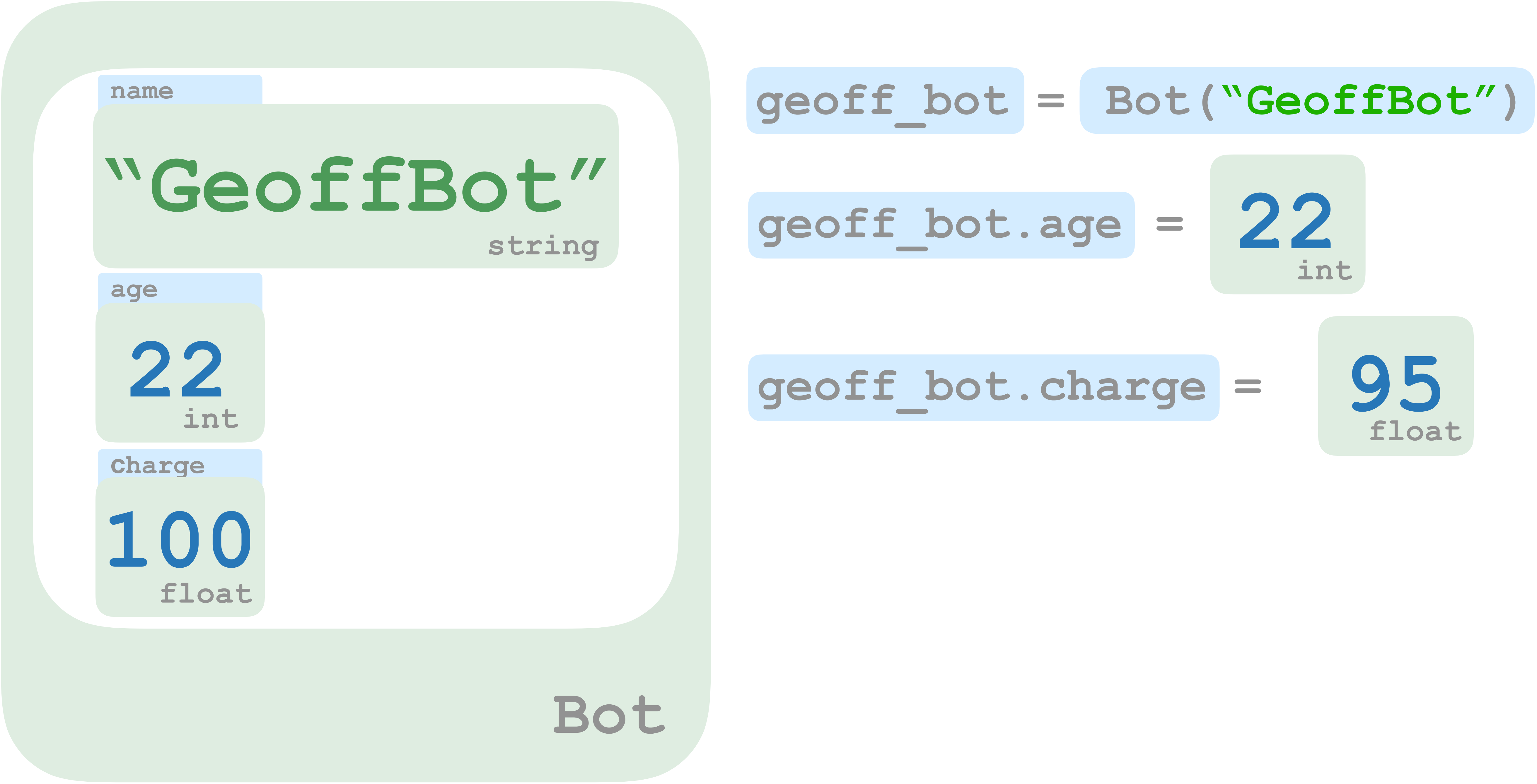
```
geoff_bot = Bot("GeoffBot")
geoff_bot.age = 22
```

22

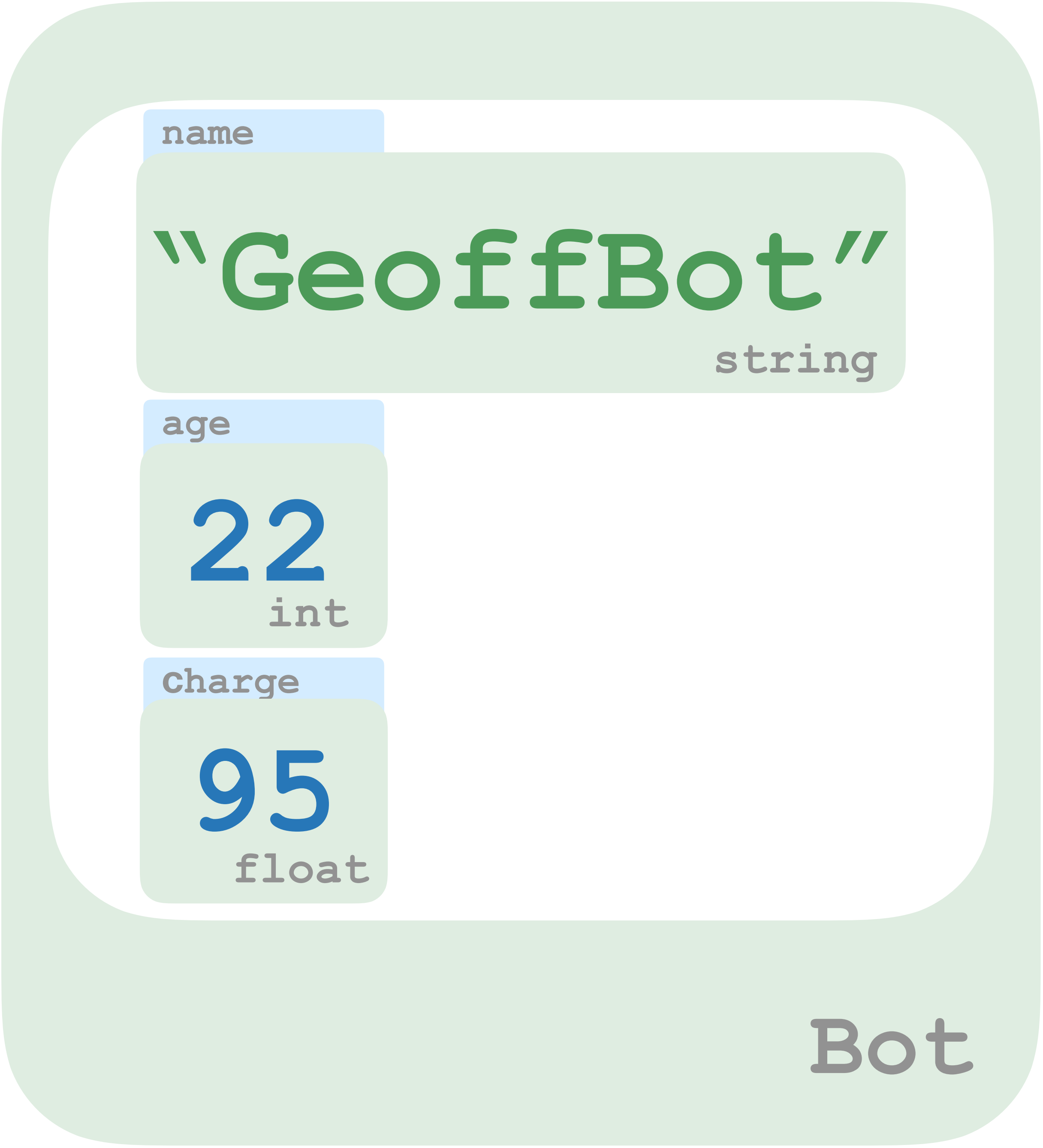
int



```
geoff_bot = Bot("GeoffBot")
geoff_bot.age = 22
```



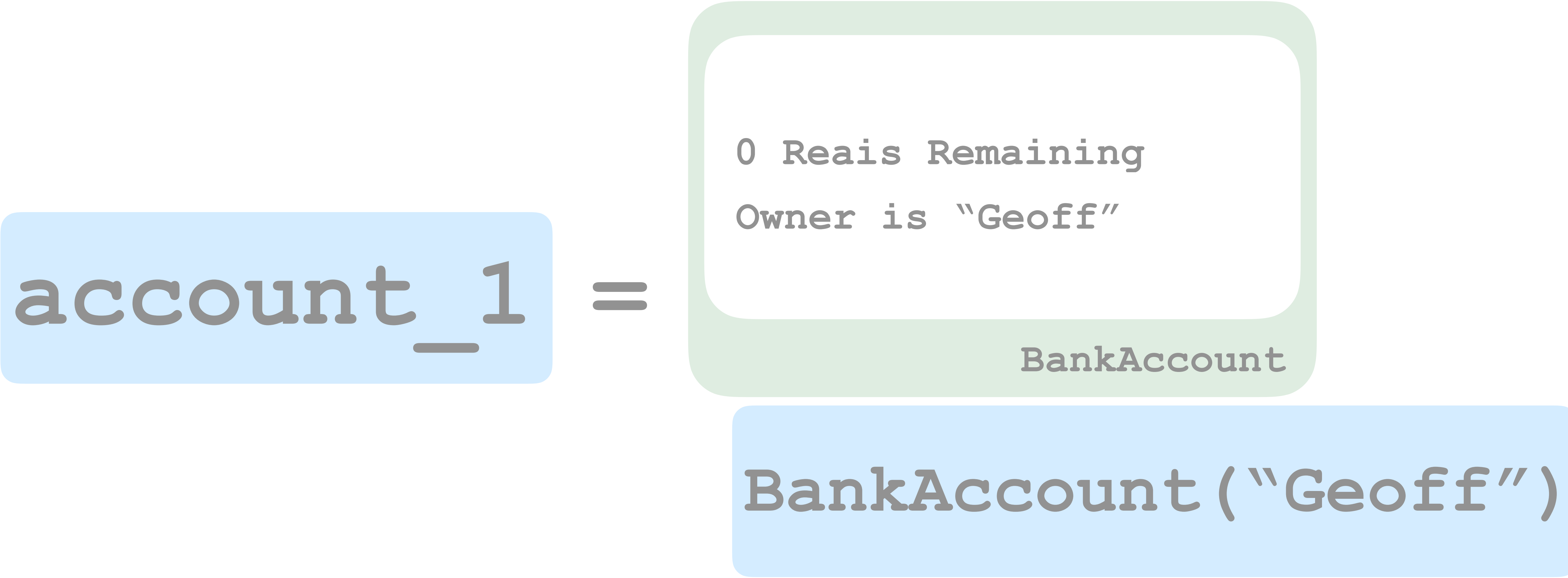
```
geoff_bot = Bot("GeoffBot")
geoff_bot.age = 22
geoff_bot.charge = 95
```



```
geoff_bot = Bot("GeoffBot")

geoff_bot.age = 22
                int

geoff_bot.charge = 95
                   float
```

Introducing the `BankAccount` class

```
account_1 = BankAccount(“Geoff”)
```



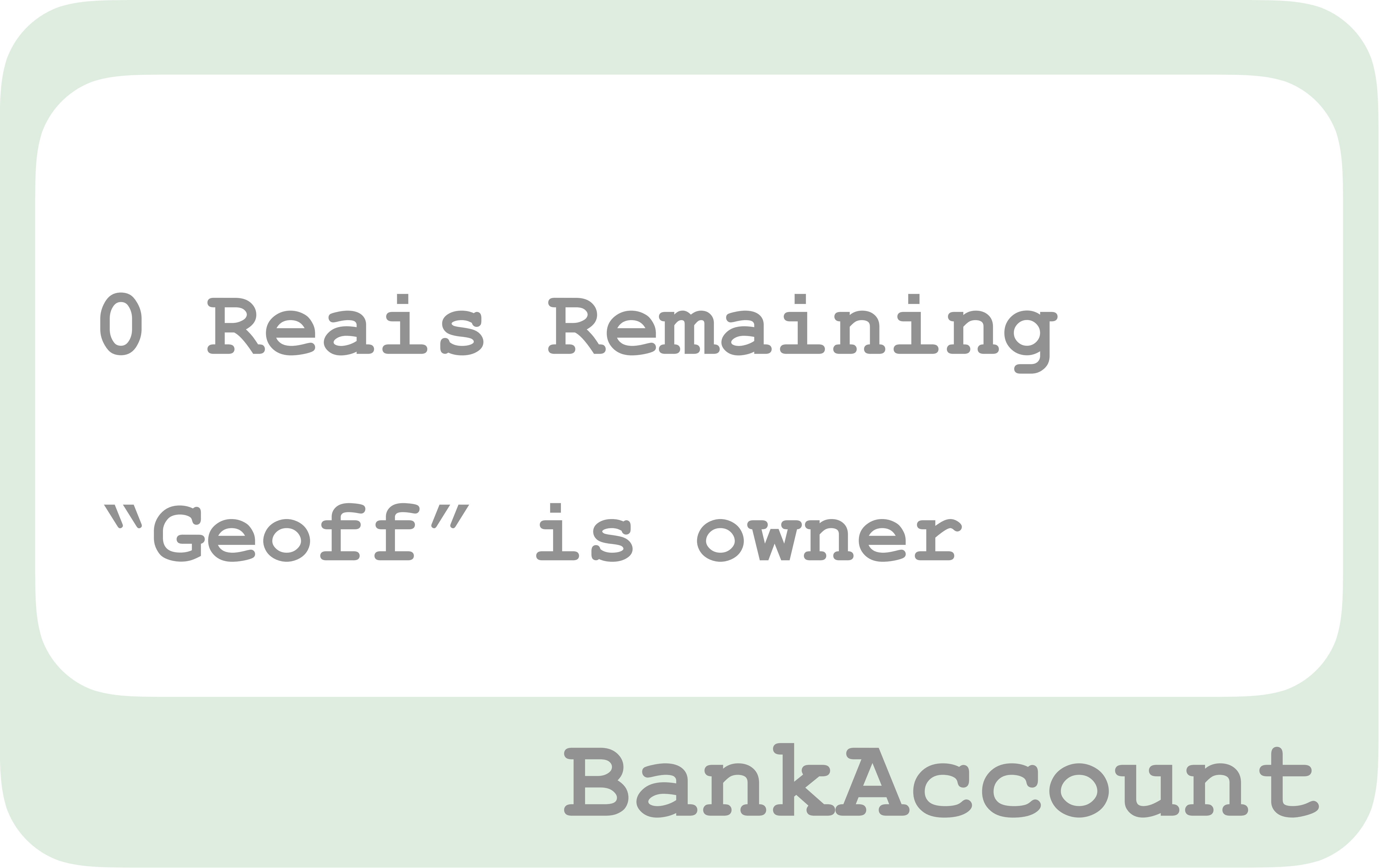
account_1 =

0 Reais Remaining

Owner is “Geoff”

BankAccount

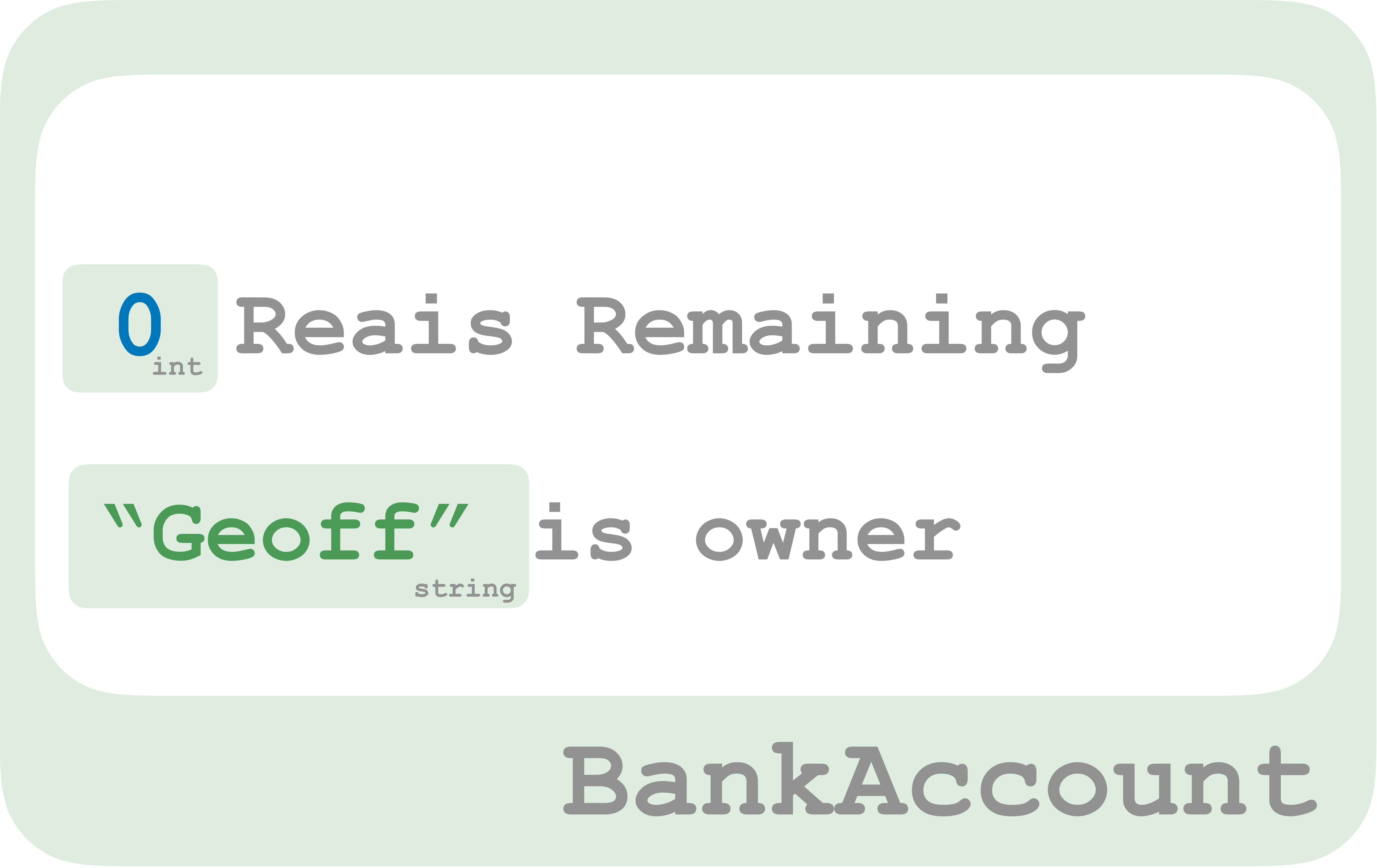
BankAccount(“Geoff”)



0 Reais Remaining

“Geoff” is owner

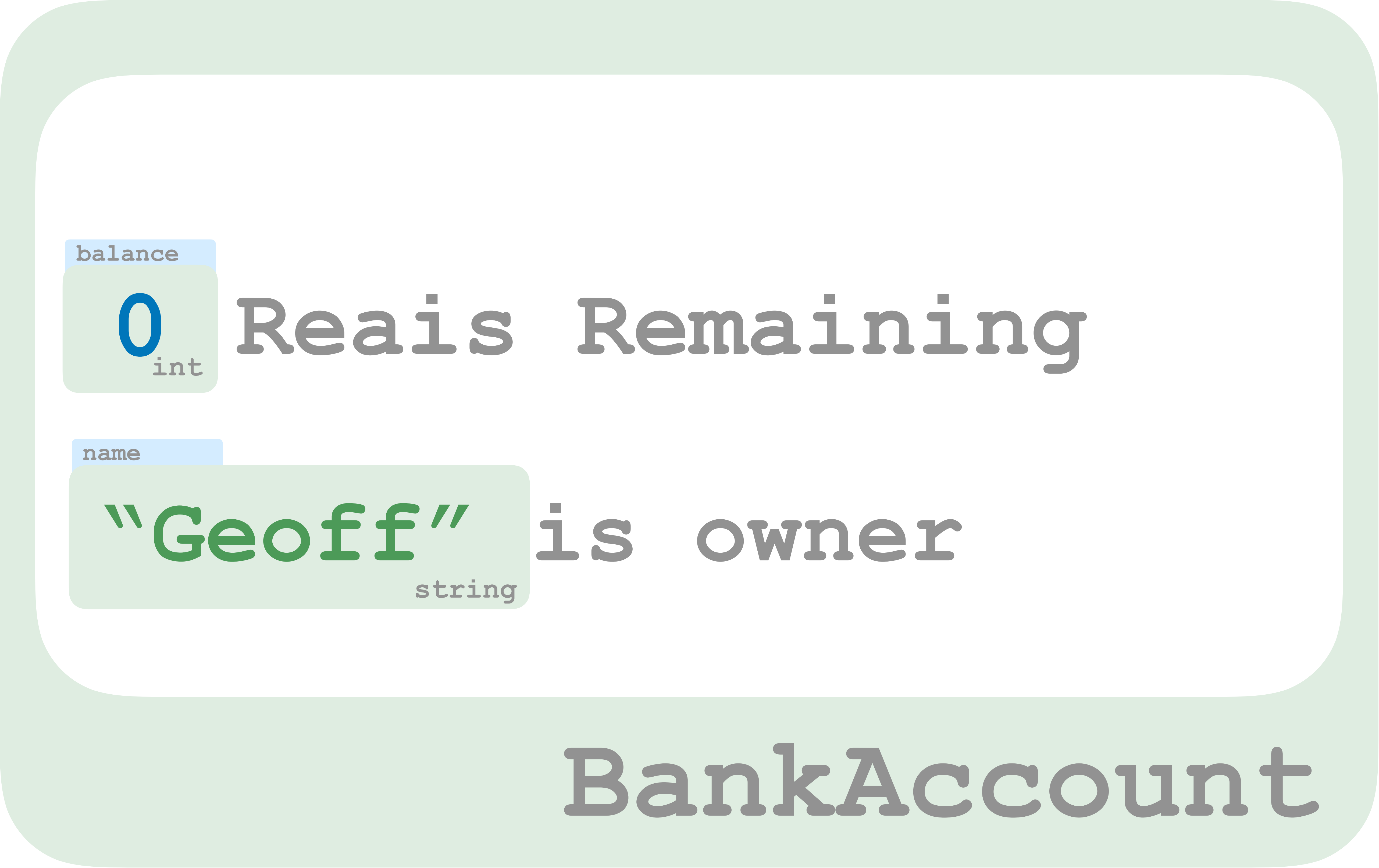
BankAccount



0 int Reais Remaining

“Geoff” string is owner

BankAccount



balance

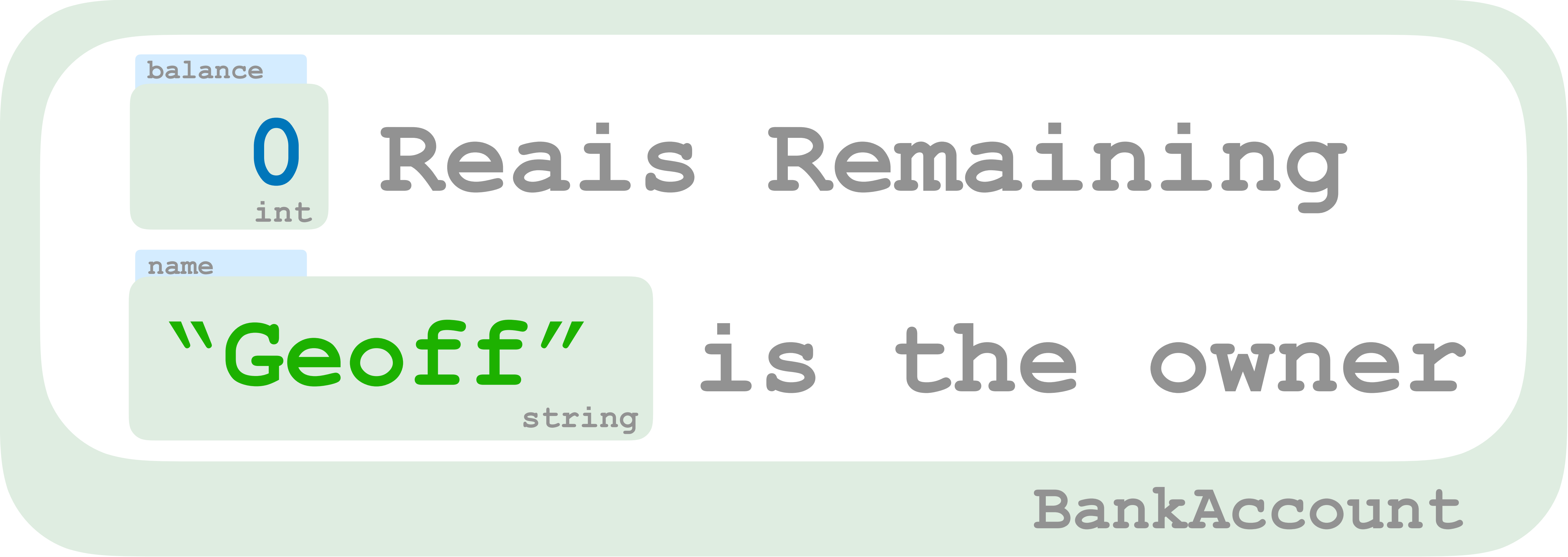
0 int Reais Remaining

name

"Geoff" string is owner

BankAccount

```
account_1 = BankAccount(“Geoff”)
```



balance

0 Reais Remaining

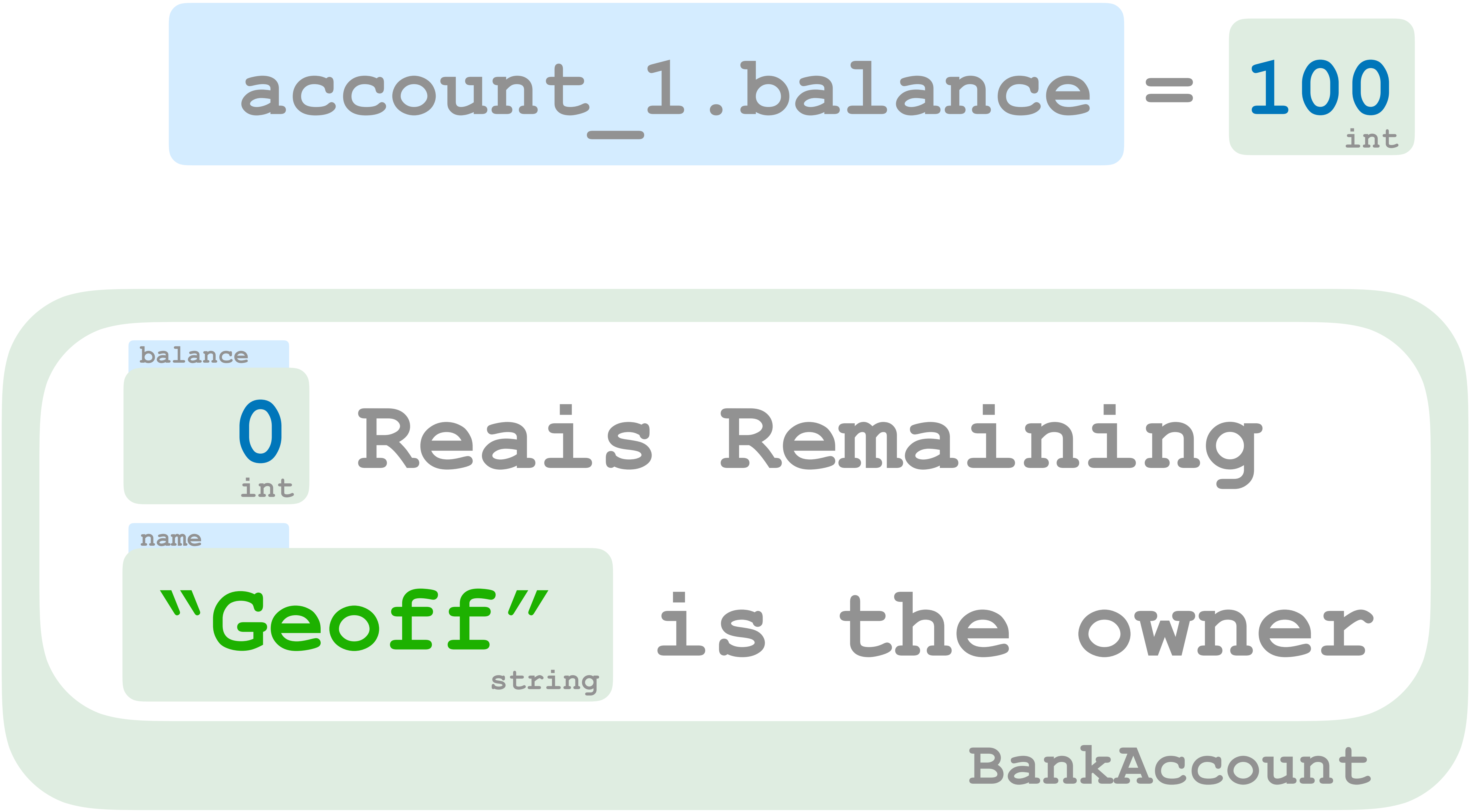
int

name

“Geoff” is the owner

string

BankAccount



account_1.balance = 100

int

balance

0

int

Reais Remaining

name

“Geoff”

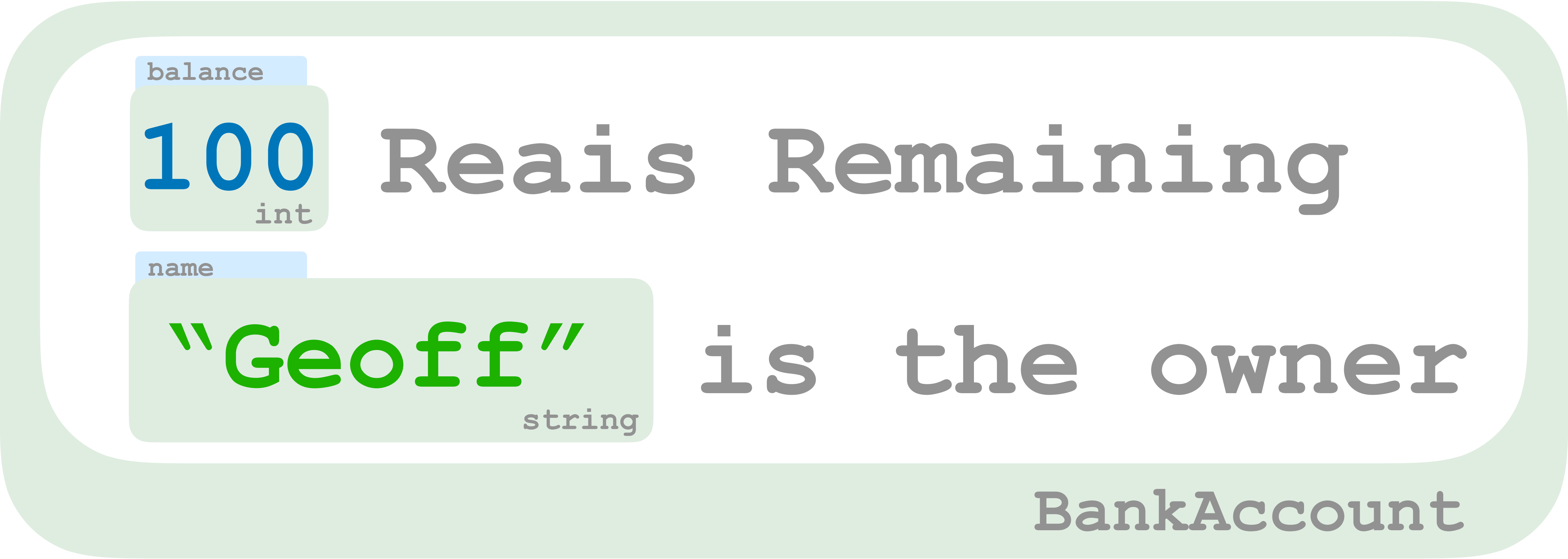
string

is the owner

BankAccount

```
account_1.balance = 100
```

int



balance

100 Reais Remaining

int

name

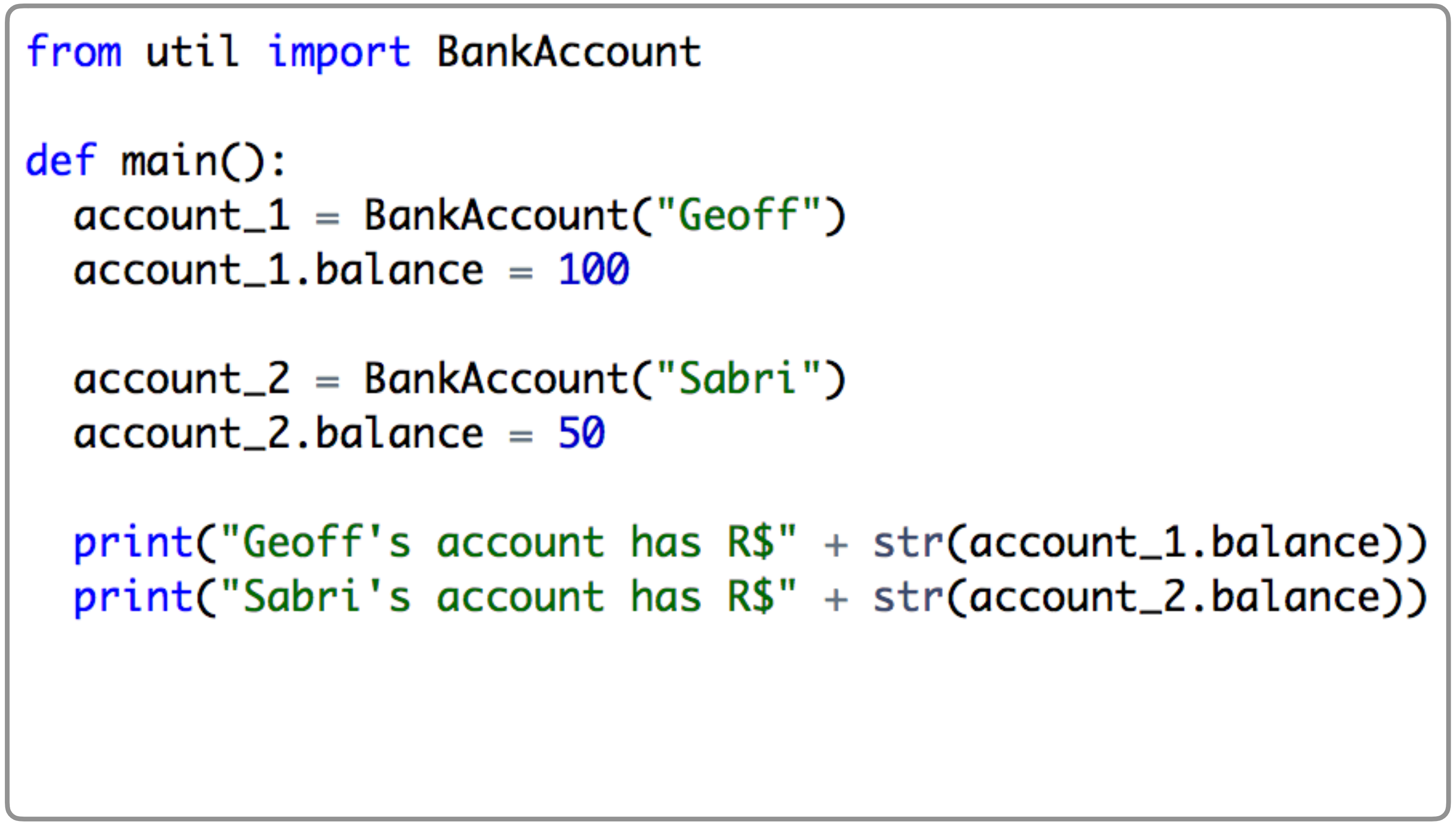
"Geoff" is the owner

string

BankAccount

Objects

Code

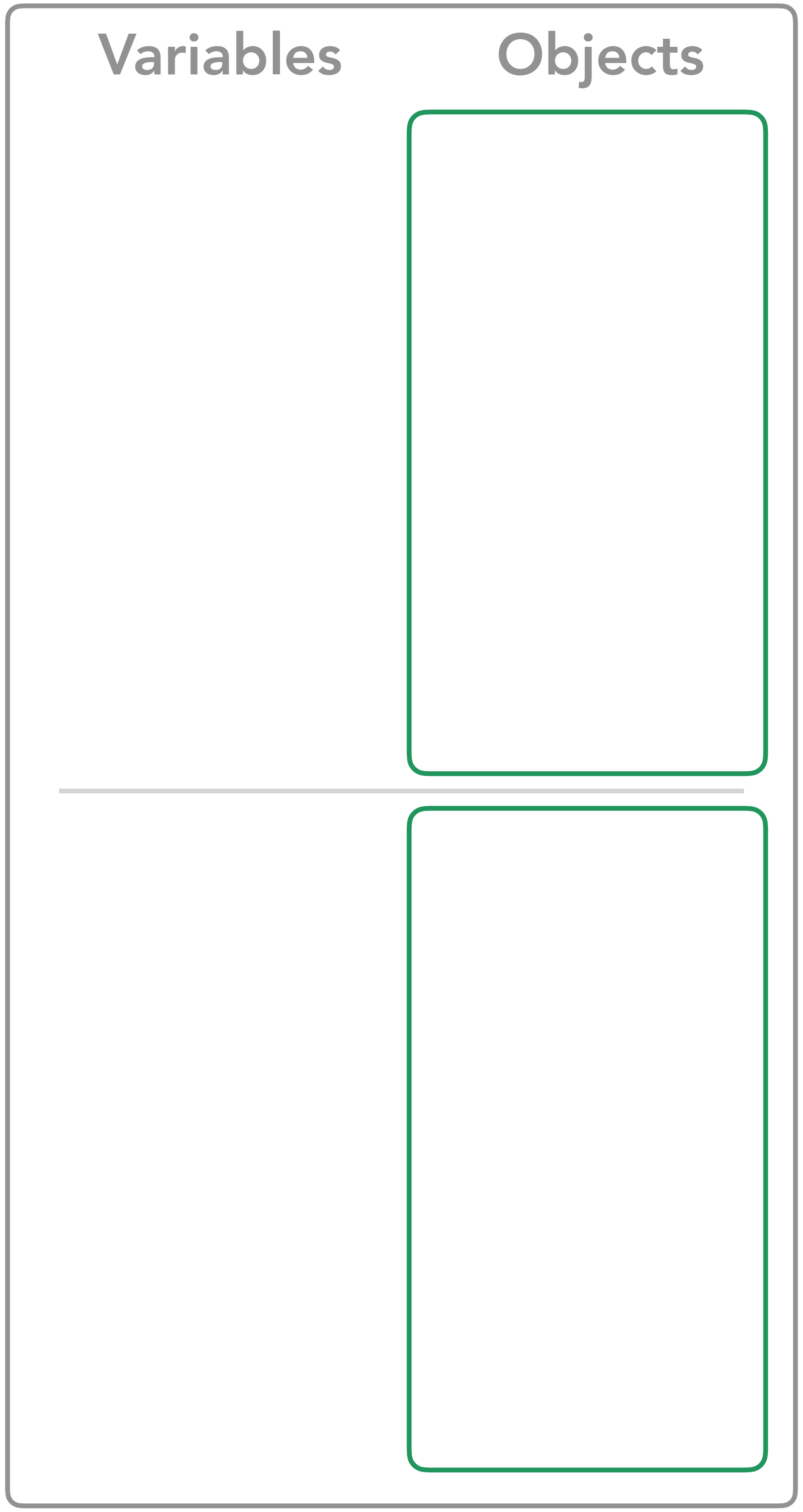


```
from util import BankAccount

def main():
  account_1 = BankAccount("Geoff")
  account_1.balance = 100

  account_2 = BankAccount("Sabri")
  account_2.balance = 50

  print("Geoff's account has R$" + str(account_1.balance))
  print("Sabri's account has R$" + str(account_2.balance))
```

Output

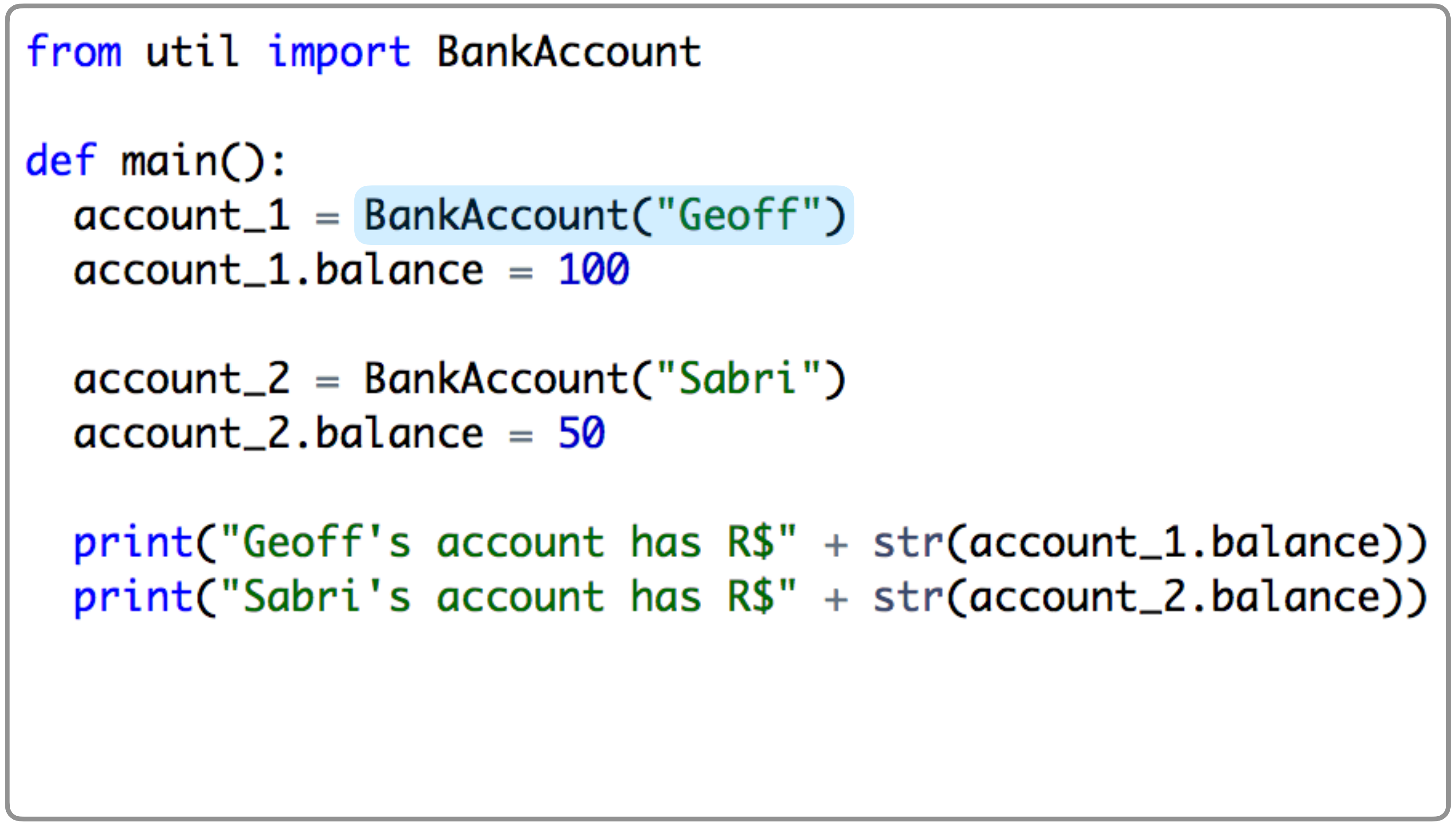
```
>
```

Memory



Scope

Code

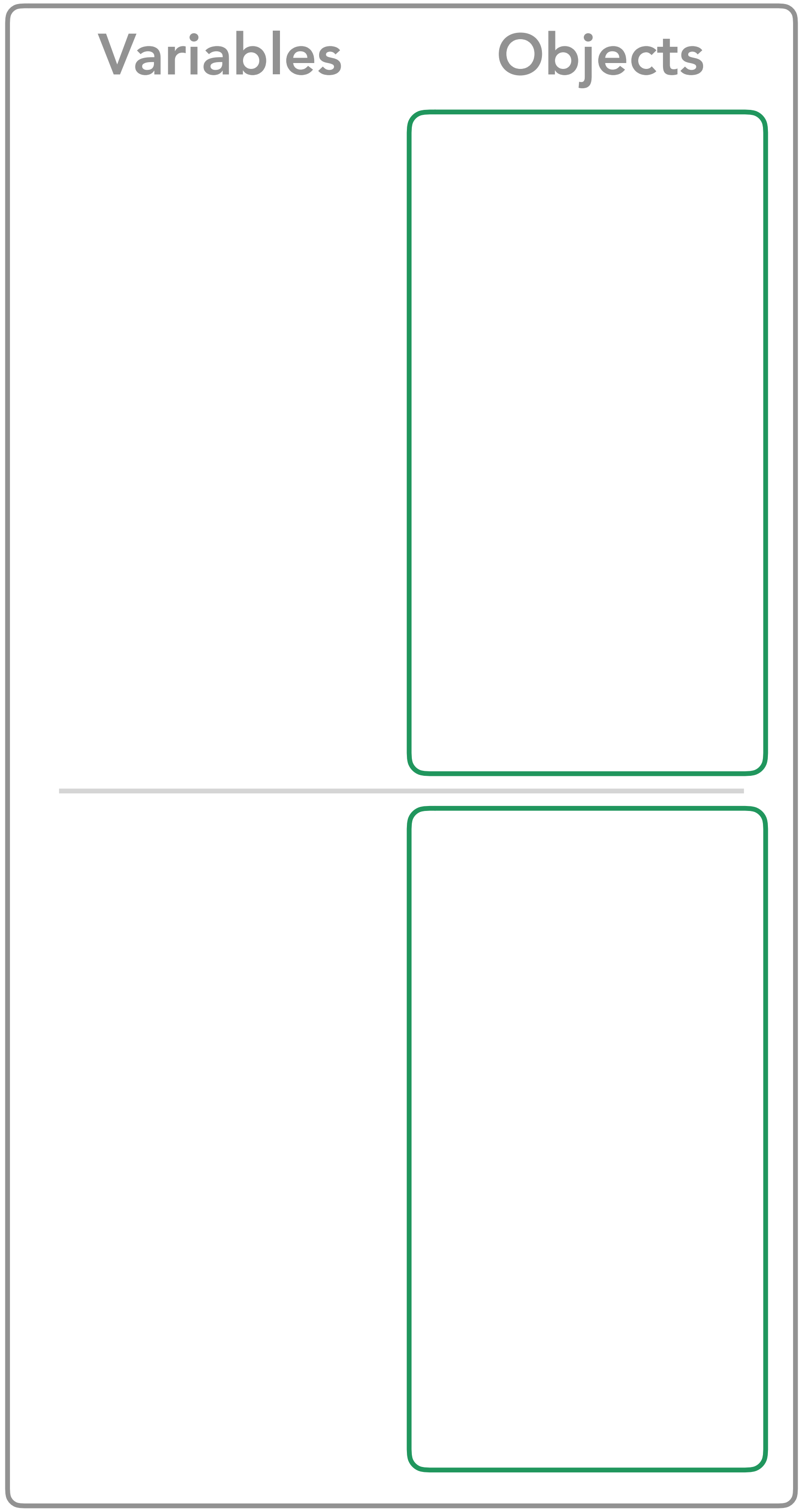


```
from util import BankAccount

def main():
  account_1 = BankAccount("Geoff")
  account_1.balance = 100

  account_2 = BankAccount("Sabri")
  account_2.balance = 50

  print("Geoff's account has R$" + str(account_1.balance))
  print("Sabri's account has R$" + str(account_2.balance))
```

Output

```
>
```

Memory



Variables

Objects

Scope

Code

```python
from util import BankAccount

def main():
  account_1 = BankAccount("Geoff")
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  account_2 = BankAccount("Sabri")
  account_2.balance = 50

  print("Geoff's account has R$" + str(account_1.balance))
  print("Sabri's account has R$" + str(account_2.balance))
```
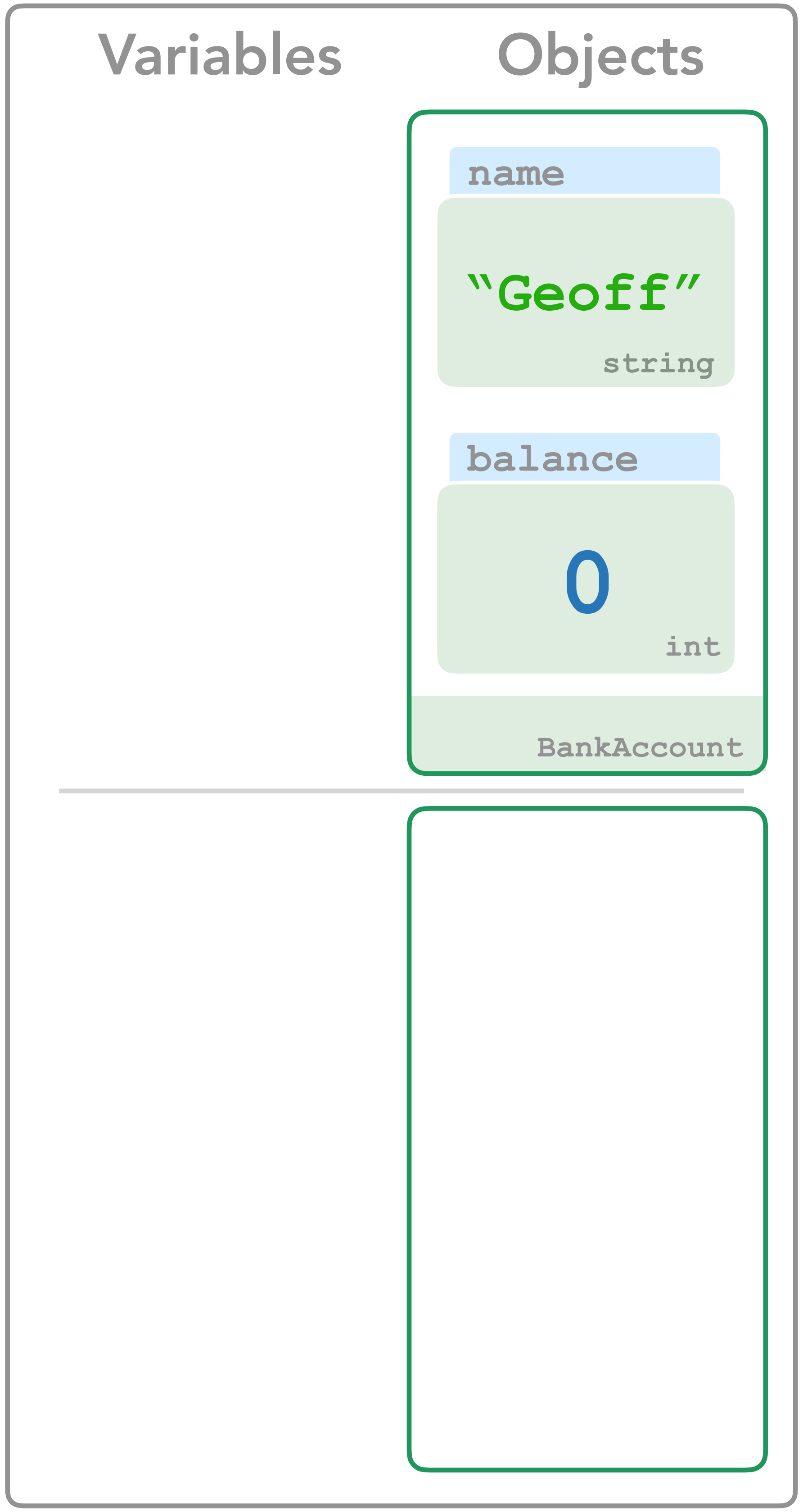

Output

```
>
```

Memory



Scope

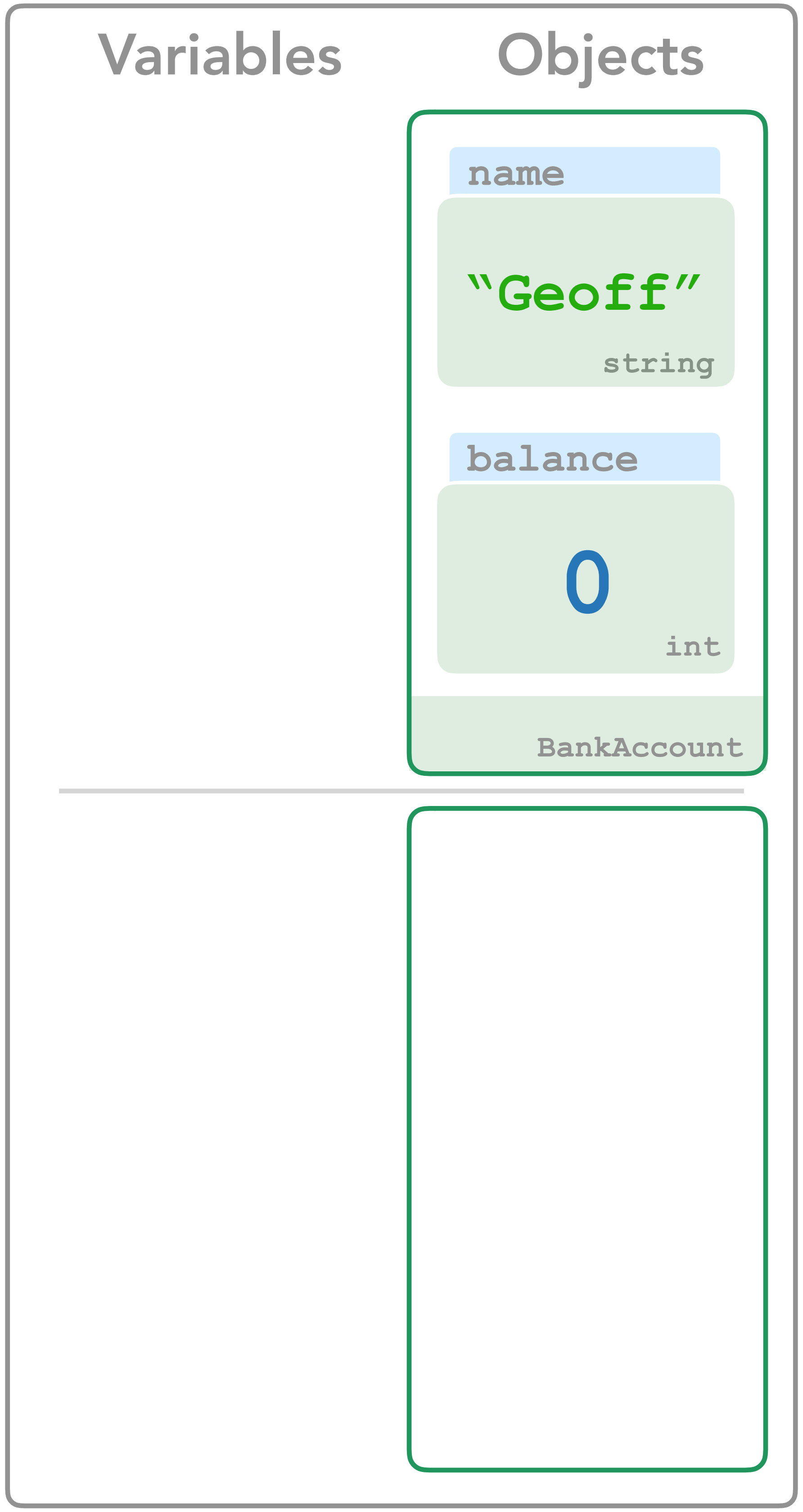
Code

```python
from util import BankAccount

def main():
  account_1 = BankAccount("Geoff")
  account_1.balance = 100

  account_2 = BankAccount("Sabri")
  account_2.balance = 50

  print("Geoff's account has R$" + str(account_1.balance))
  print("Sabri's account has R$" + str(account_2.balance))
```

Output

```
>
```

Memory



Variables

Objects

name

"Geoff"

string

balance

0

int

BankAccount

Scope

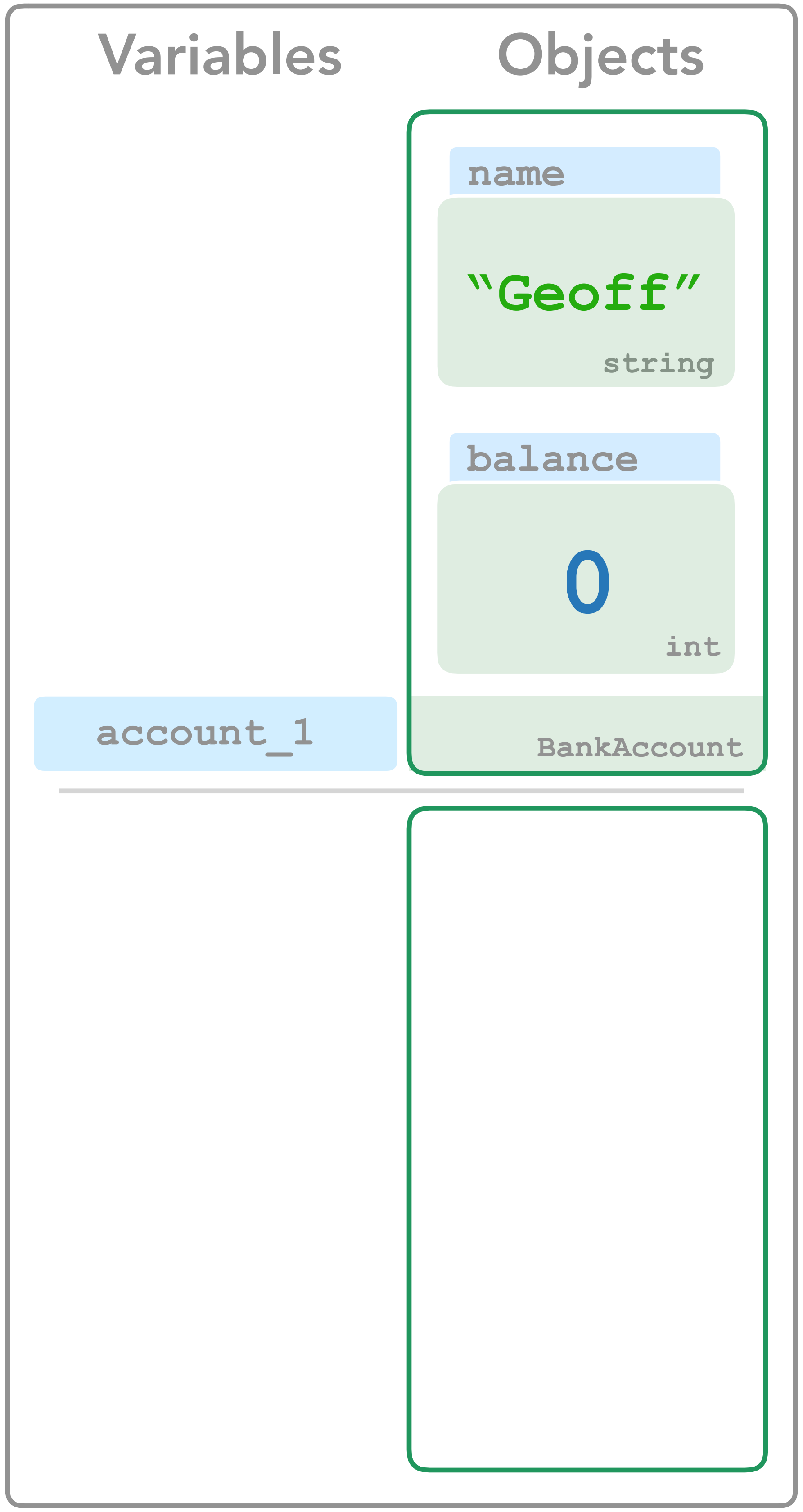
Code

```python
from util import BankAccount

def main():
  account_1 = BankAccount("Geoff")
  account_1.balance = 100

  account_2 = BankAccount("Sabri")
  account_2.balance = 50

  print("Geoff's account has R$" + str(account_1.balance))
  print("Sabri's account has R$" + str(account_2.balance))
```

Output

```
>
```

Memory



Scope

Code

```python
from util import BankAccount

def main():
  account_1 = BankAccount("Geoff")
  account_1.balance = 100

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  print("Geoff's account has R$" + str(account_1.balance))
  print("Sabri's account has R$" + str(account_2.balance))
```
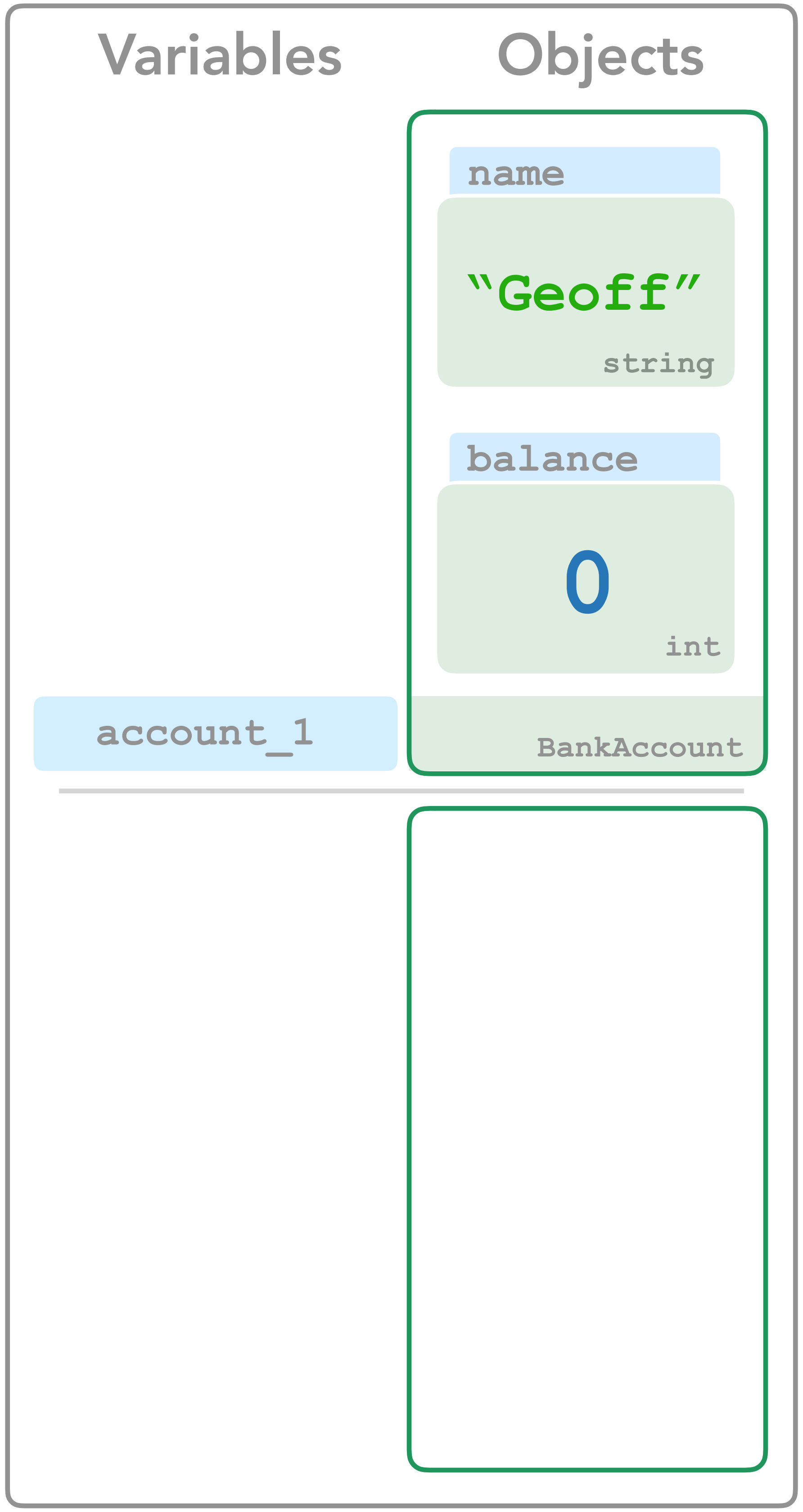

Output

```
>
```

Memory



Variables

Objects

name

"Geoff"

string

balance

0

int

account_1

BankAccount

Scope

Code

```python
from util import BankAccount

def main():
  account_1 = BankAccount("Geoff")
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  print("Geoff's account has R$" + str(account_1.balance))
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```
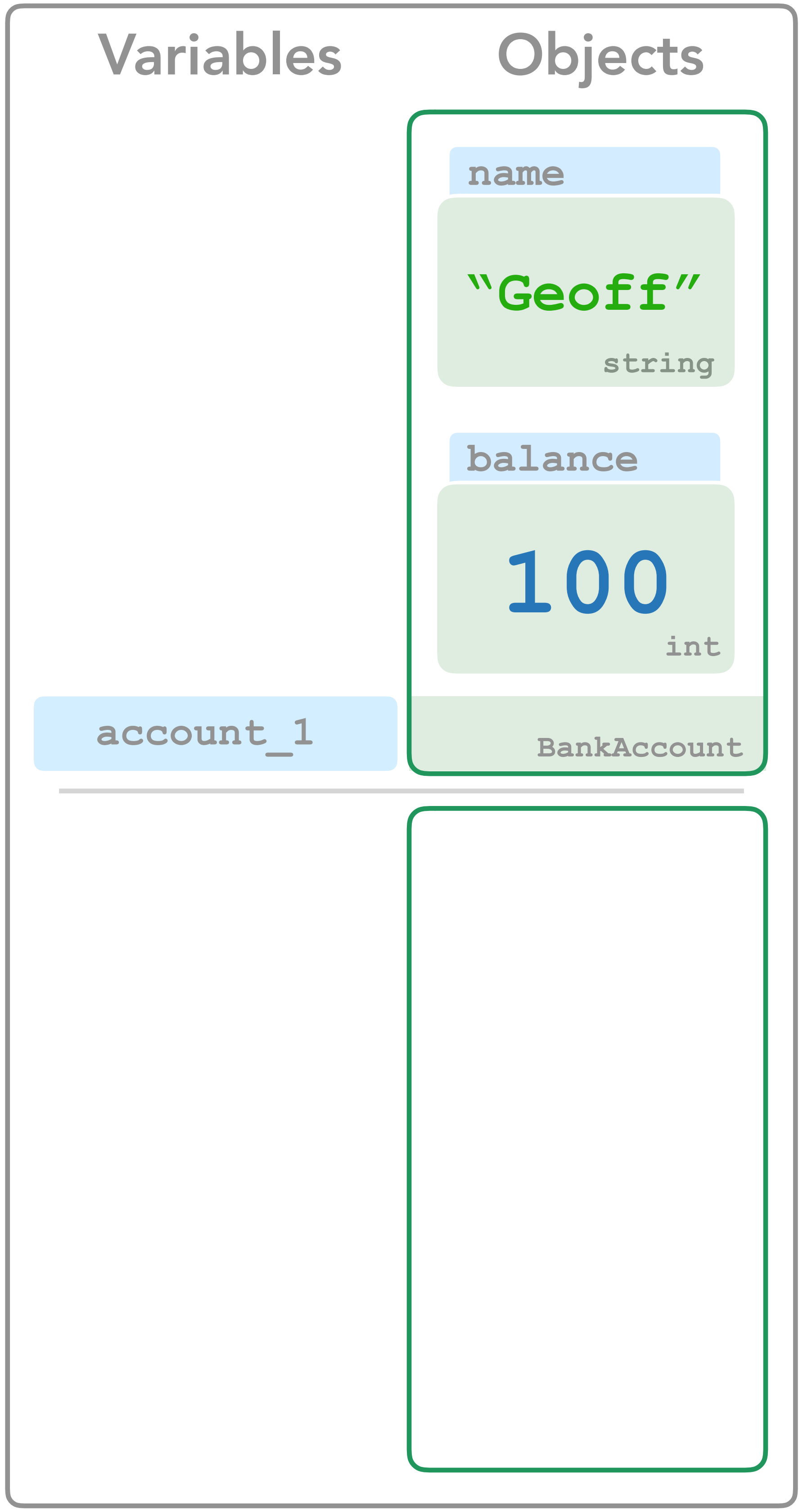

Output

Memory



Scope

Code

```python
from util import BankAccount

def main():
  account_1 = BankAccount("Geoff")
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```
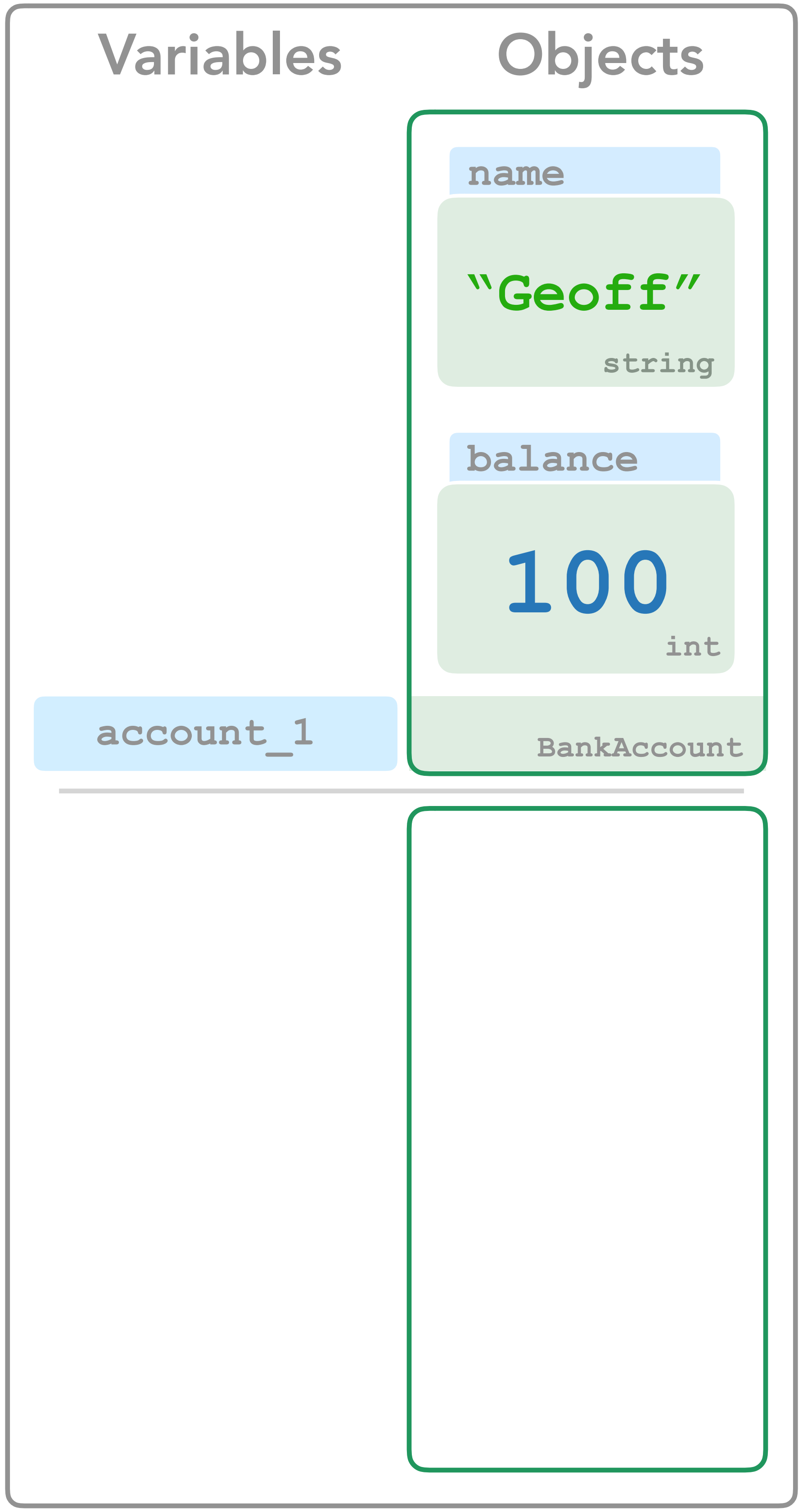

Output

Memory



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Code

```
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def main():
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  account_2.balance = 50

  print("Geoff's account has R$" + str(account_1.balance))
  print("Sabri's account has R$" + str(account_2.balance))
```
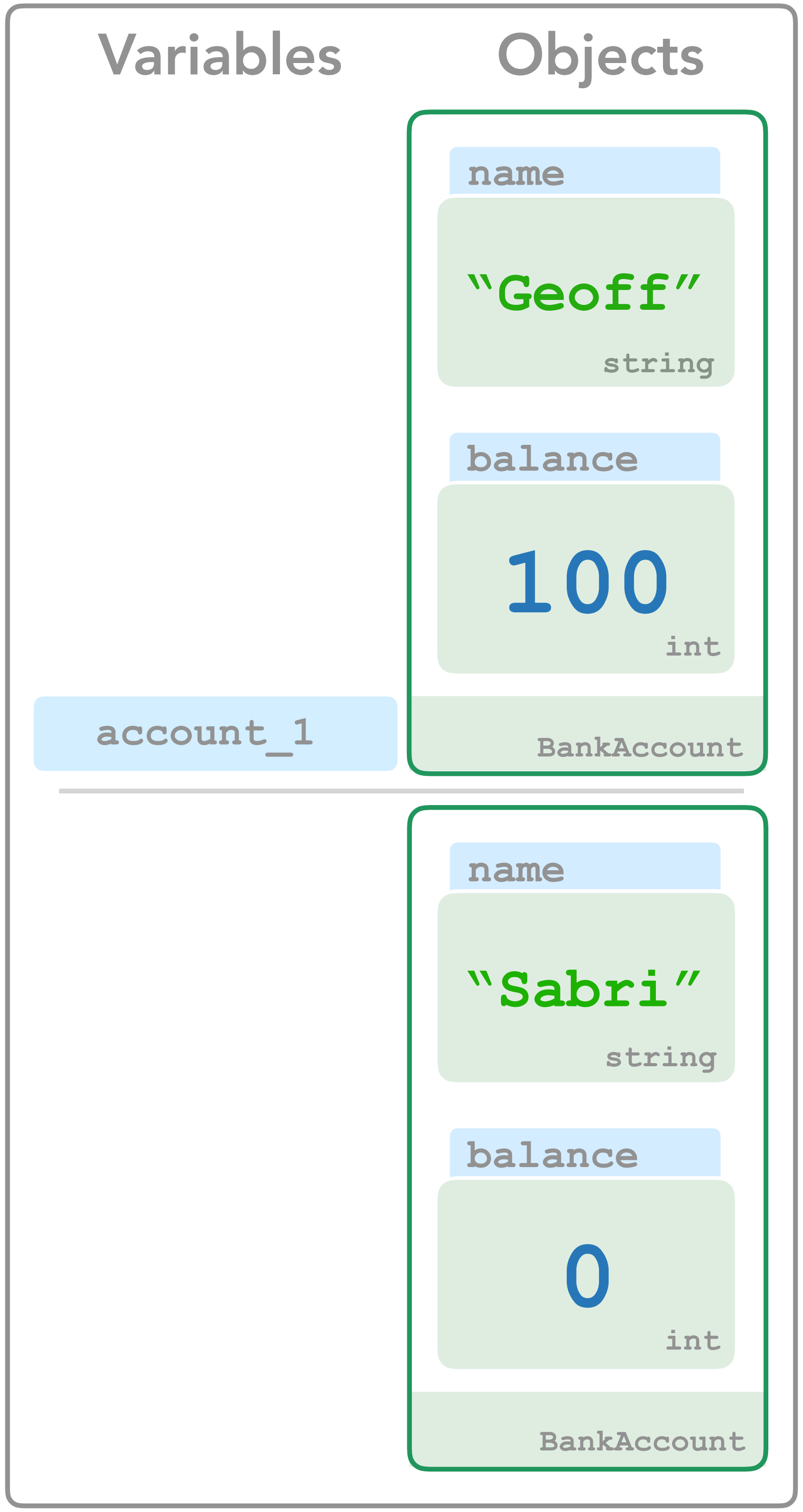

Output

Memory



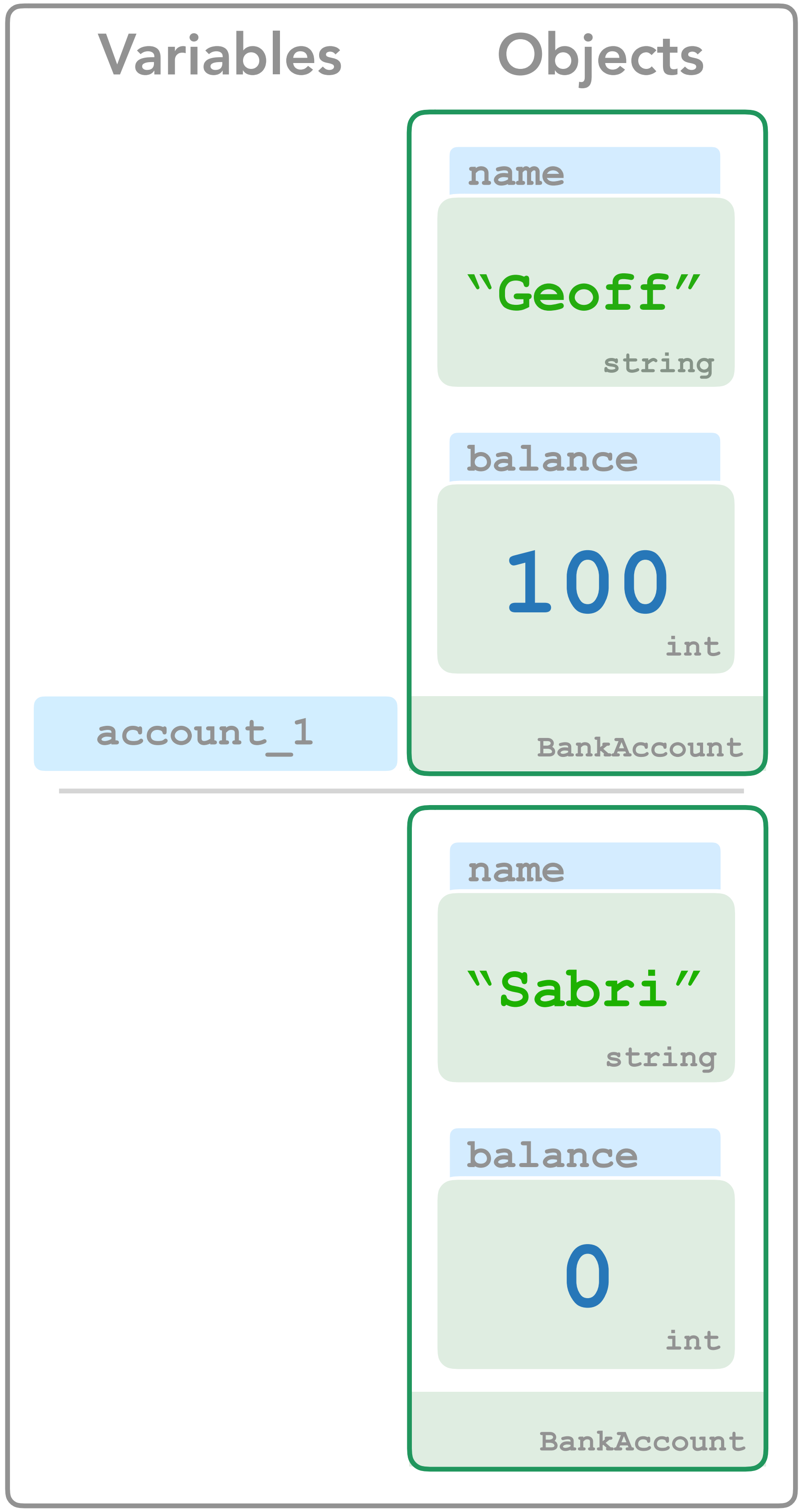
Scope

Code

```
from util import BankAccount

def main():
  account_1 = BankAccount("Geoff")
  account_1.balance = 100

  account_2 = BankAccount("Sabri")
  account_2.balance = 50

  print("Geoff's account has R$" + str(account_1.balance))
  print("Sabri's account has R$" + str(account_2.balance))
```

Output

Memory



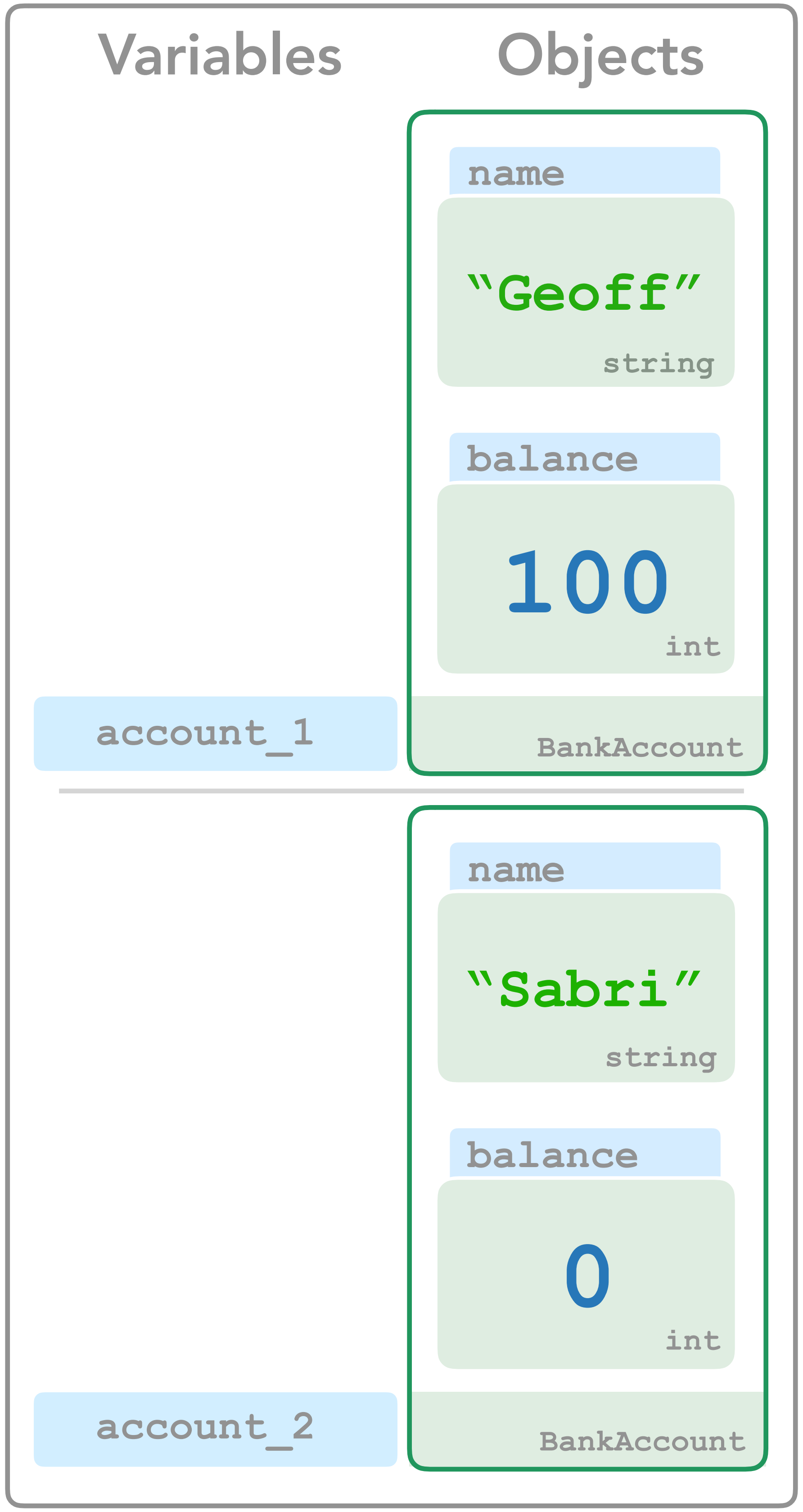
Scope

Code

```
from util import BankAccount

def main():
  account_1 = BankAccount("Geoff")
  account_1.balance = 100

  account_2 = BankAccount("Sabri")
  account_2.balance = 50

  print("Geoff's account has R$" + str(account_1.balance))
  print("Sabri's account has R$" + str(account_2.balance))
```

Output

Memory



Scope

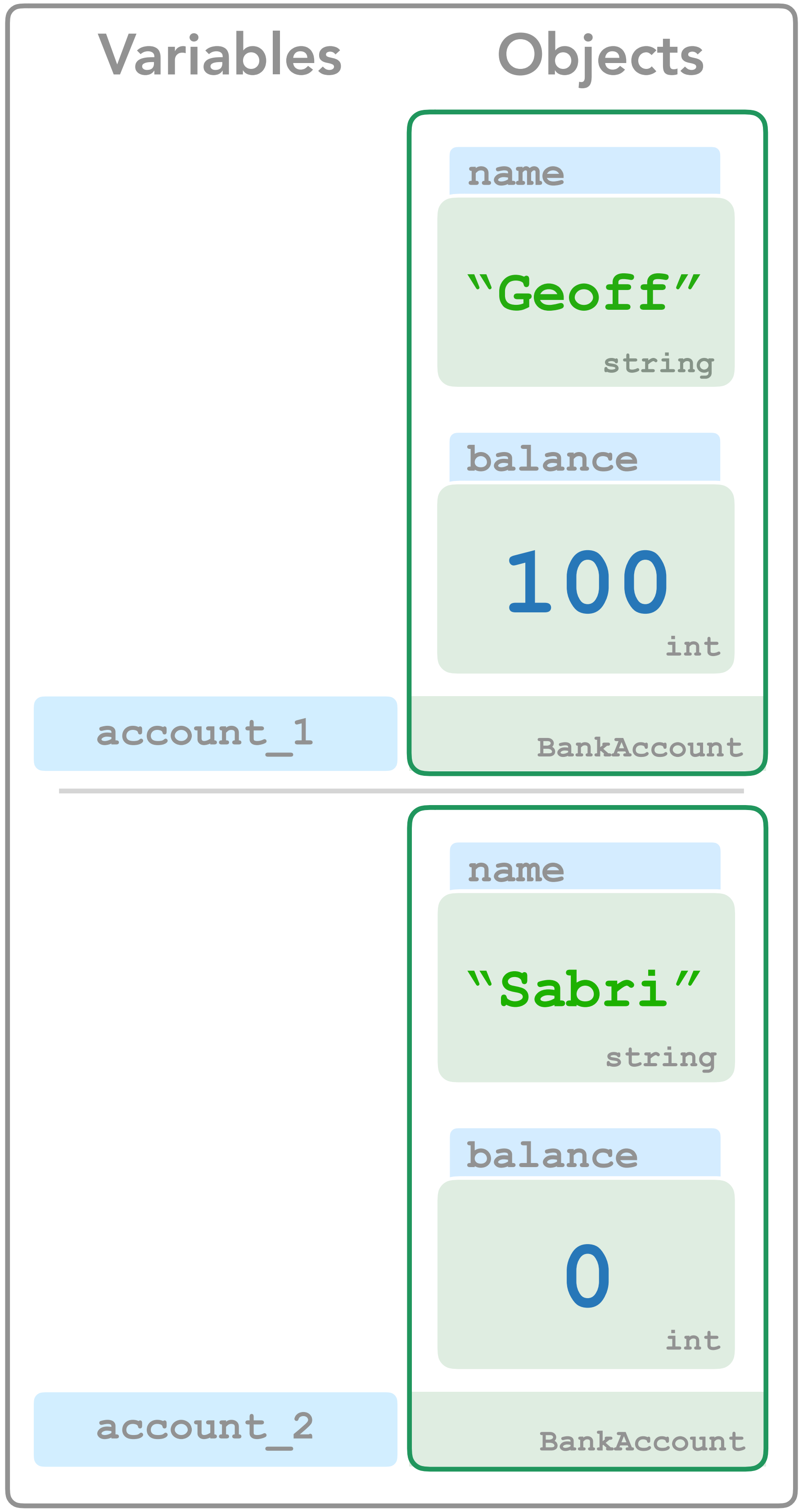
Code

```
from util import BankAccount

def main():
  account_1 = BankAccount("Geoff")
  account_1.balance = 100

  account_2 = BankAccount("Sabri")
  account_2.balance = 50

  print("Geoff's account has R$" + str(account_1.balance))
  print("Sabri's account has R$" + str(account_2.balance))
```

Output

```
>
```

Memory


Variables

Objects

name

“Geoff”

string

balance

100

int

account_1

BankAccount

name

“Sabri”

string

balance

0

int

account_2

BankAccount

Scope

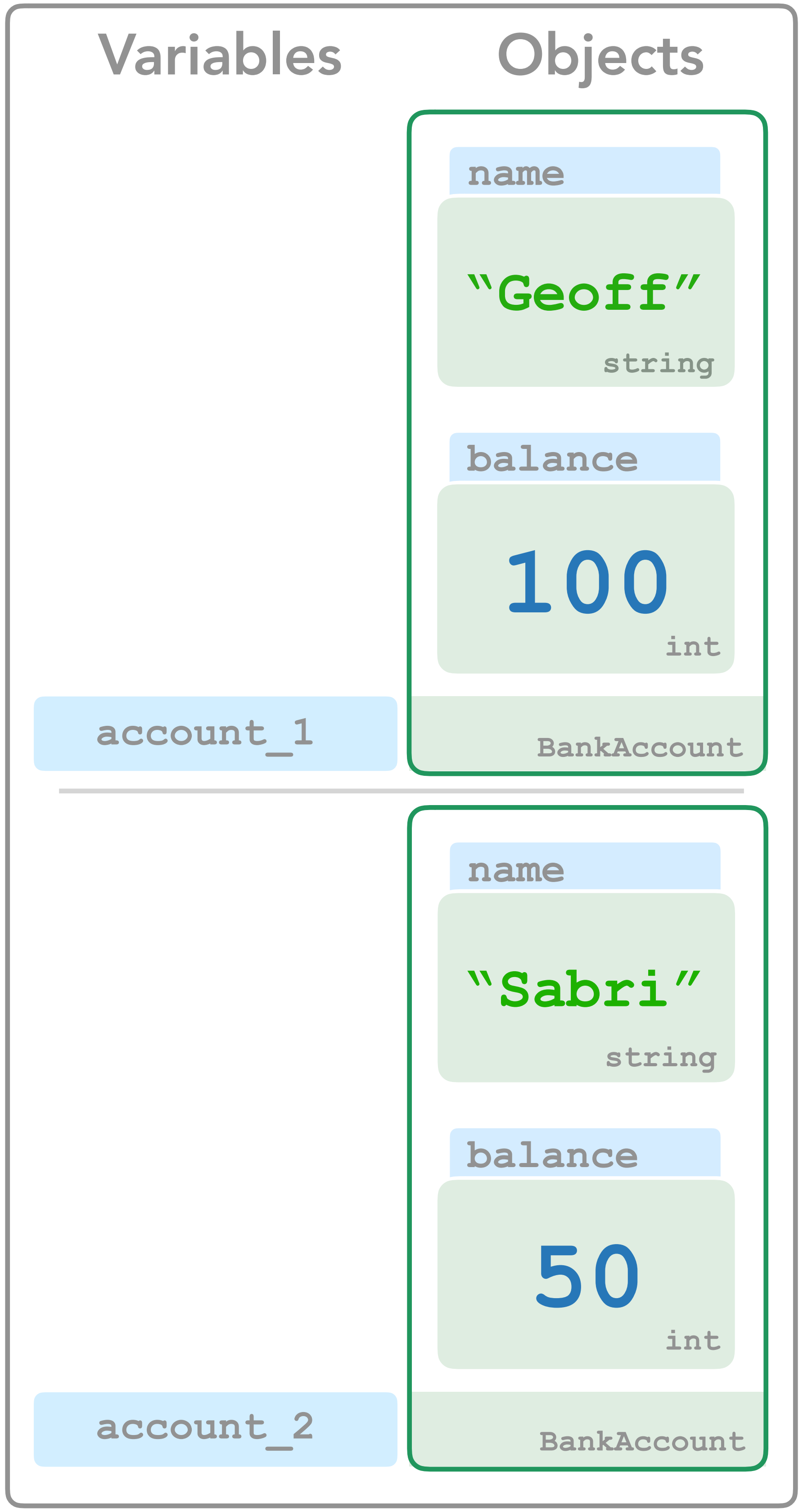
Code

```
from util import BankAccount

def main():
  account_1 = BankAccount("Geoff")
  account_1.balance = 100

  account_2 = BankAccount("Sabri")
  account_2.balance = 50

  print("Geoff's account has R$" + str(account_1.balance))
  print("Sabri's account has R$" + str(account_2.balance))
```

Output

```
>
```

Memory



Variables

Objects

name

"Geoff"

string

balance

100

int

account_1

BankAccount

name

"Sabri"

string

balance

50

int

account_2

BankAccount

Scope

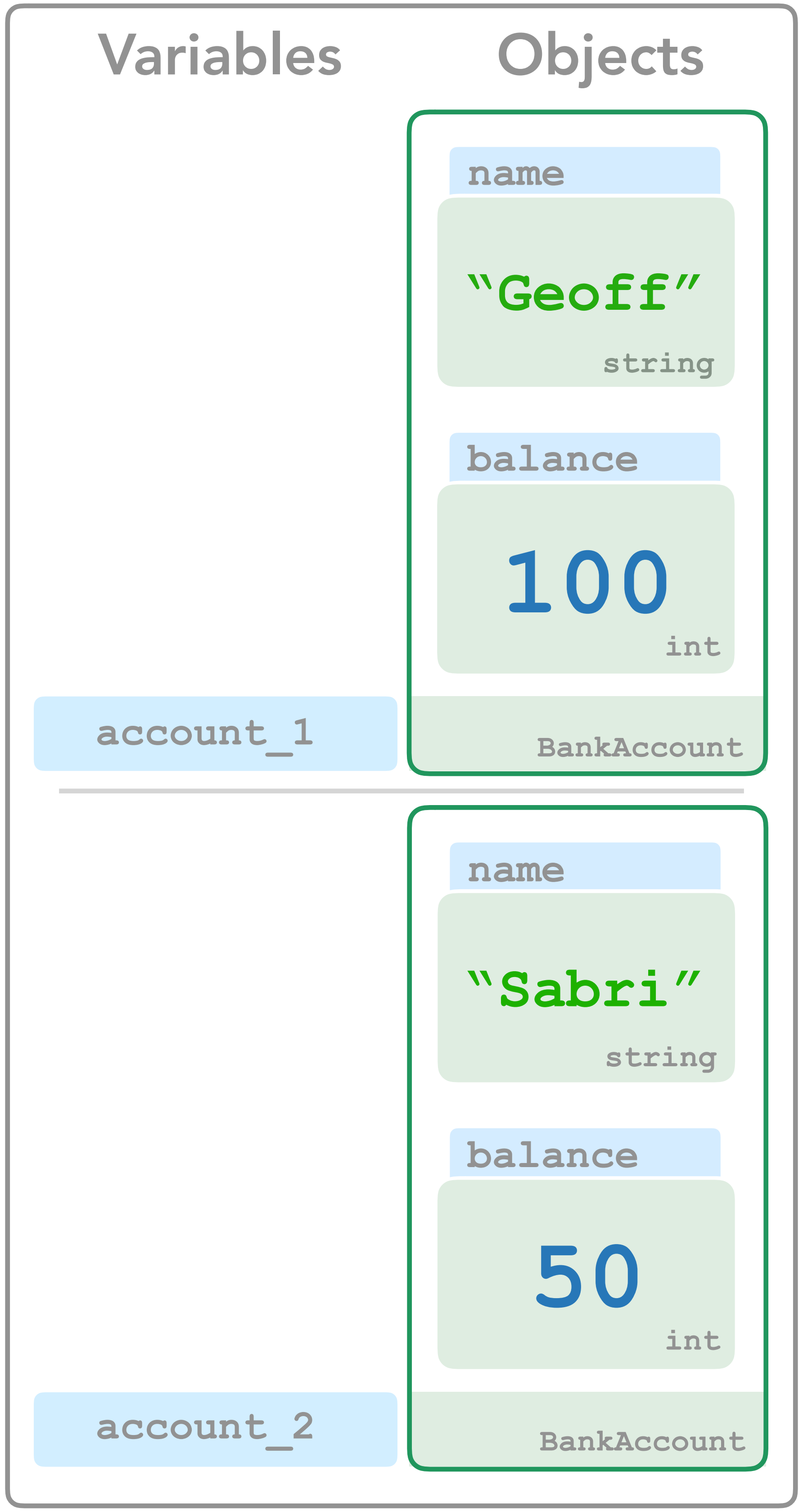
Code

```
from util import BankAccount

def main():
  account_1 = BankAccount("Geoff")
  account_1.balance = 100

  account_2 = BankAccount("Sabri")
  account_2.balance = 50

  print("Geoff's account has R$" + str(account_1.balance))
  print("Sabri's account has R$" + str(account_2.balance))
```

Output

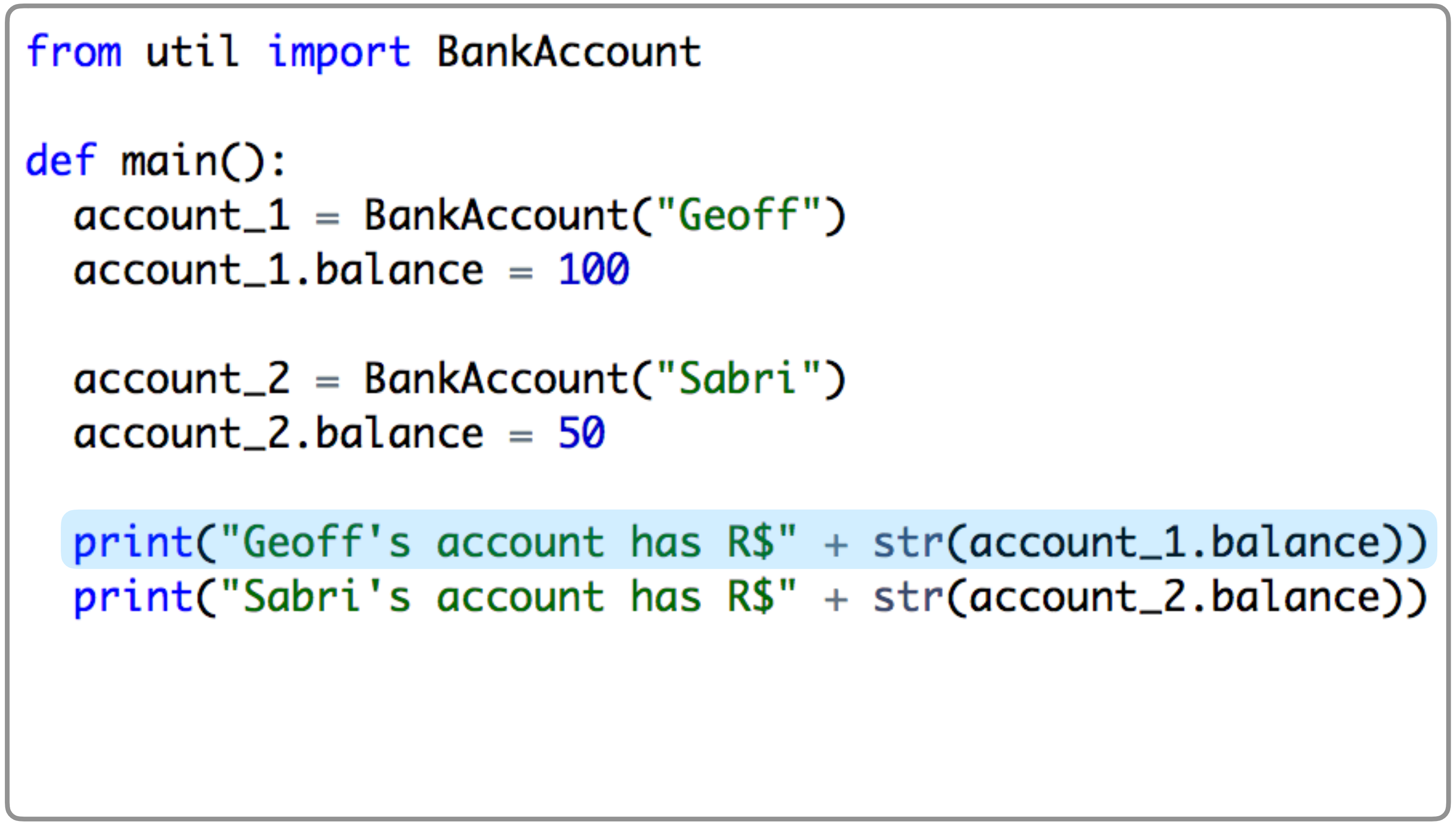
```
>
```

Memory



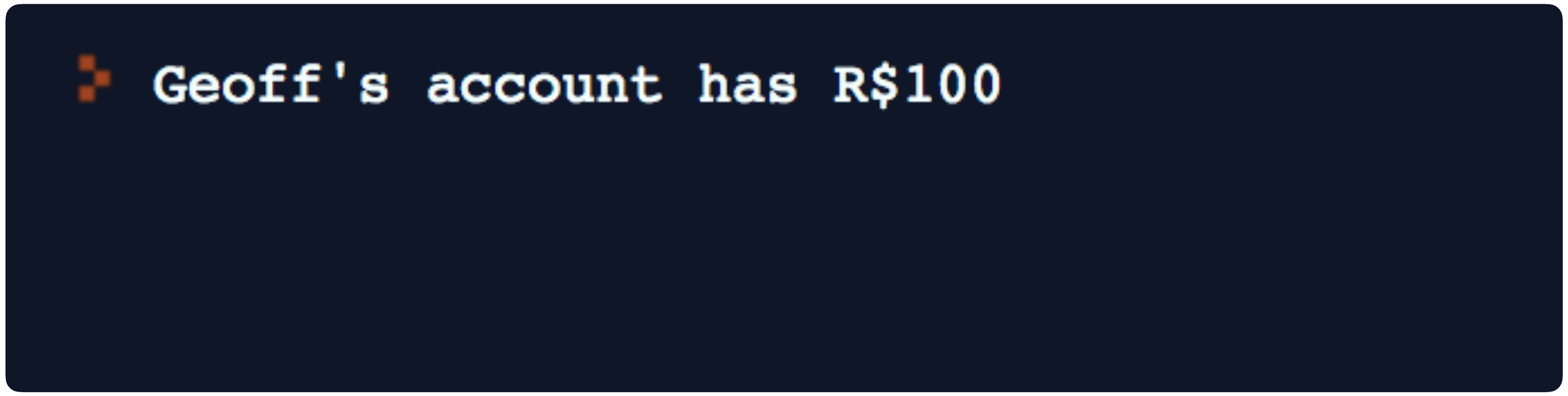
Scope

Code



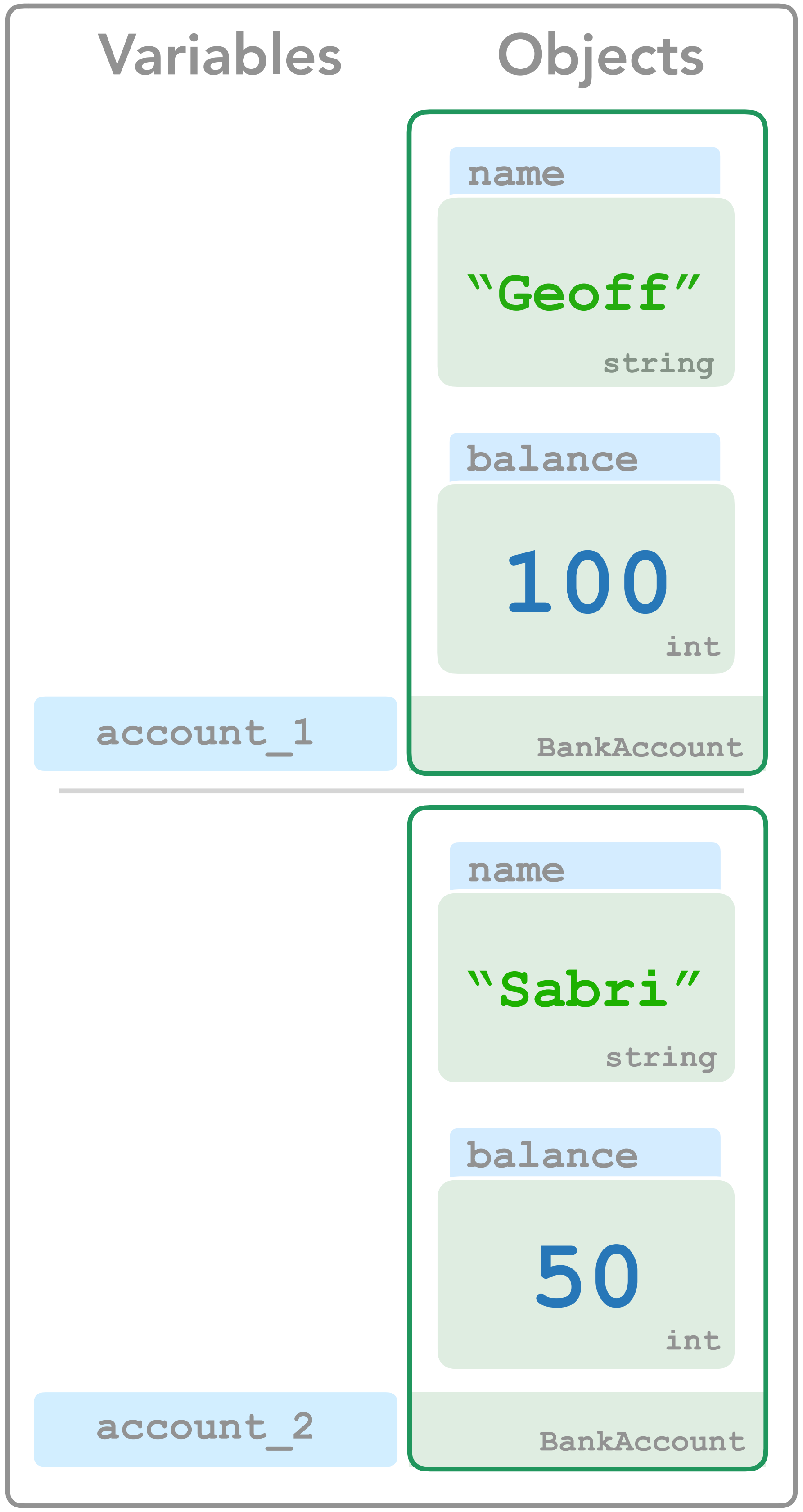
```
from util import BankAccount

def main():
  account_1 = BankAccount("Geoff")
  account_1.balance = 100

  account_2 = BankAccount("Sabri")
  account_2.balance = 50

  print("Geoff's account has R$" + str(account_1.balance))
  print("Sabri's account has R$" + str(account_2.balance))
```

Output



```
Geoff's account has R$100
```

Memory

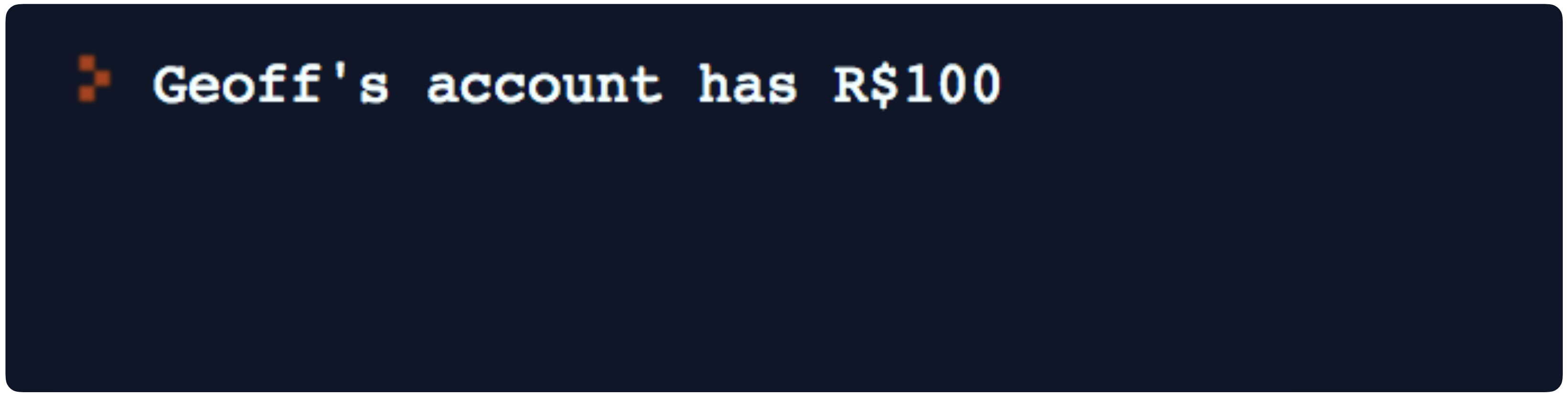


Scope

Code

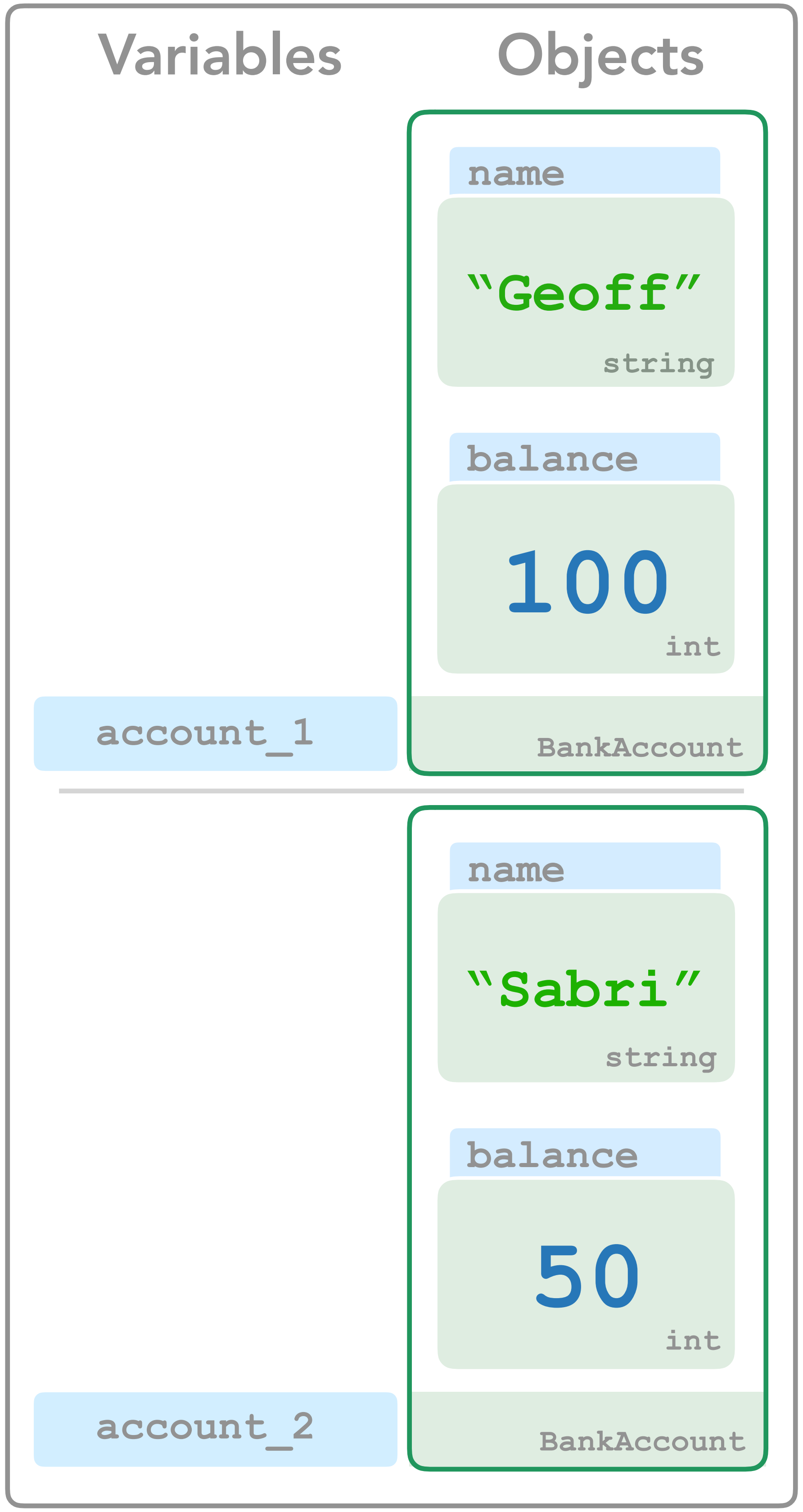
```python
from util import BankAccount

def main():
  account_1 = BankAccount("Geoff")
  account_1.balance = 100

  account_2 = BankAccount("Sabri")
  account_2.balance = 50

  print("Geoff's account has R$" + str(account_1.balance))
  print("Sabri's account has R$" + str(account_2.balance))
```

Output



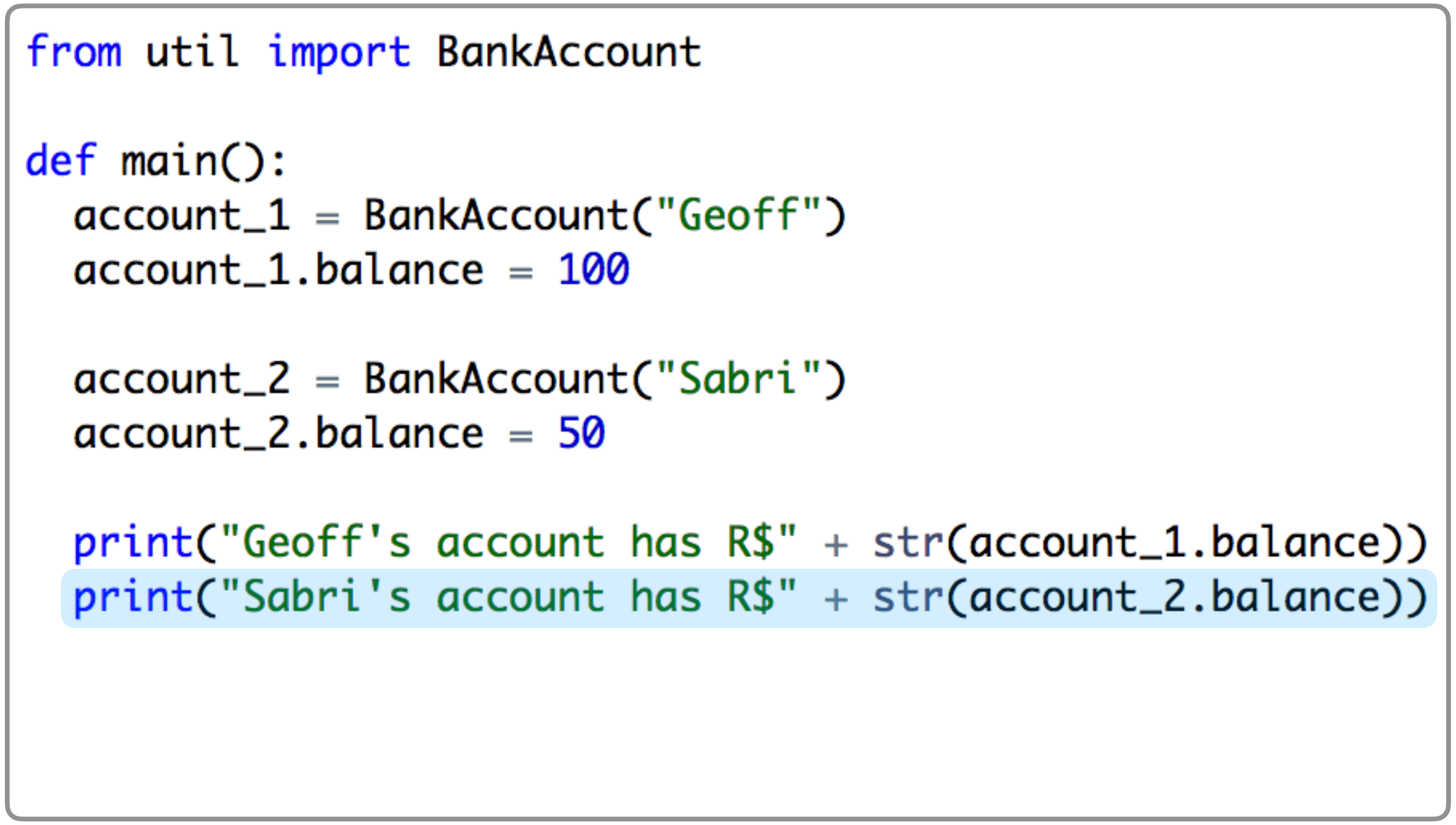
```
Geoff's account has R$100
```

Memory



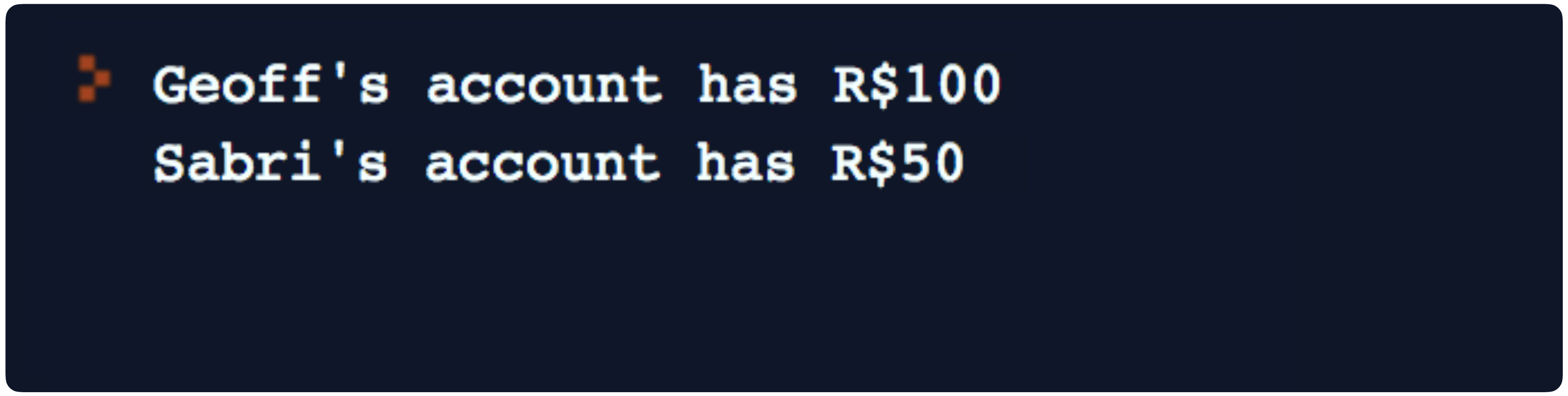
Scope

Code



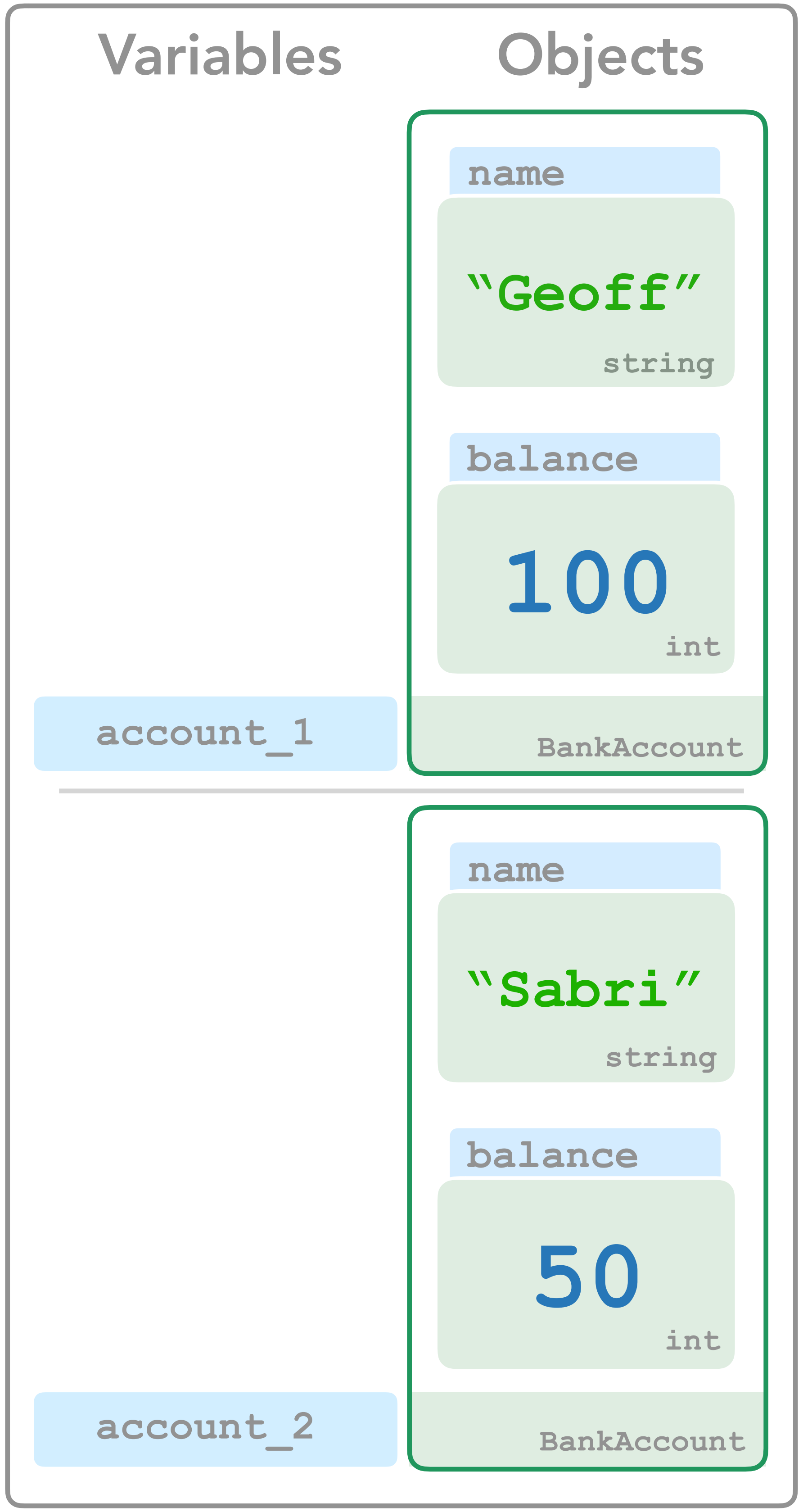
```python
from util import BankAccount

def main():
  account_1 = BankAccount("Geoff")
  account_1.balance = 100

  account_2 = BankAccount("Sabri")
  account_2.balance = 50

  print("Geoff's account has R$" + str(account_1.balance))
  print("Sabri's account has R$" + str(account_2.balance))
```

Output



```
Geoff's account has R$100
Sabri's account has R$50
```

Memory



Variables

Objects

name

"Geoff"

string

balance

100

int

account_1

BankAccount

name

"Sabri"

string

balance

50

int

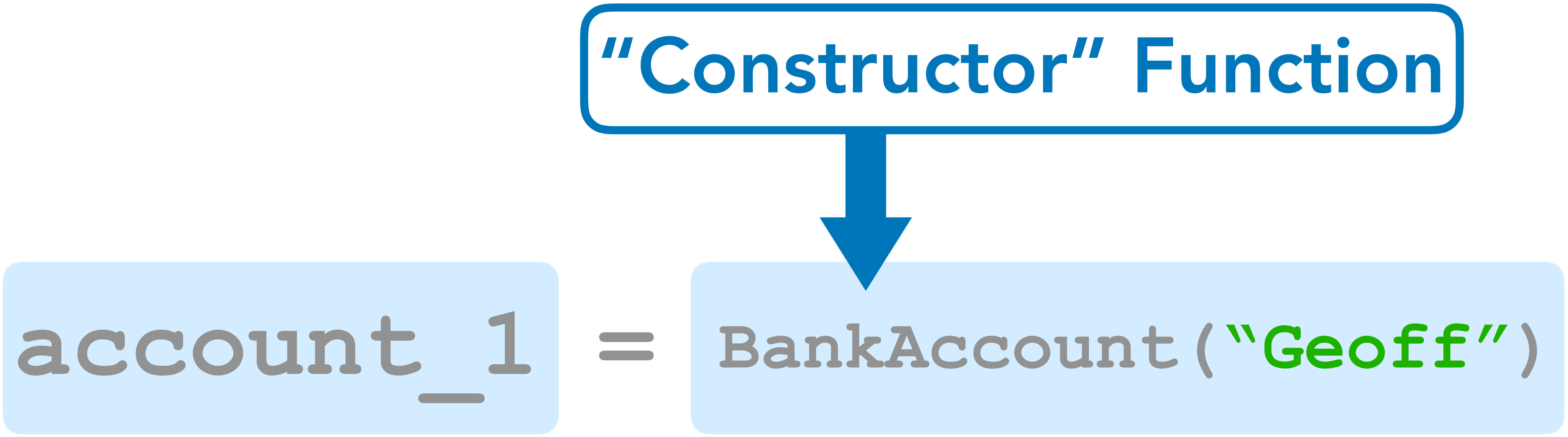
account_2

BankAccount

Complex Object **Syntax**

```
account_1 = BankAccount(“Geoff”)
```

Complex Object **Syntax**



“Constructor” Function

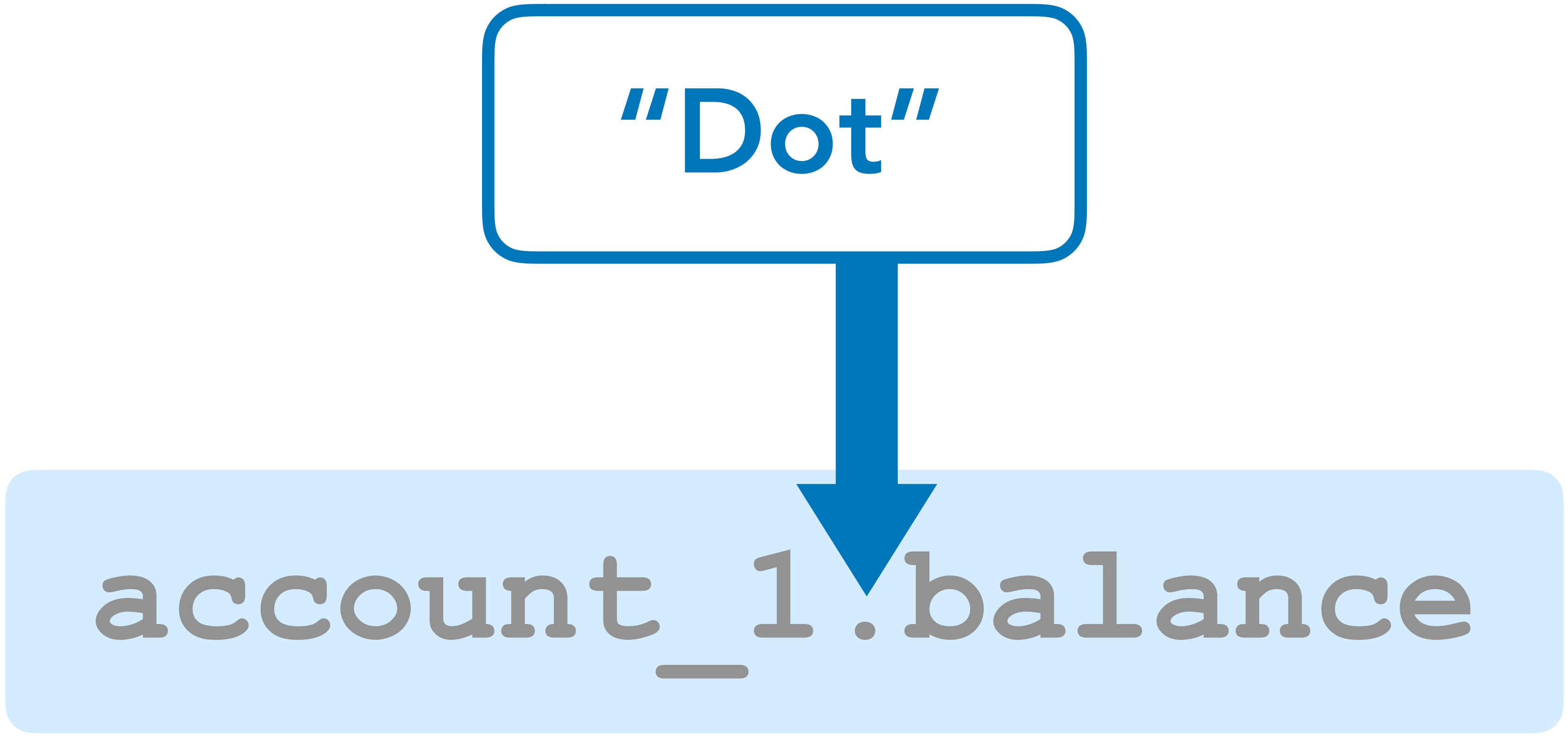
```
account_1 = BankAccount(“Geoff”)
```

Complex Object **Syntax**

Parameters

```
account_1 = BankAccount(“Geoff”)
```

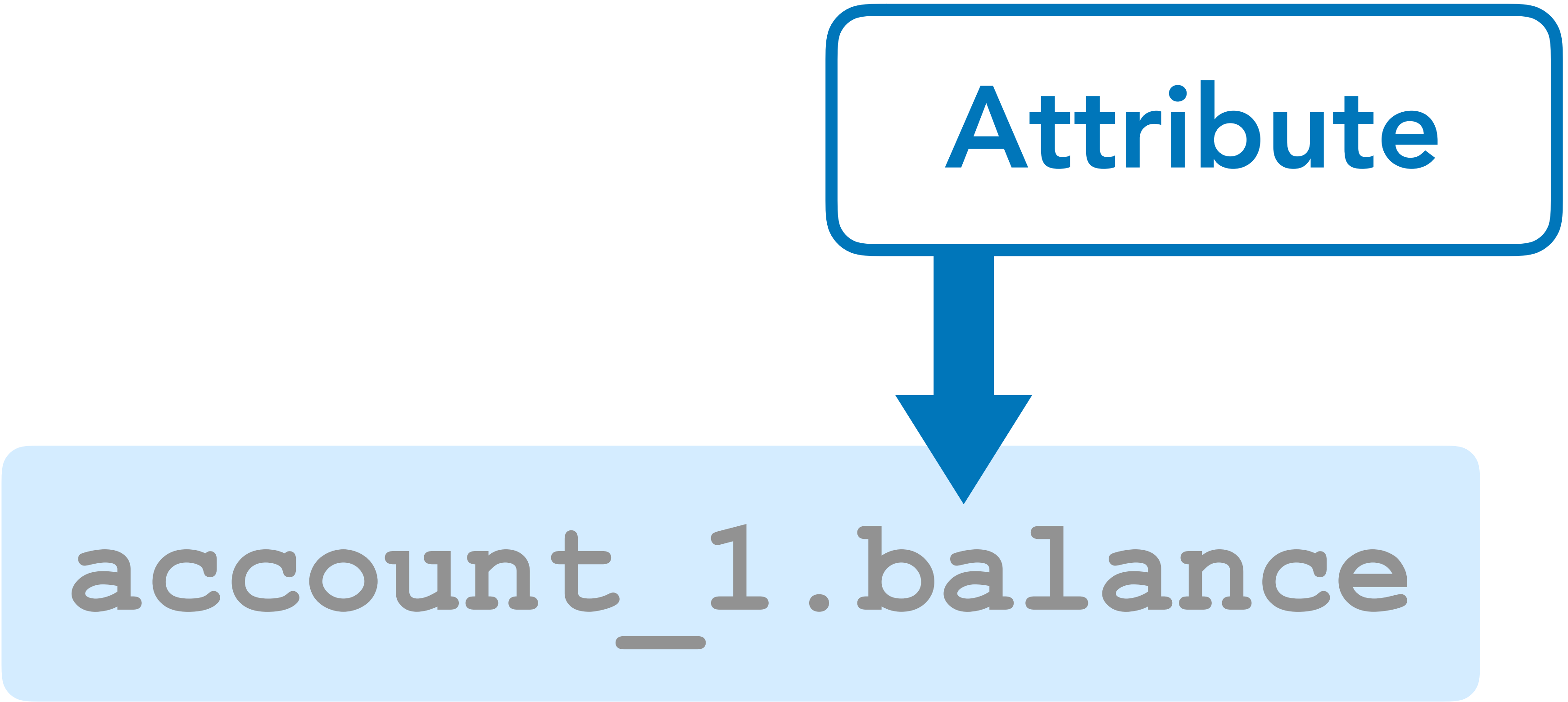
Complex Object **Syntax**



“Dot”

```
account_1.balance
```

Complex Object **Syntax**



Attribute

```
account_1.balance
```

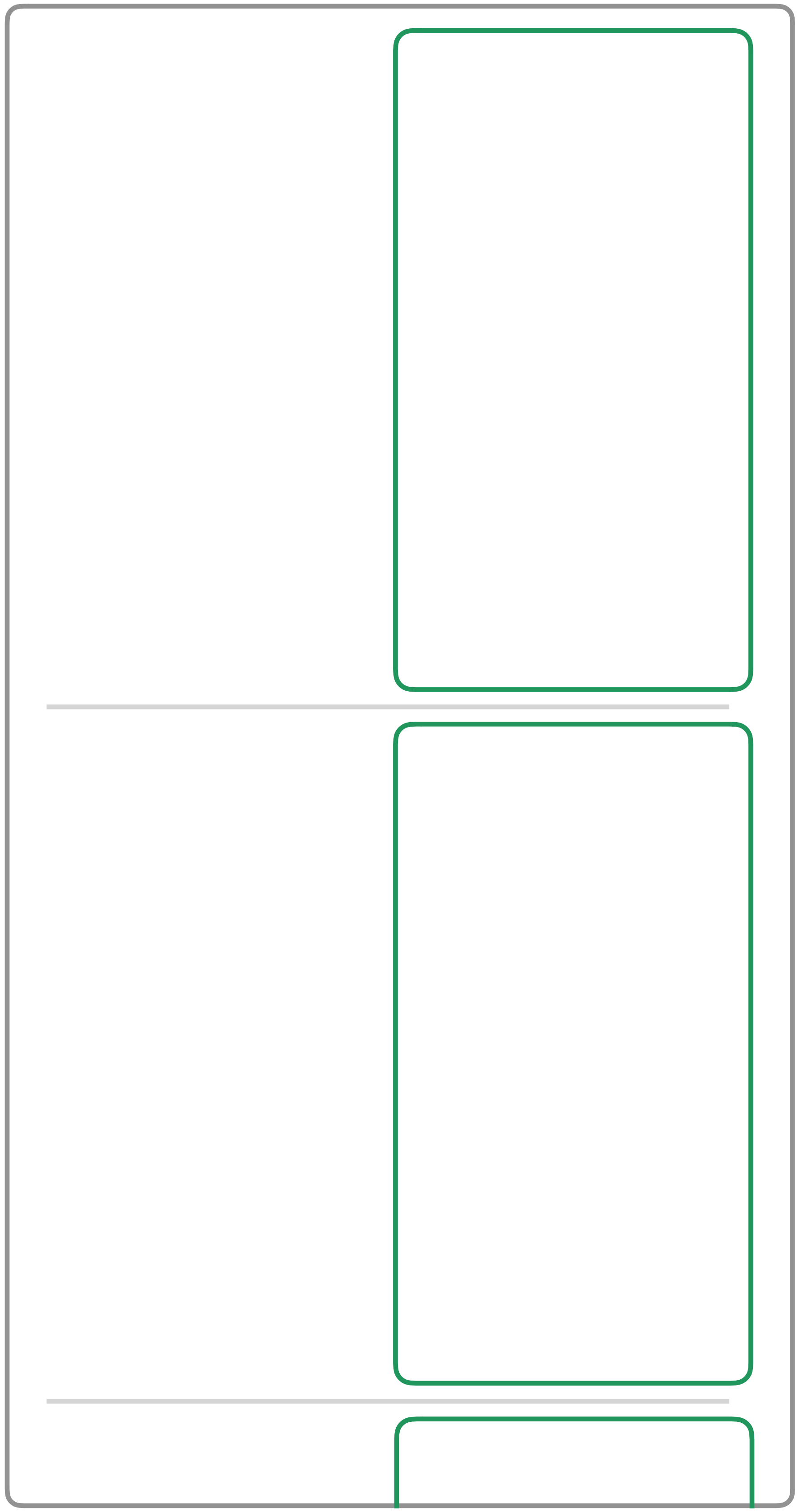
Code

```python
from util import BankAccount, input_float

def transfer(payer, receiver):
  transfer_amount = input_float("How much to transfer?")
  payer.balance = payer.balance - transfer_amount
  receiver.balance = receiver.balance + transfer_amount

def main():
  account_1 = BankAccount("Geoff")
  account_1.balance = 100
  account_2 = BankAccount("Sabri")
  account_2.balance = 75
  print("Geoff has R$" + str(account_1.balance))
  print("Sabri has R$" + str(account_2.balance))
  transfer(account_1, account_2)
  print("Geoff has R$" + str(account_1.balance))
  print("Sabri has R$" + str(account_2.balance))
```

Output

```
>
```

Memory



Code

```python
from util import BankAccount, input_float

def transfer(payer, receiver):
  transfer_amount = input_float("How much to transfer?")
  payer.balance = payer.balance - transfer_amount
  receiver.balance = receiver.balance + transfer_amount

def main():
  account_1 = BankAccount("Geoff")
  account_1.balance = 100
  account_2 = BankAccount("Sabri")
  account_2.balance = 75
  print("Geoff has R$" + str(account_1.balance))
  print("Sabri has R$" + str(account_2.balance))
  transfer(account_1, account_2)
  print("Geoff has R$" + str(account_1.balance))
  print("Sabri has R$" + str(account_2.balance))
```

Memory

Output

```
>
```

Code

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from util import BankAccount, input_float

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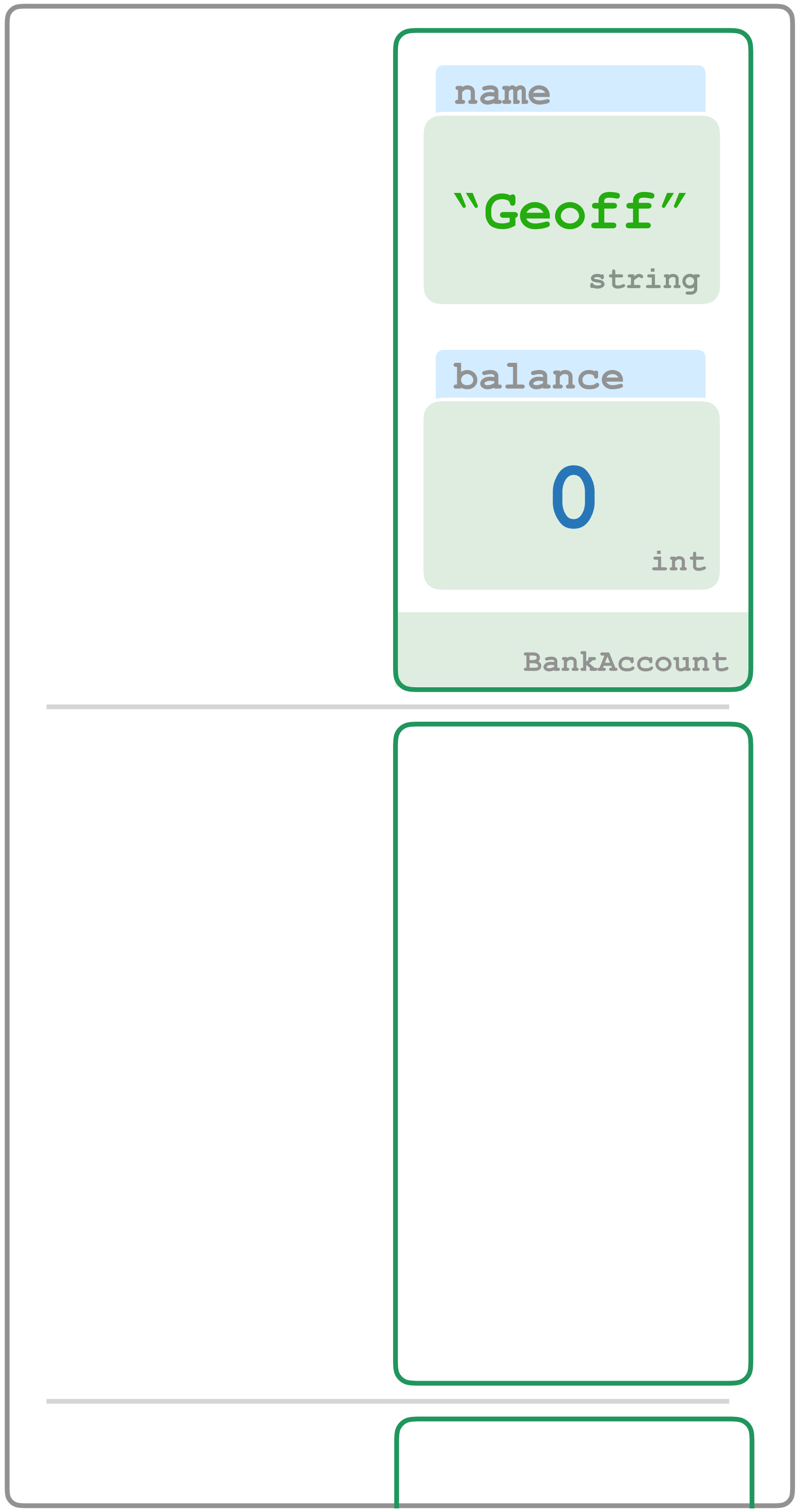
```

Output

Memory



Code

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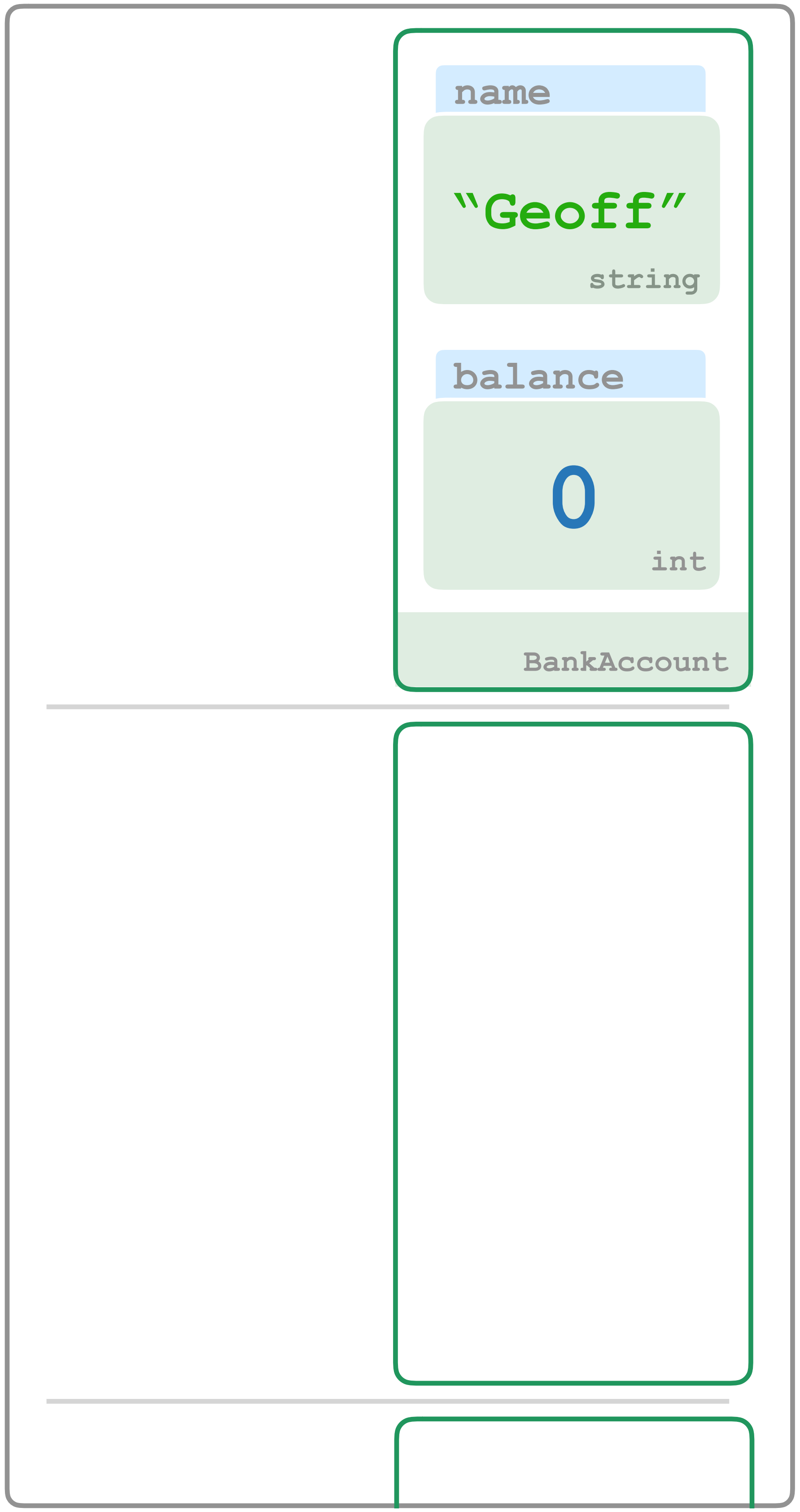
Output

Memory



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```
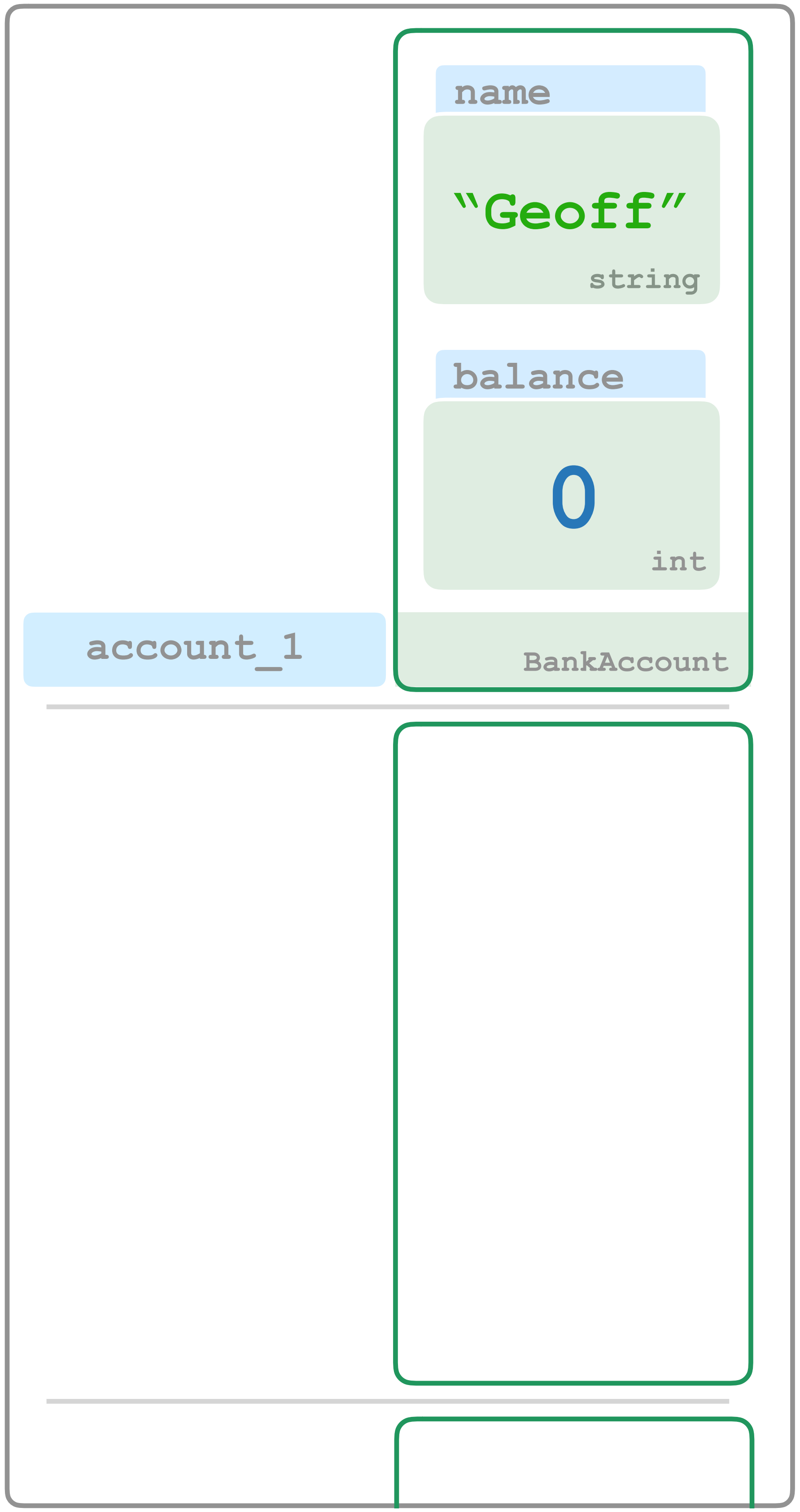

Memory



Output

```
>
```

Code

```
from util import BankAccount, input_float

def transfer(payer, receiver):
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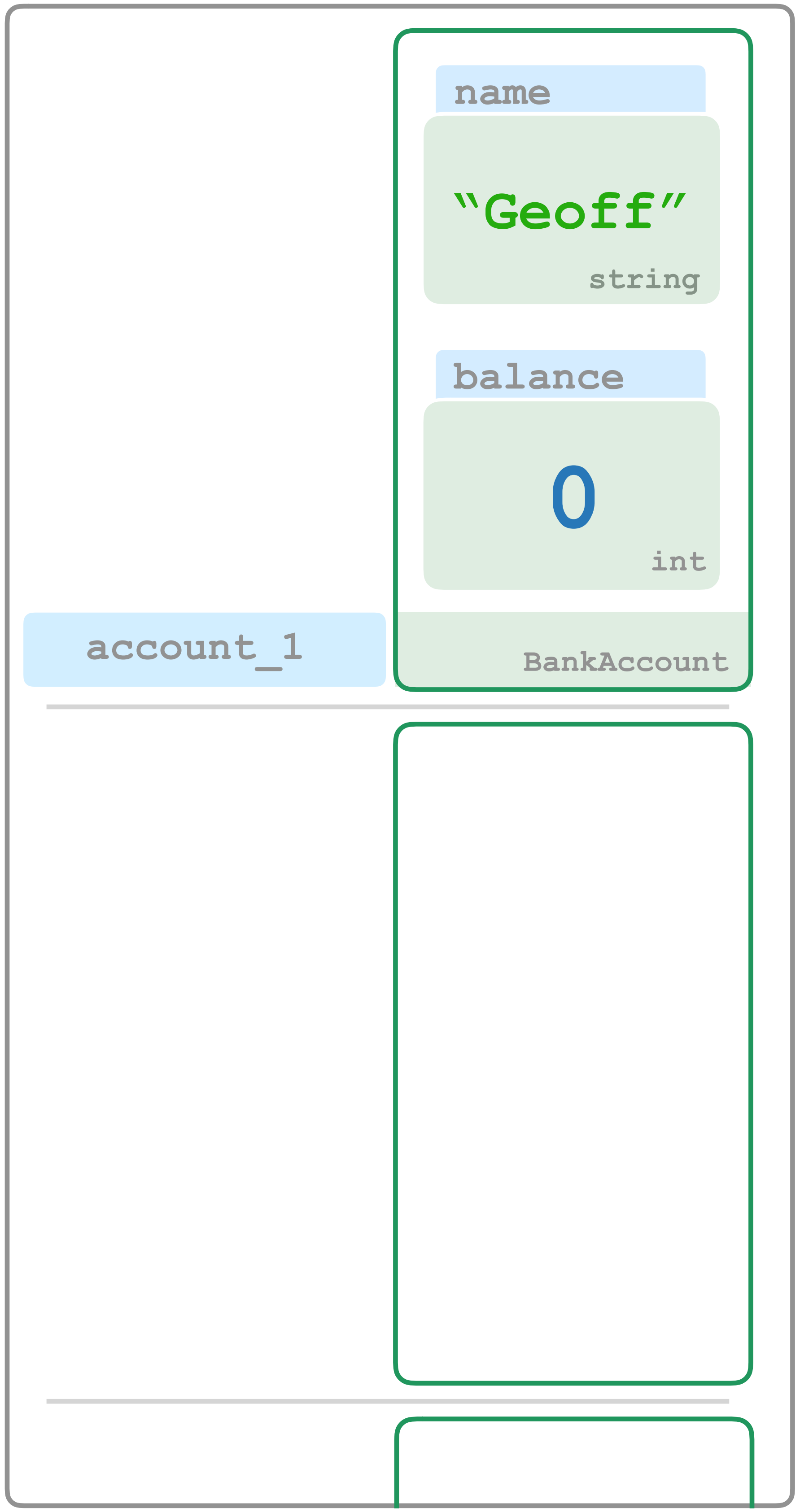
Memory



Output

Code

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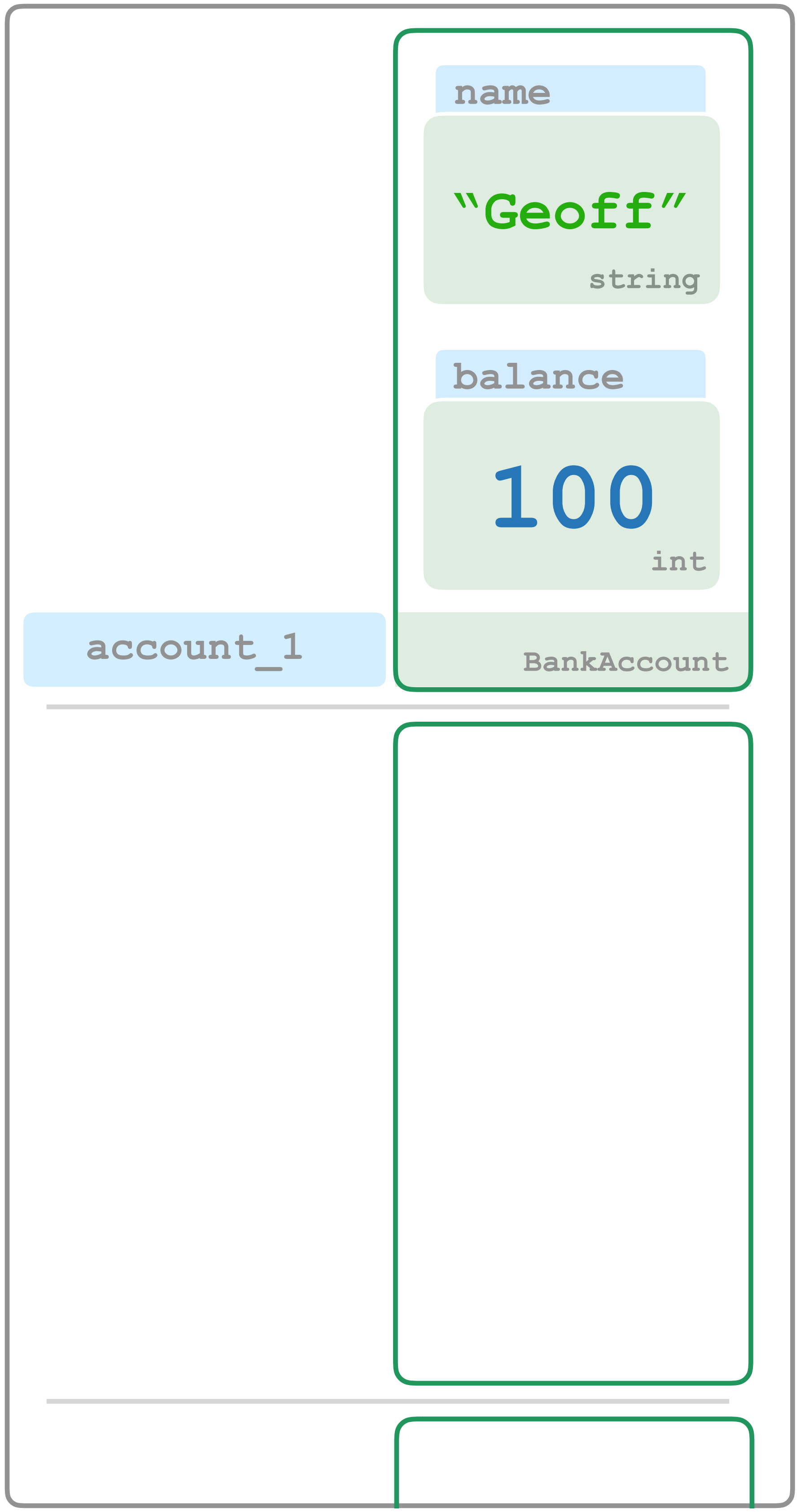
Output

Memory



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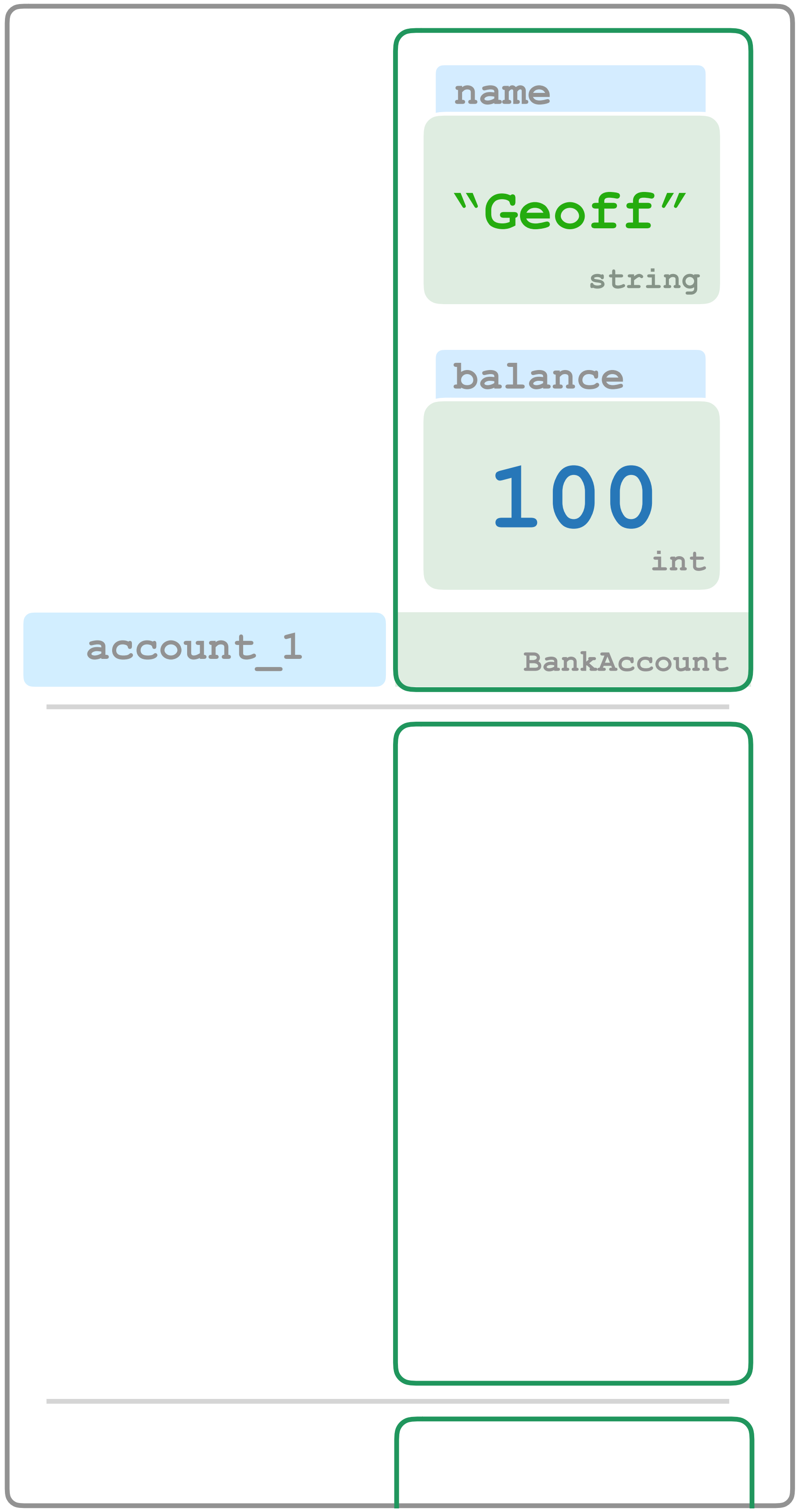
Output

Memory



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```
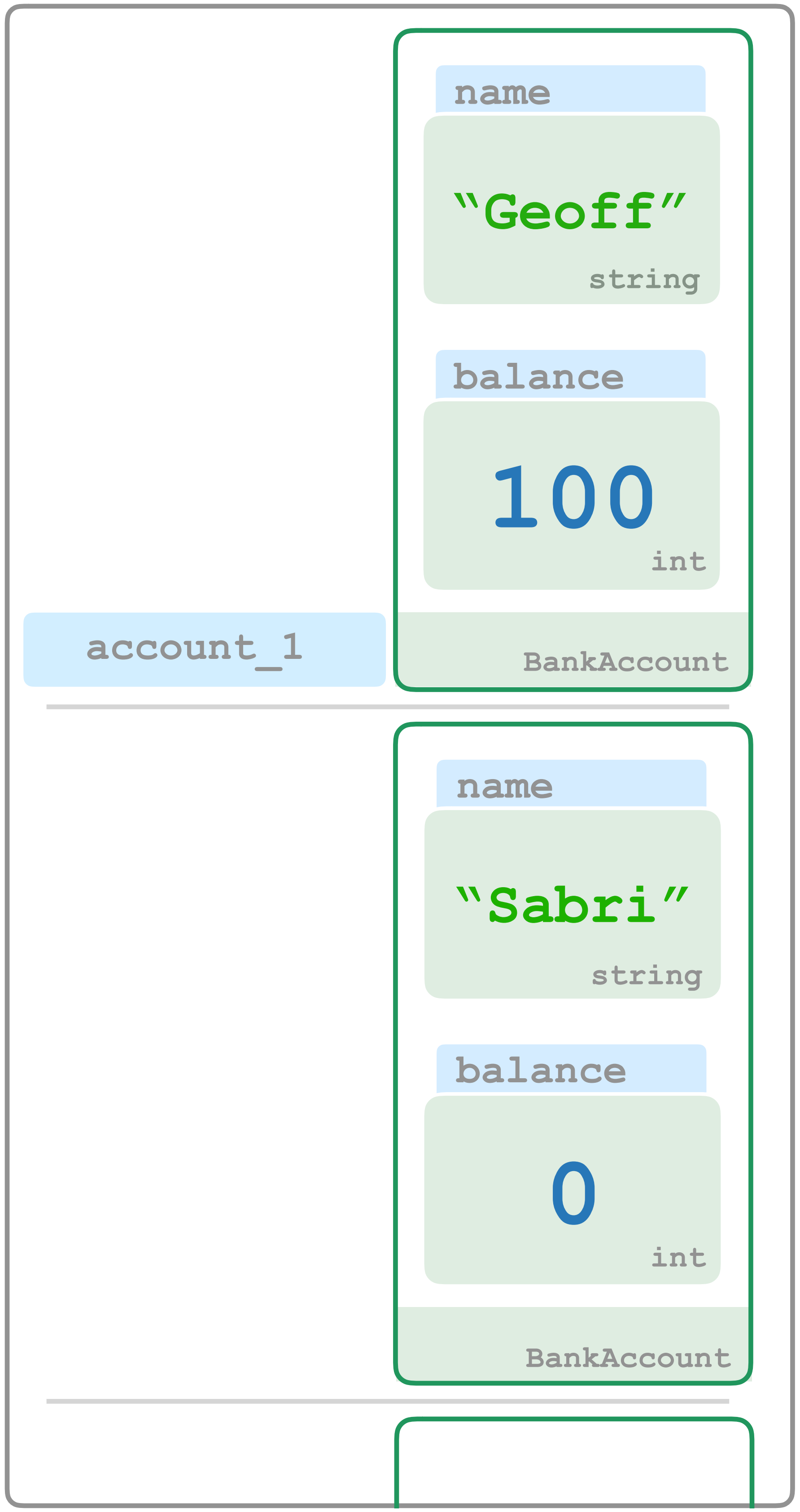

Output

Memory



name
"Geoff"
string
balance
100
int
account_1
BankAccount

name
"Sabri"
string
balance
0
int
BankAccount

Code

```
from util import BankAccount, input_float

def transfer(payer, receiver):
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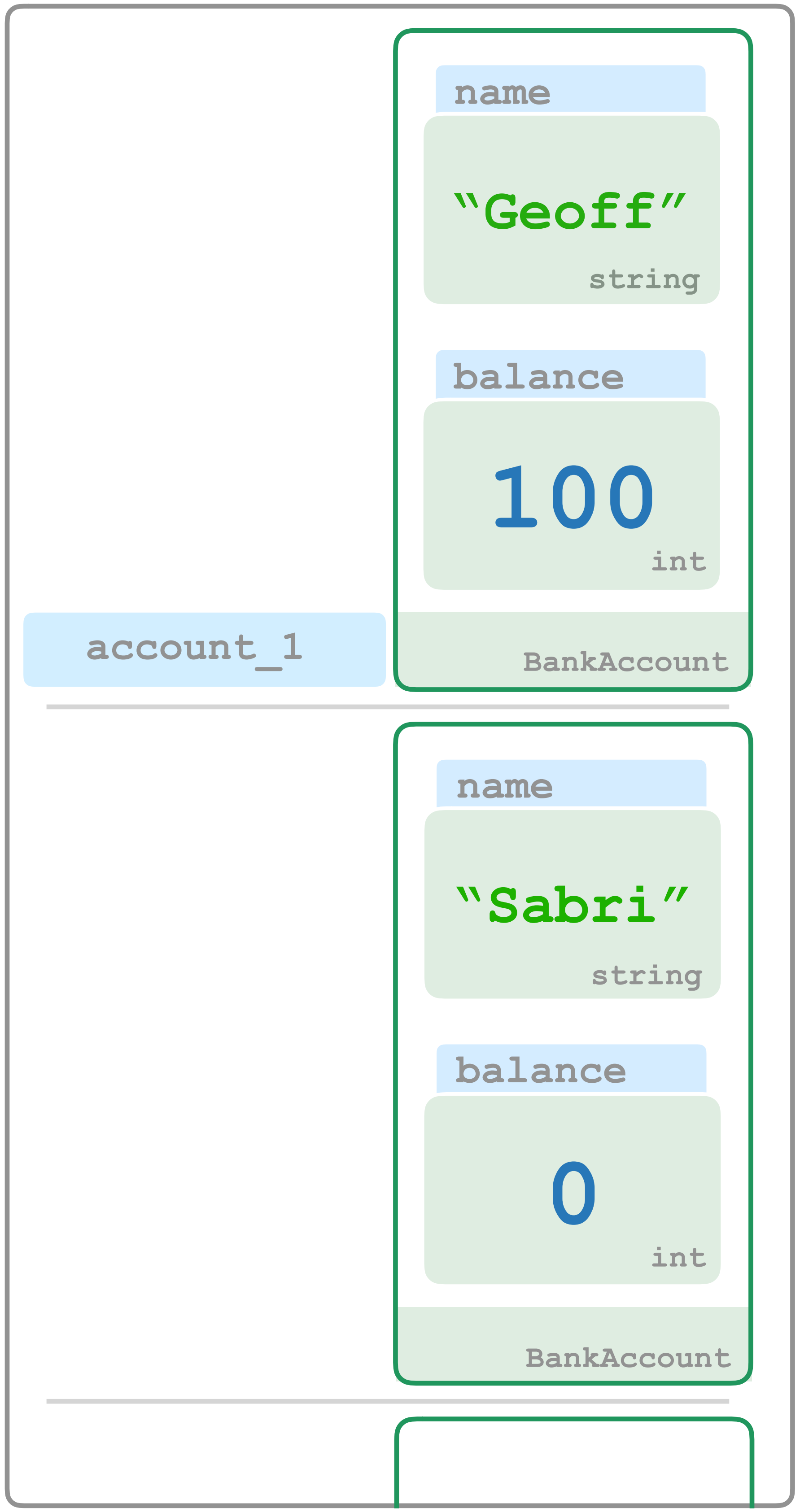
Output

Memory



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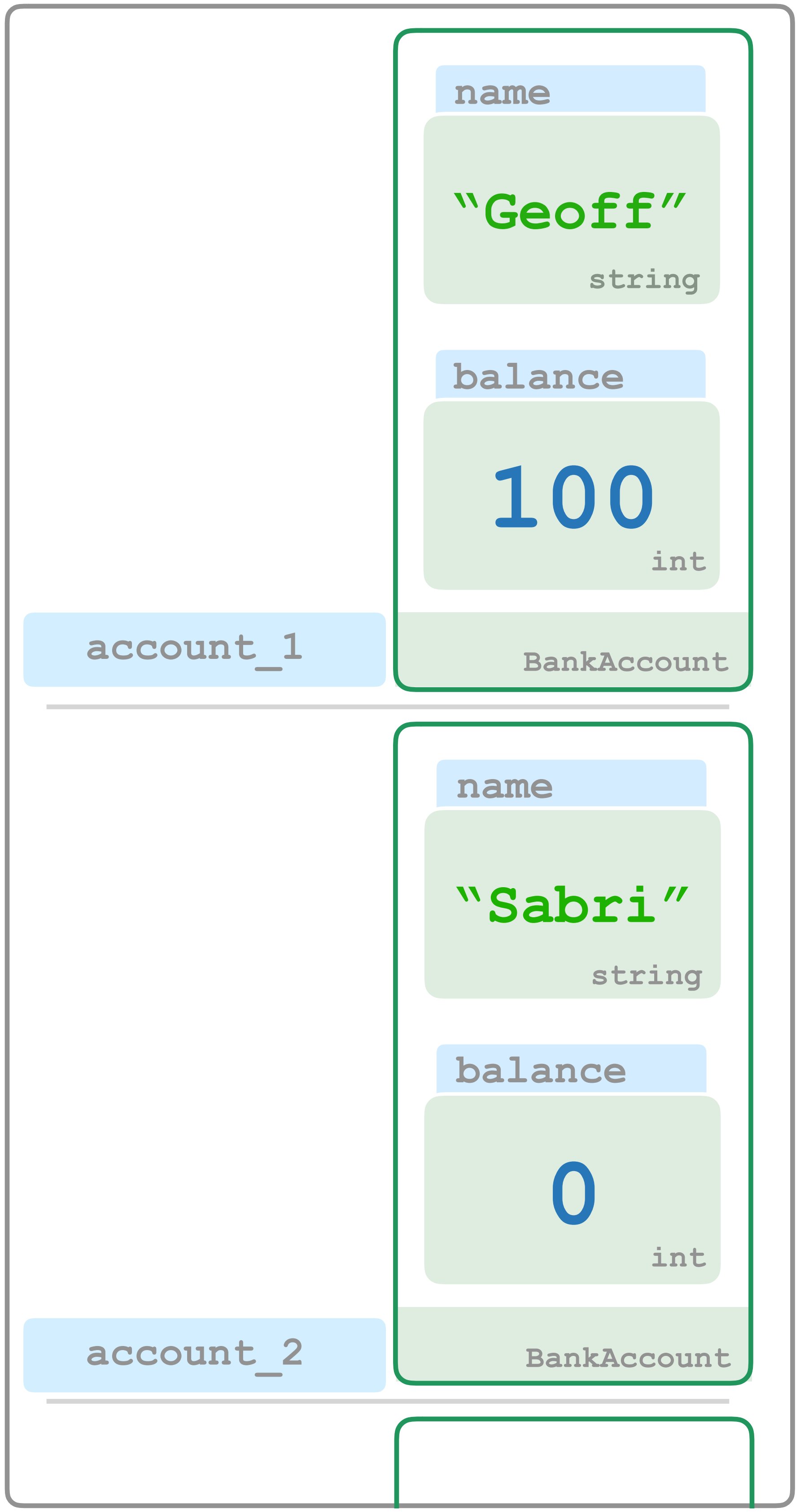
Output

Memory



Code

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```
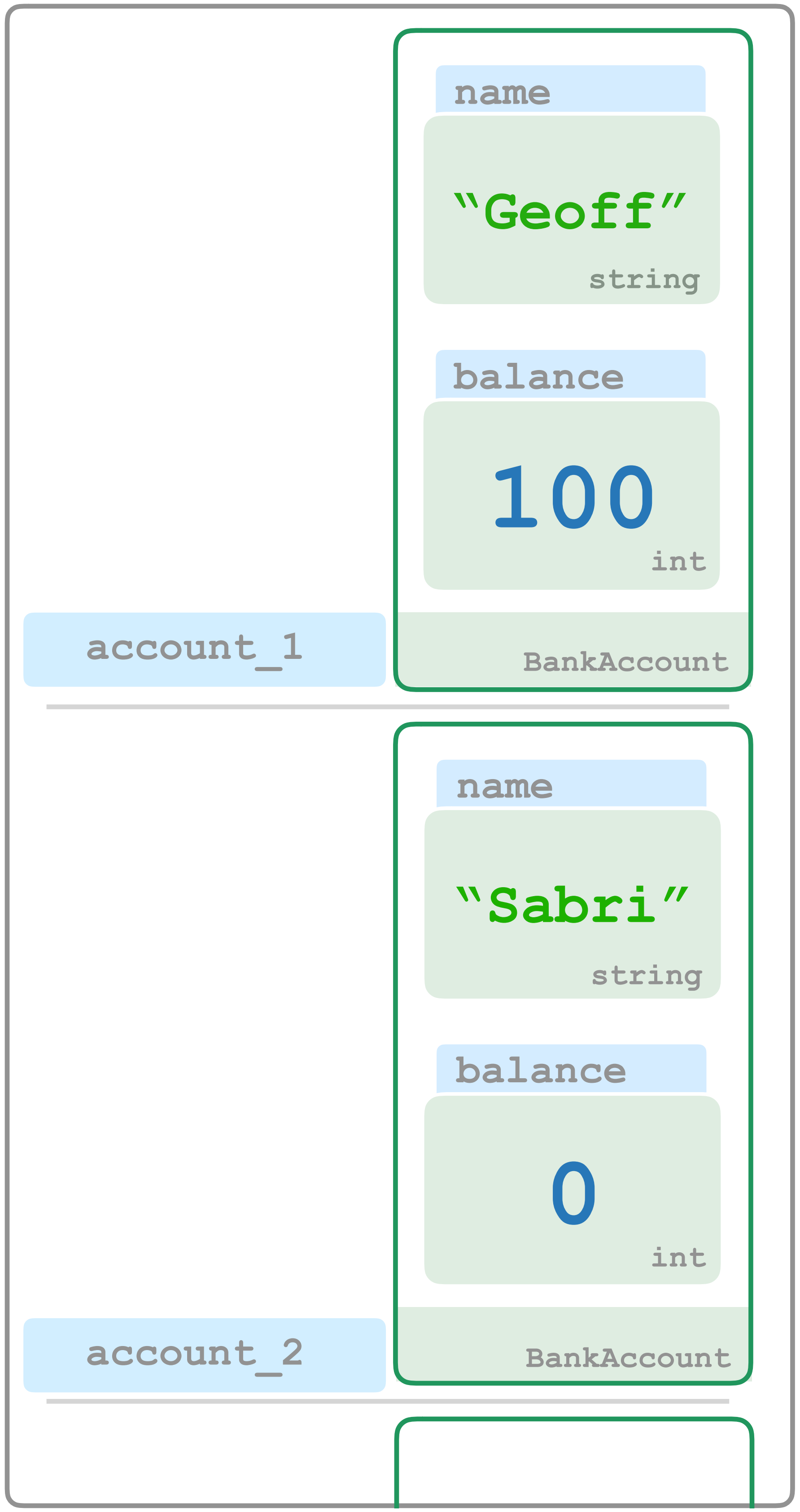

Output

```
>
```

Memory



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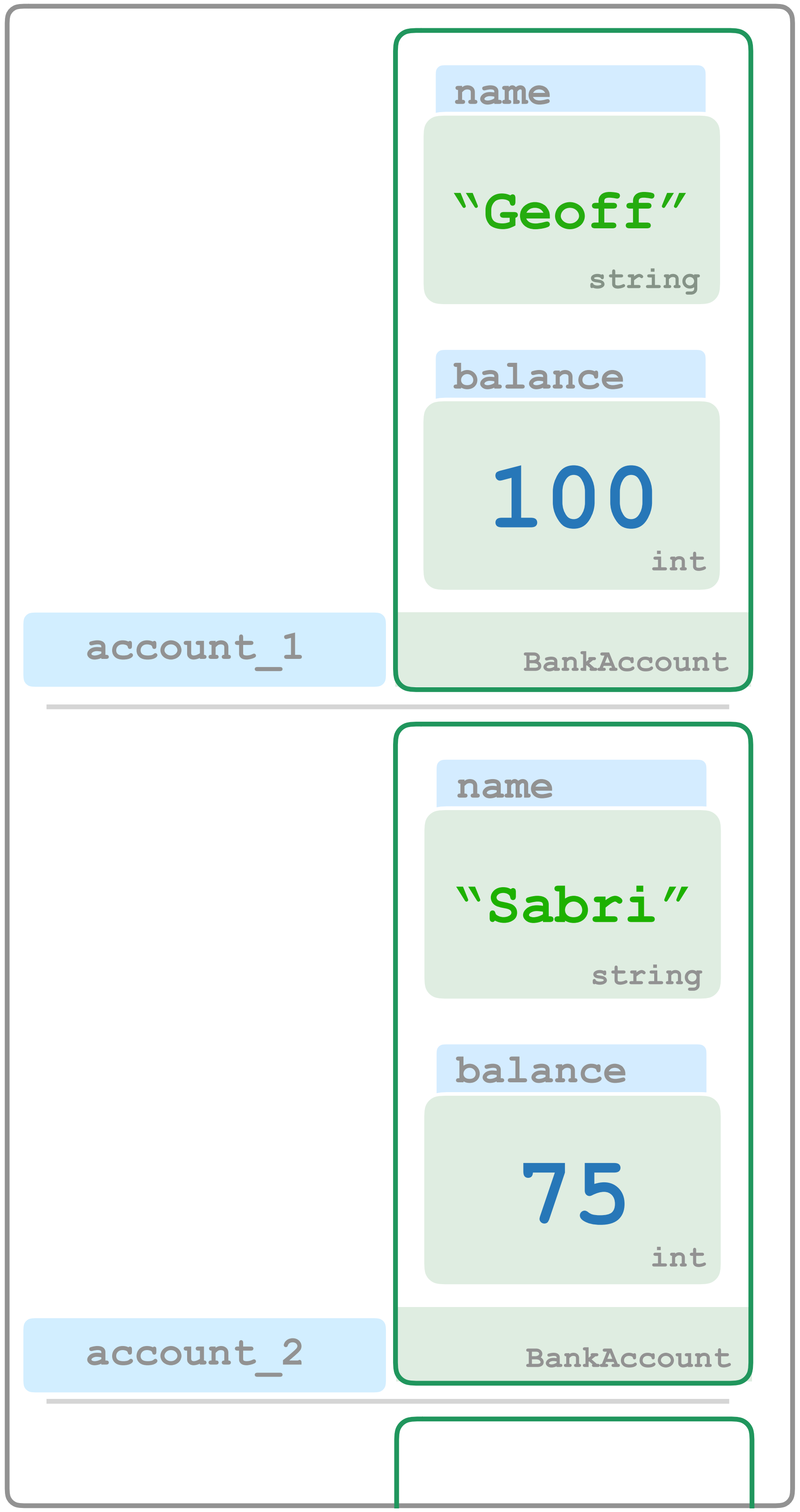

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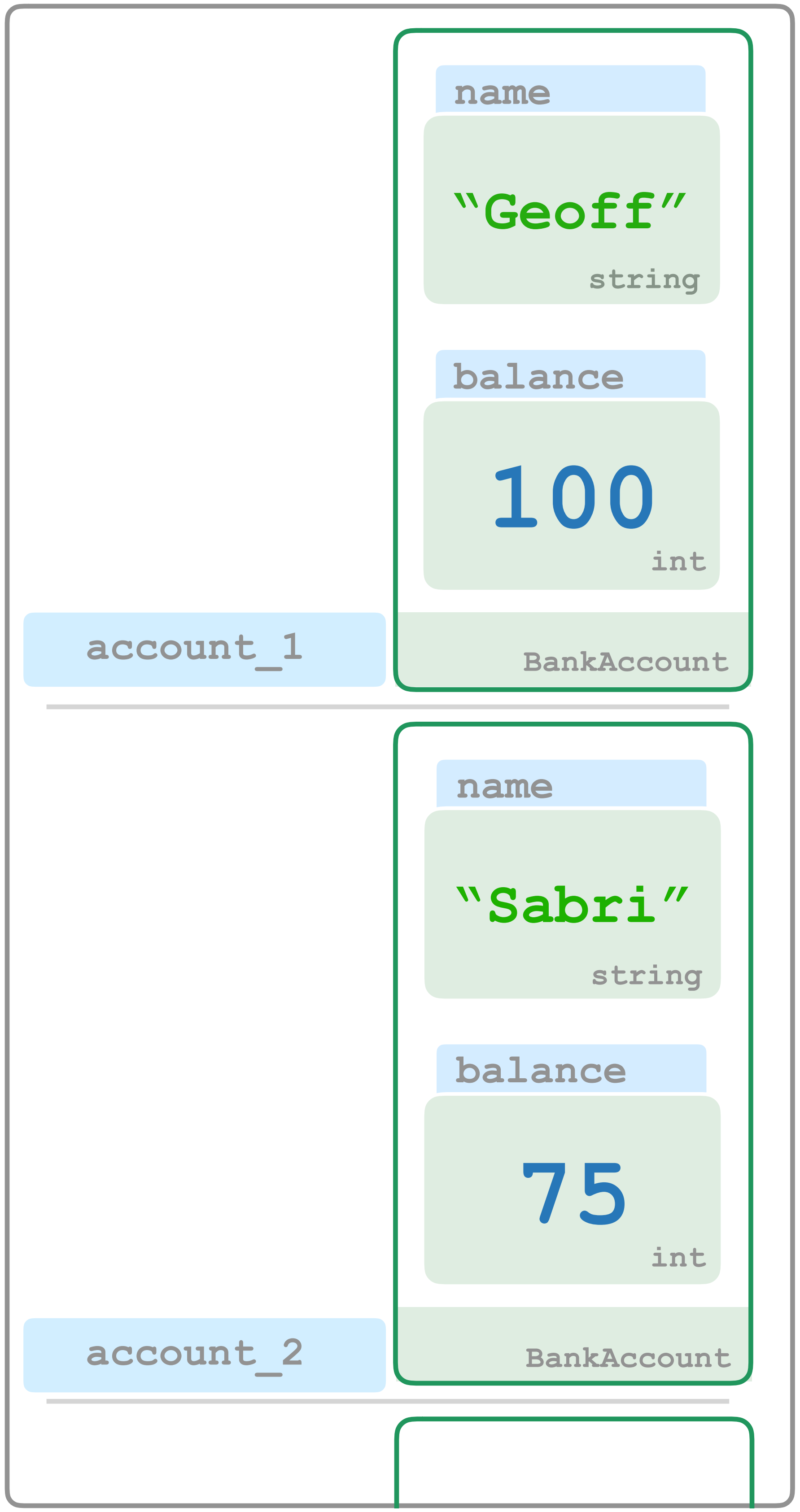
  print("Geoff has R$" + str(account_1.balance))
  print("Sabri has R$" + str(account_2.balance))
```

Output

```
Geoff has R$100
Sabri has R$75
```

Memory



Code

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```
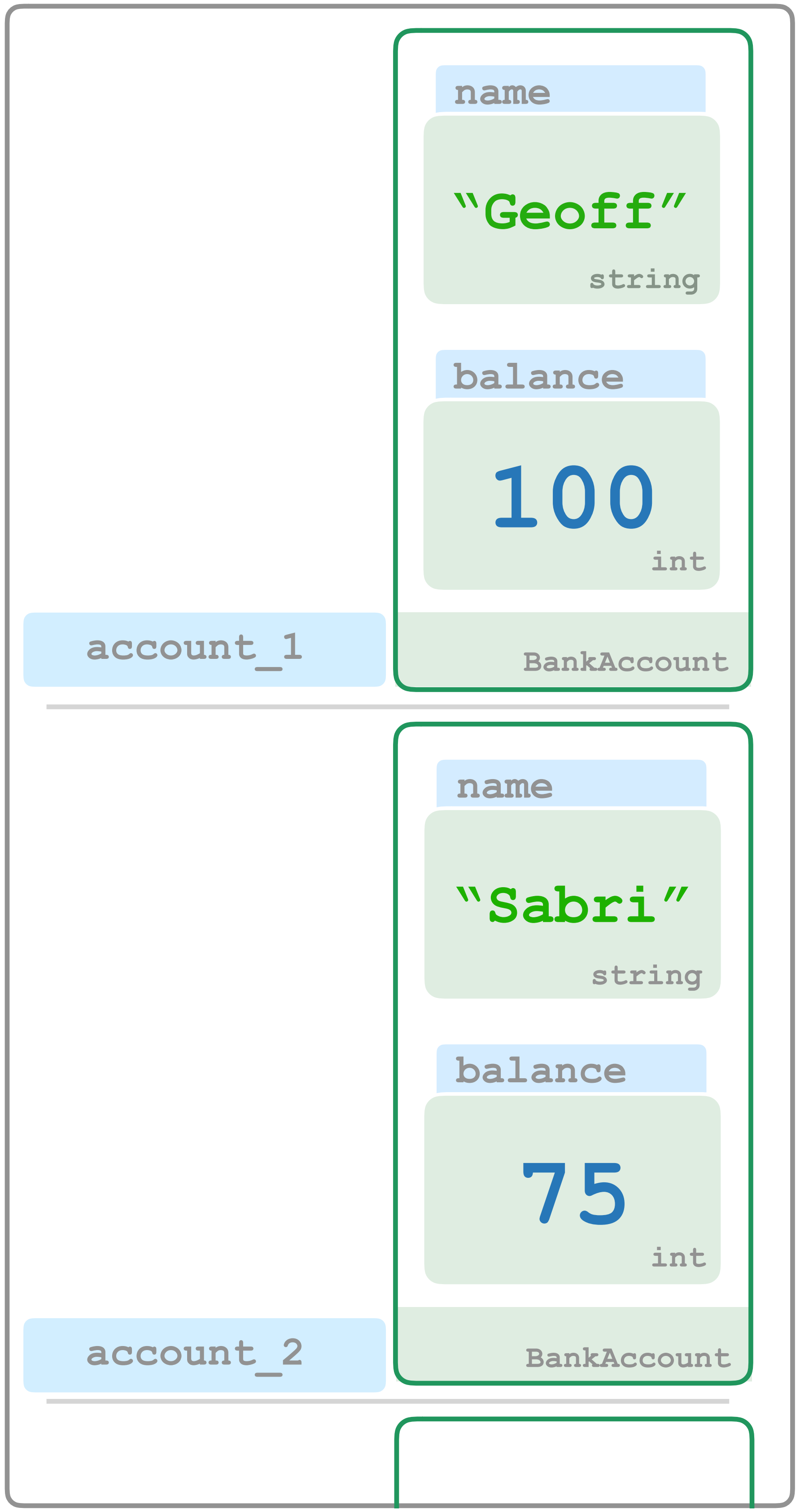

Output

```
Geoff has R$100
Sabri has R$75
```

Memory



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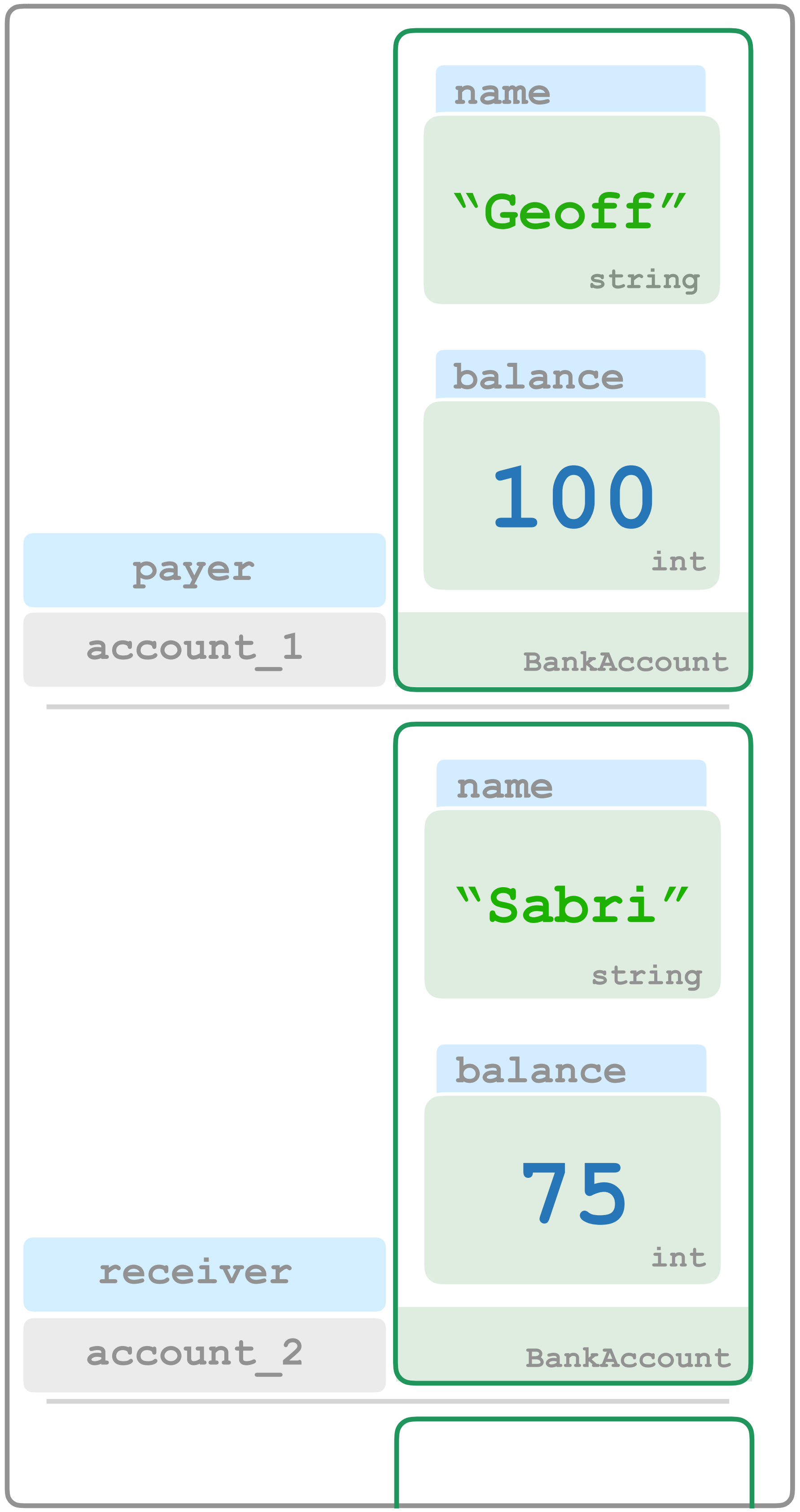
```

Output

```
Geoff has R$100
Sabri has R$75
```

Memory



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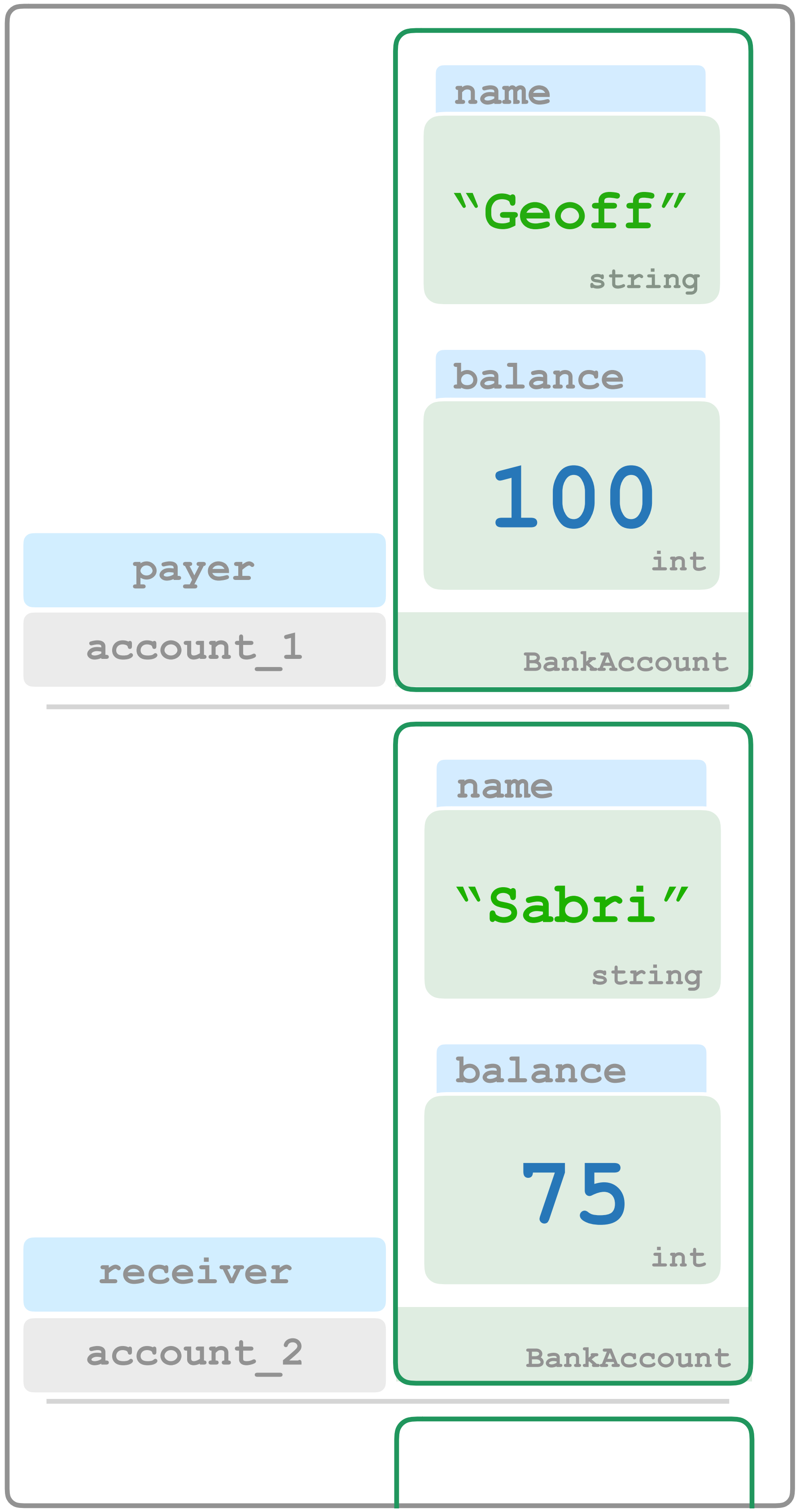
Output

```
Geoff has R$100
Sabri has R$75
```

Memory



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```
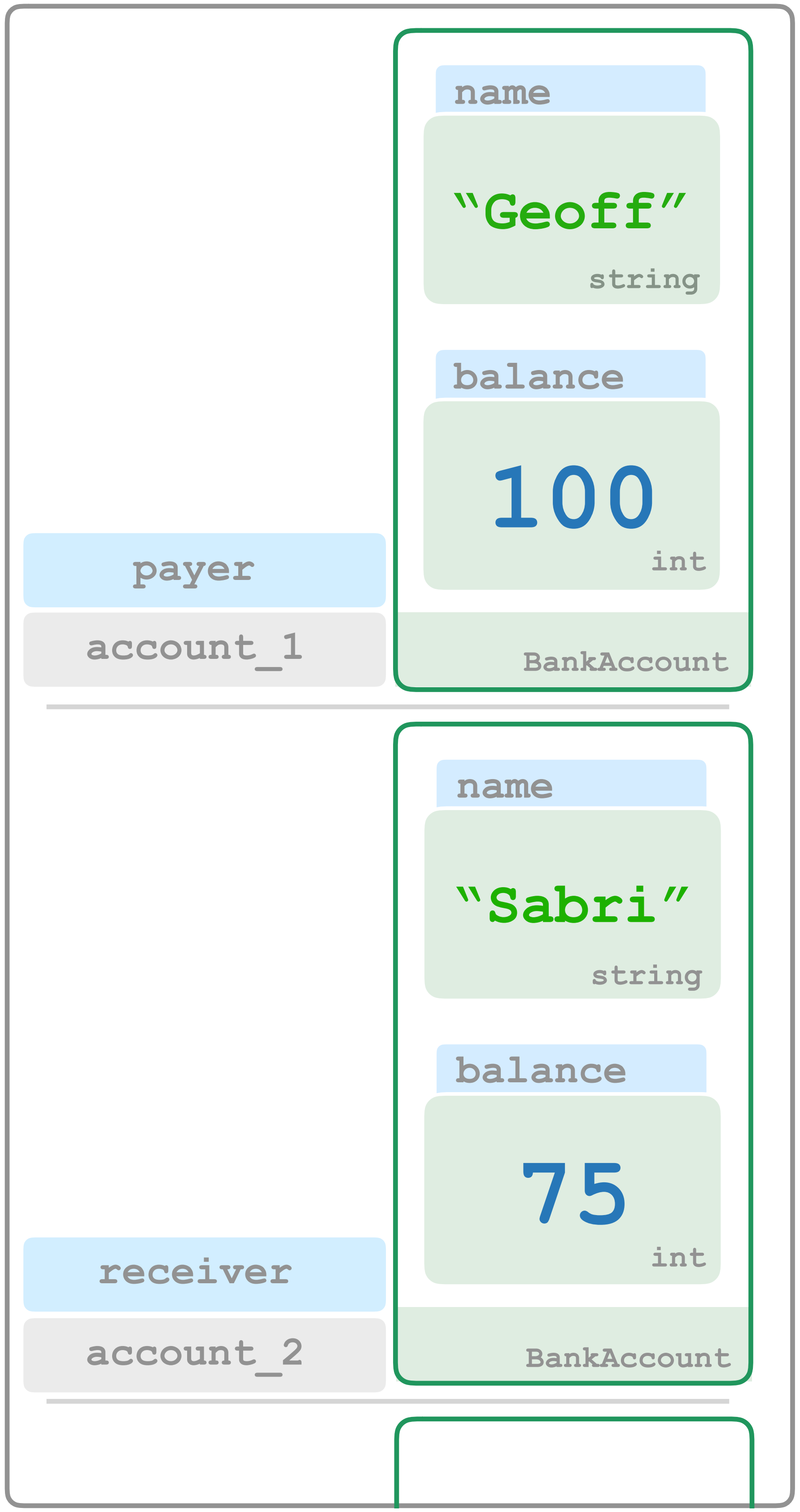

Output

```
Geoff has R$100
Sabri has R$75
How much to transfer?
```

Memory



payer

account_1

name

“Geoff”

string

balance

100

int

BankAccount

receiver

account_2

name

“Sabri”

string

balance

75

int

BankAccount

Code

```python
from util import BankAccount, input_float

def transfer(payer, receiver):
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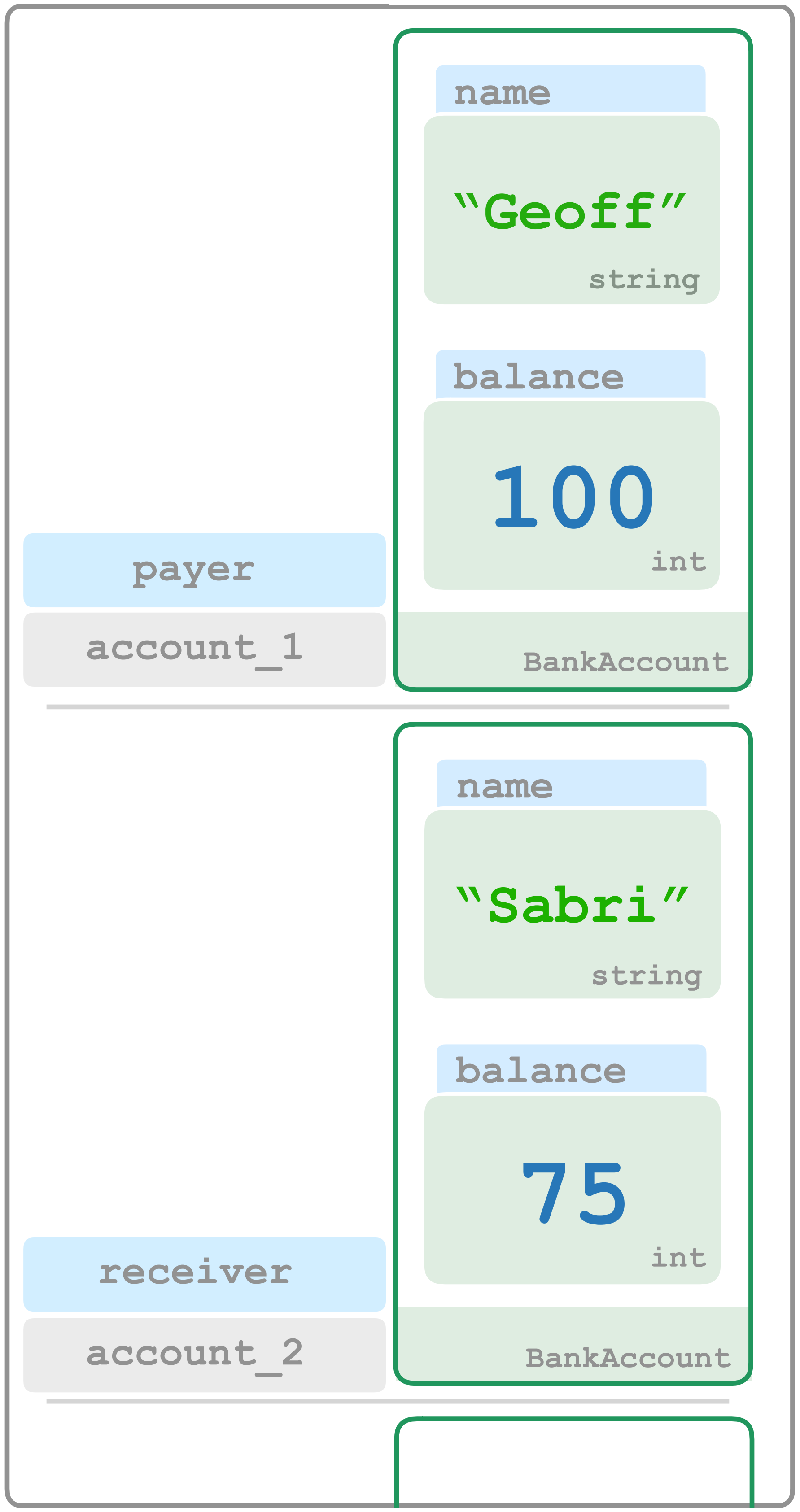
```

Memory



Output

```
Geoff has R$100
Sabri has R$75
How much to transfer? 10
```

Code

```
from util import BankAccount, input_float

def transfer(payer, receiver):
  transfer_amount = input_float("How much to transfer?")
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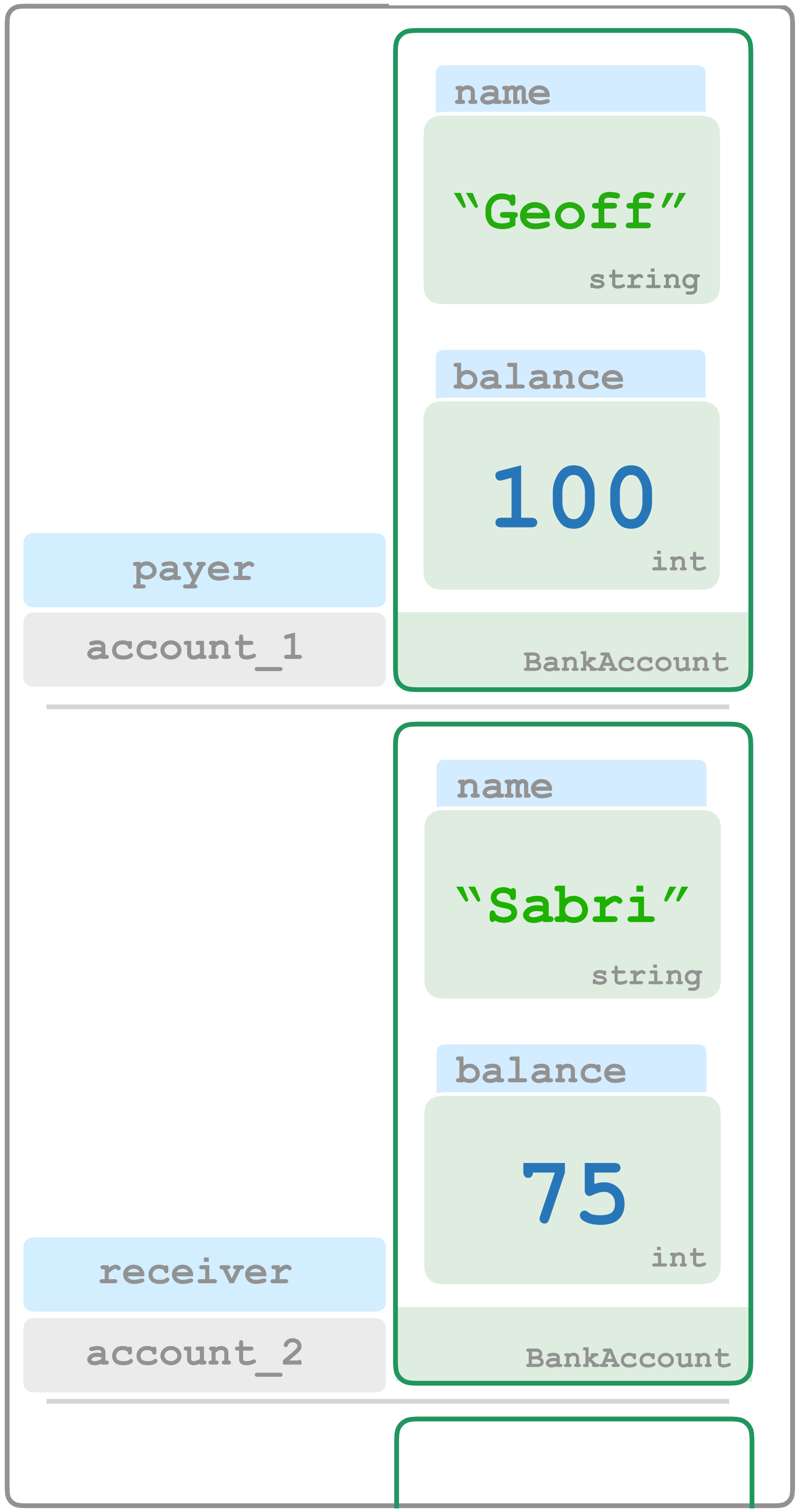
```

Output

```
Geoff has R$100
Sabri has R$75
How much to transfer? 10
```

Memory



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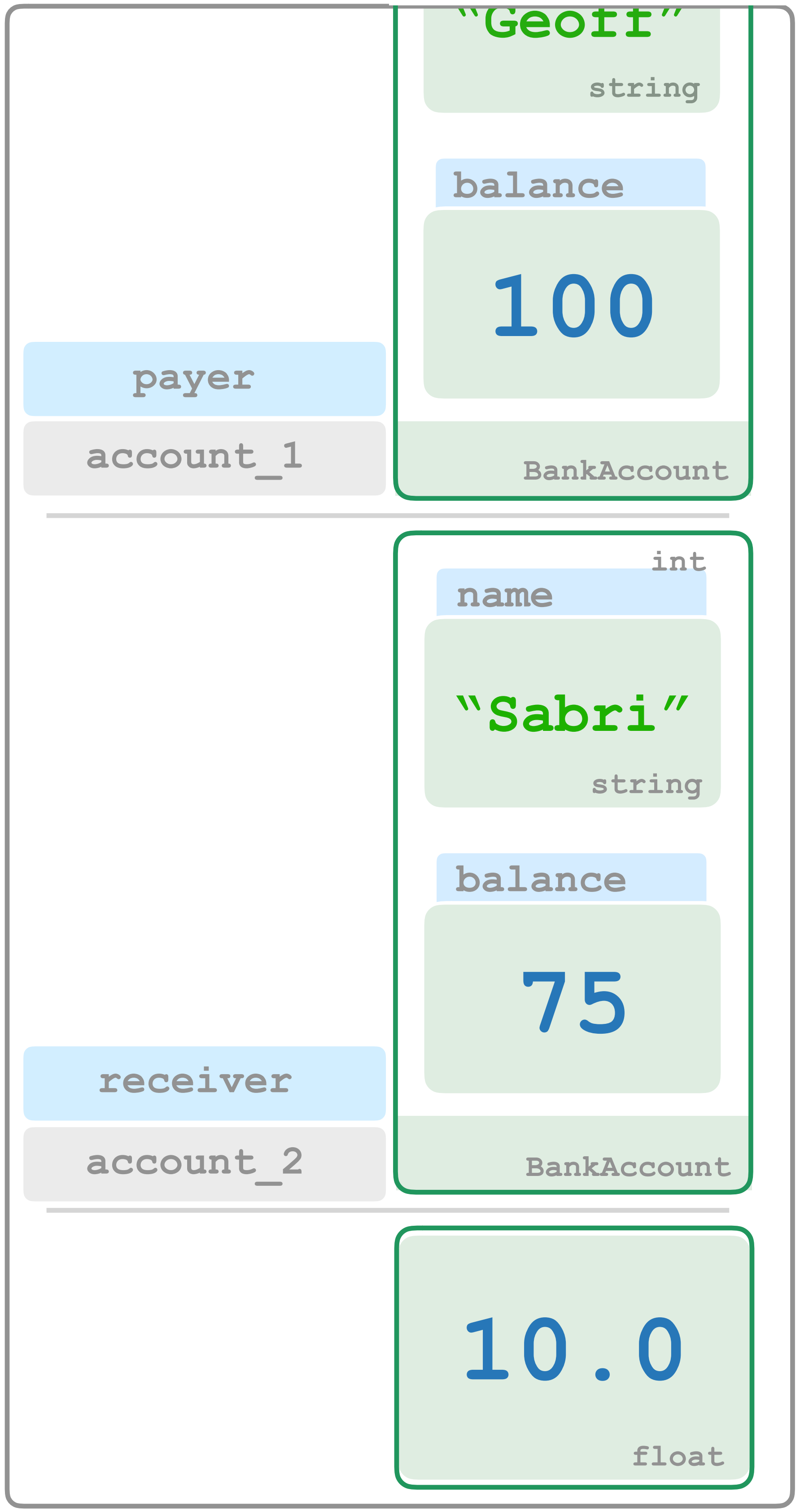
```

Output

```
Geoff has R$100
Sabri has R$75
How much to transfer? 10
```

Memory



Code

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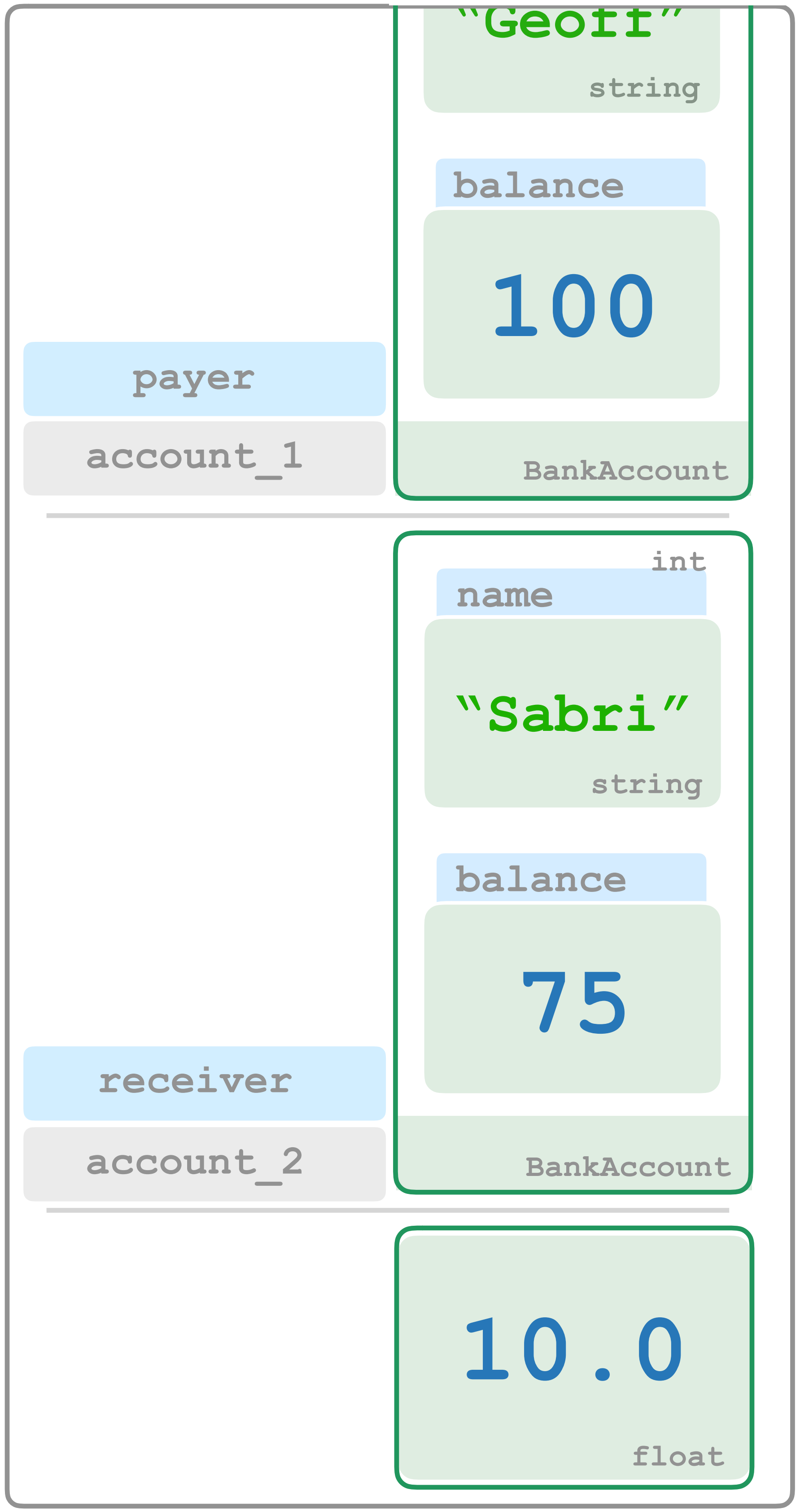
```

Output

```
Geoff has R$100
Sabri has R$75
How much to transfer? 10
```

Memory



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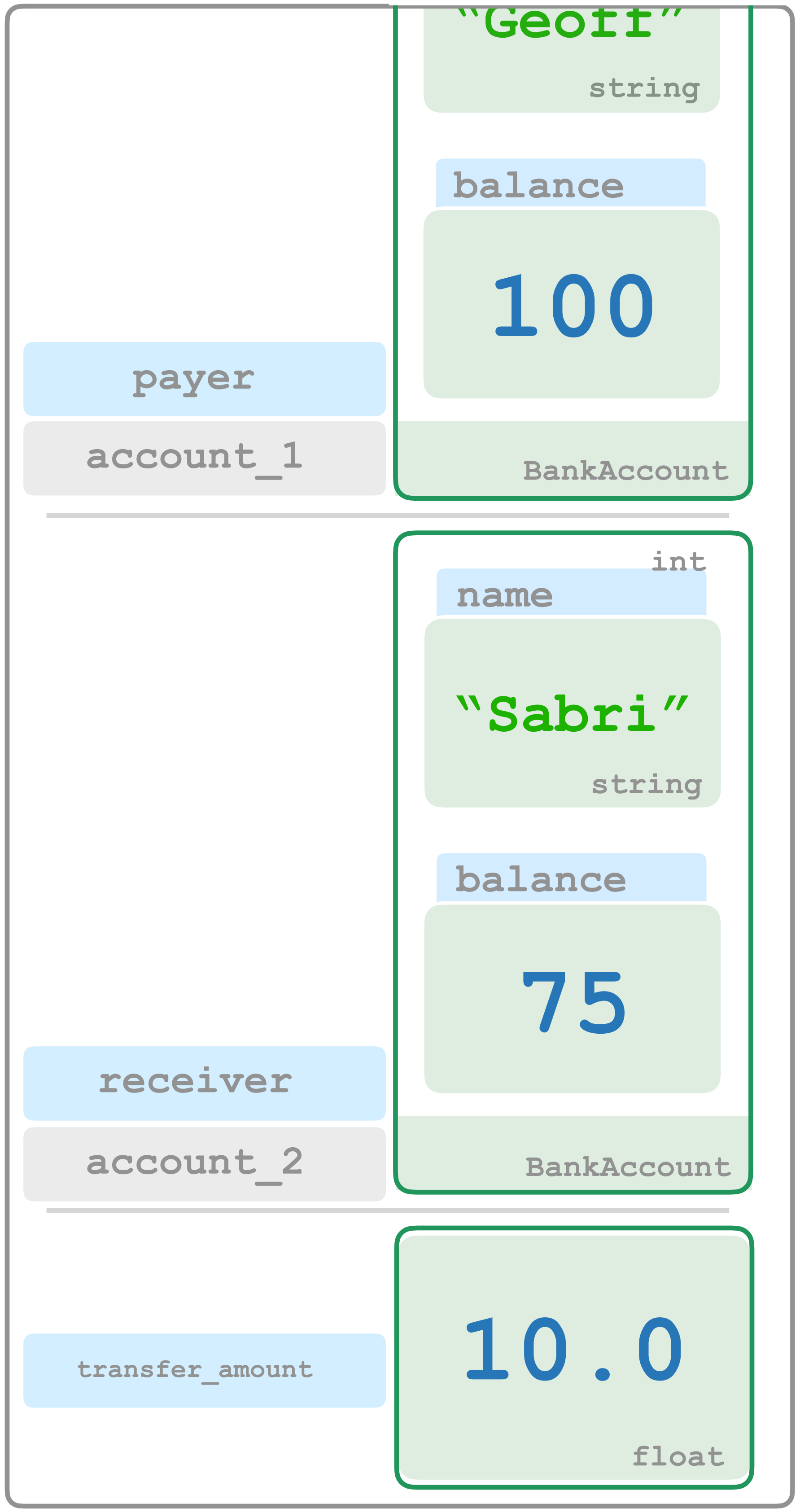
```

Output

```
Geoff has R$100
Sabri has R$75
How much to transfer? 10
```

Memory



Code

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from util import BankAccount, input_float

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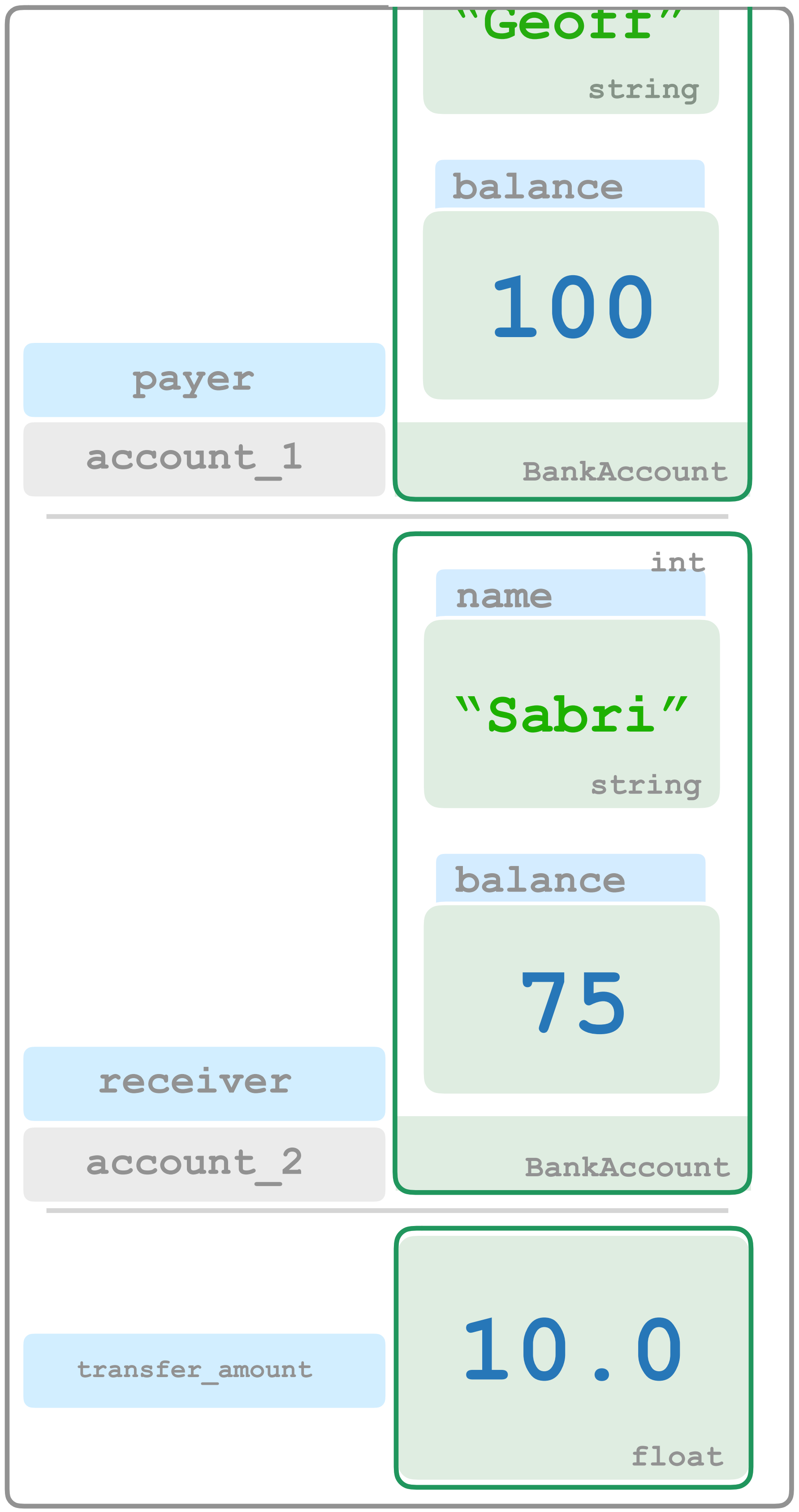
Memory



“Geoff”
string
balance
100
payer
account_1
BankAccount
int
name
“Sabri”
string
balance
75
receiver
account_2
BankAccount
transfer_amount
10.0
float

Output

```
Geoff has R$100
Sabri has R$75
How much to transfer? 10
```

Code

```
from util import BankAccount, input_float

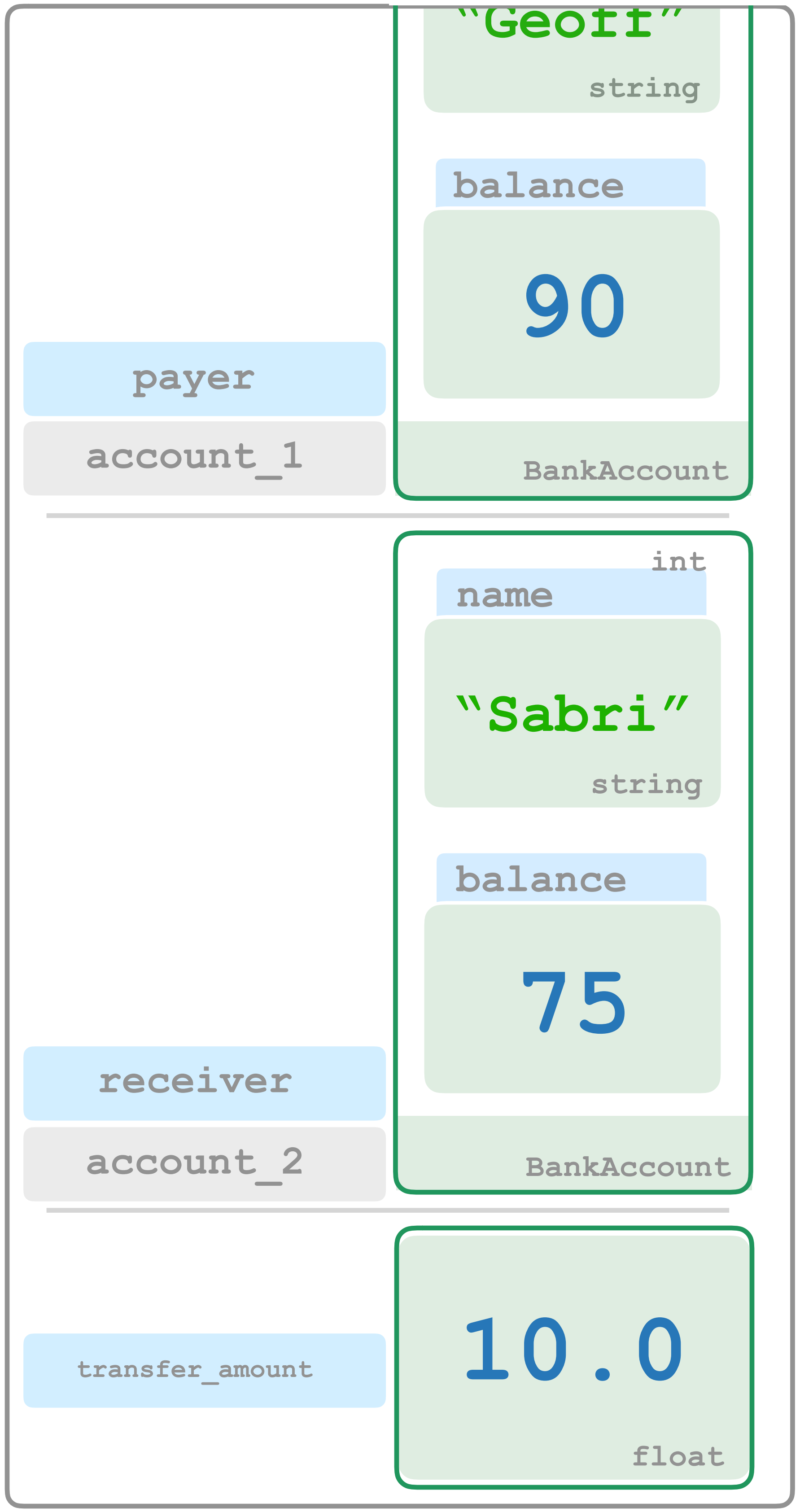
def transfer(payer, receiver):
  transfer_amount = input_float("How much to transfer?")
  payer.balance = payer.balance - transfer_amount
  receiver.balance = receiver.balance + transfer_amount

def main():
  account_1 = BankAccount("Geoff")
  account_1.balance = 100
  account_2 = BankAccount("Sabri")
  account_2.balance = 75
  print("Geoff has R$" + str(account_1.balance))
  print("Sabri has R$" + str(account_2.balance))
  transfer(account_1, account_2)
  print("Geoff has R$" + str(account_1.balance))
  print("Sabri has R$" + str(account_2.balance))
```

Output

```
Geoff has R$100
Sabri has R$75
How much to transfer? 10
```

Memory



Code

```python
from util import BankAccount, input_float

def transfer(payer, receiver):
  transfer_amount = input_float("How much to transfer?")
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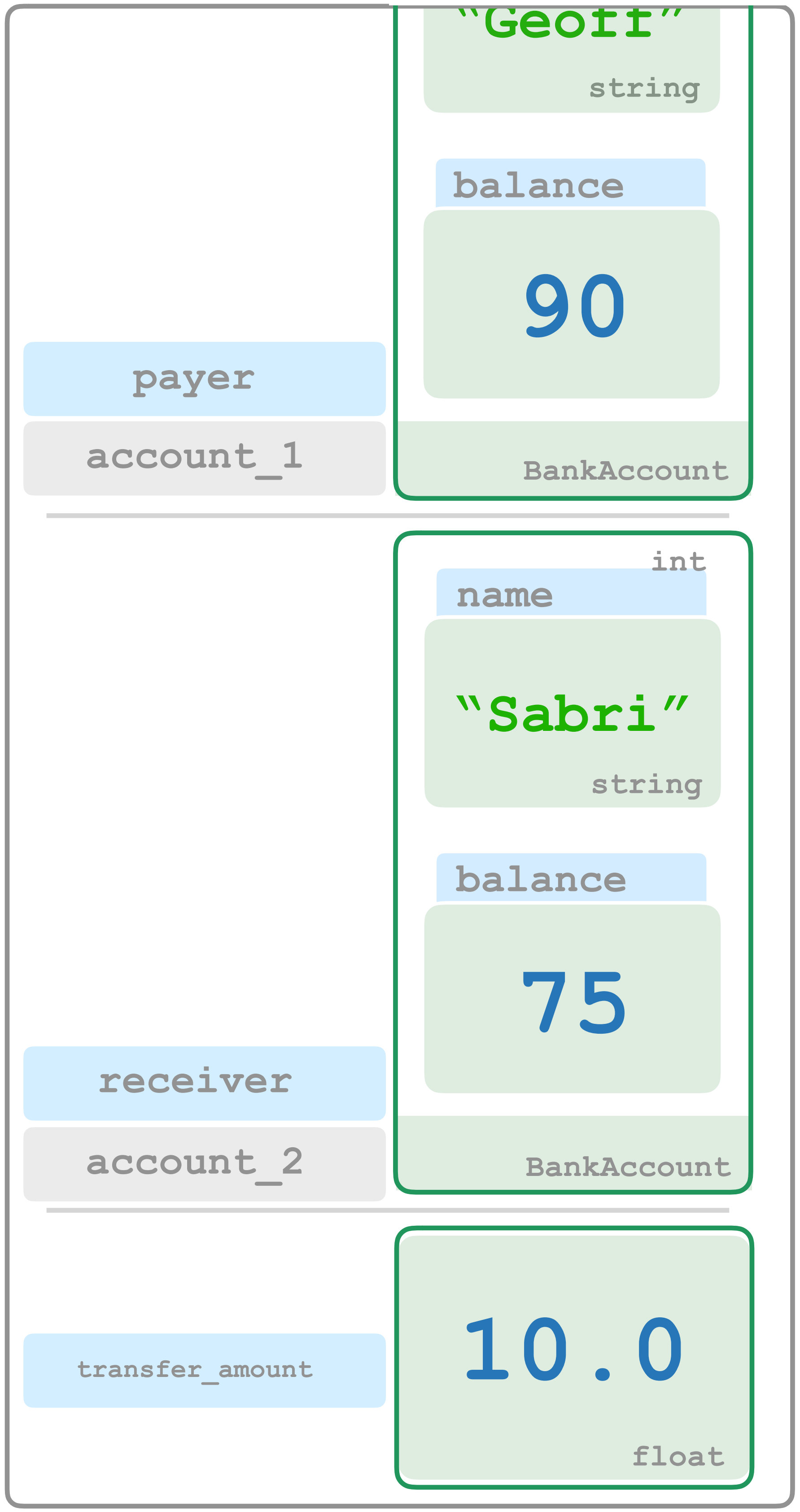
  print("Sabri has R$" + str(account_2.balance))
```

Output

```
Geoff has R$100
Sabri has R$75
How much to transfer? 10
```

Memory



Code

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from util import BankAccount, input_float

def transfer(payer, receiver):
  transfer_amount = input_float("How much to transfer?")
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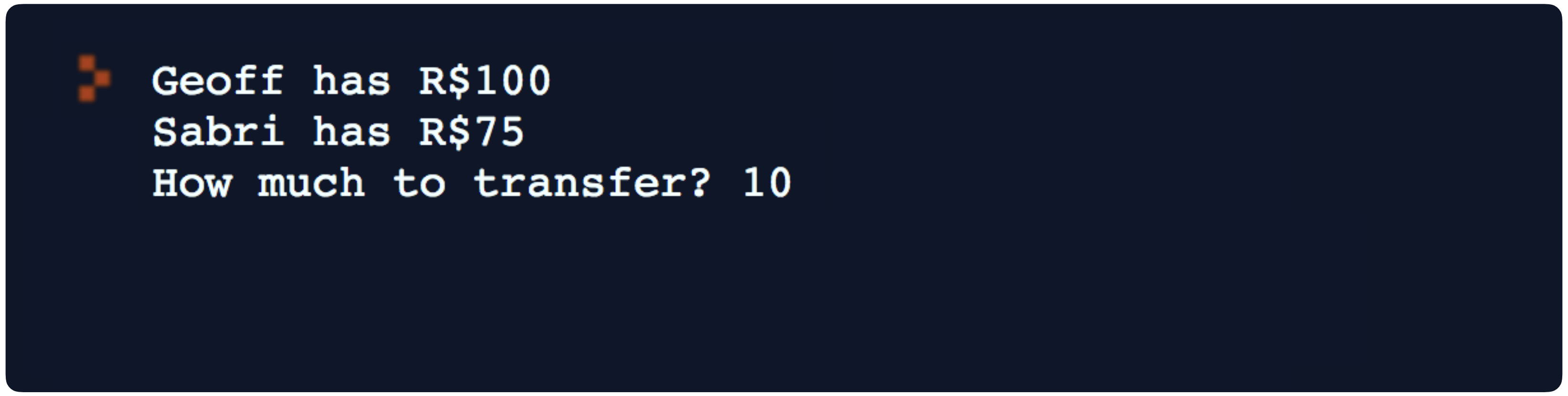
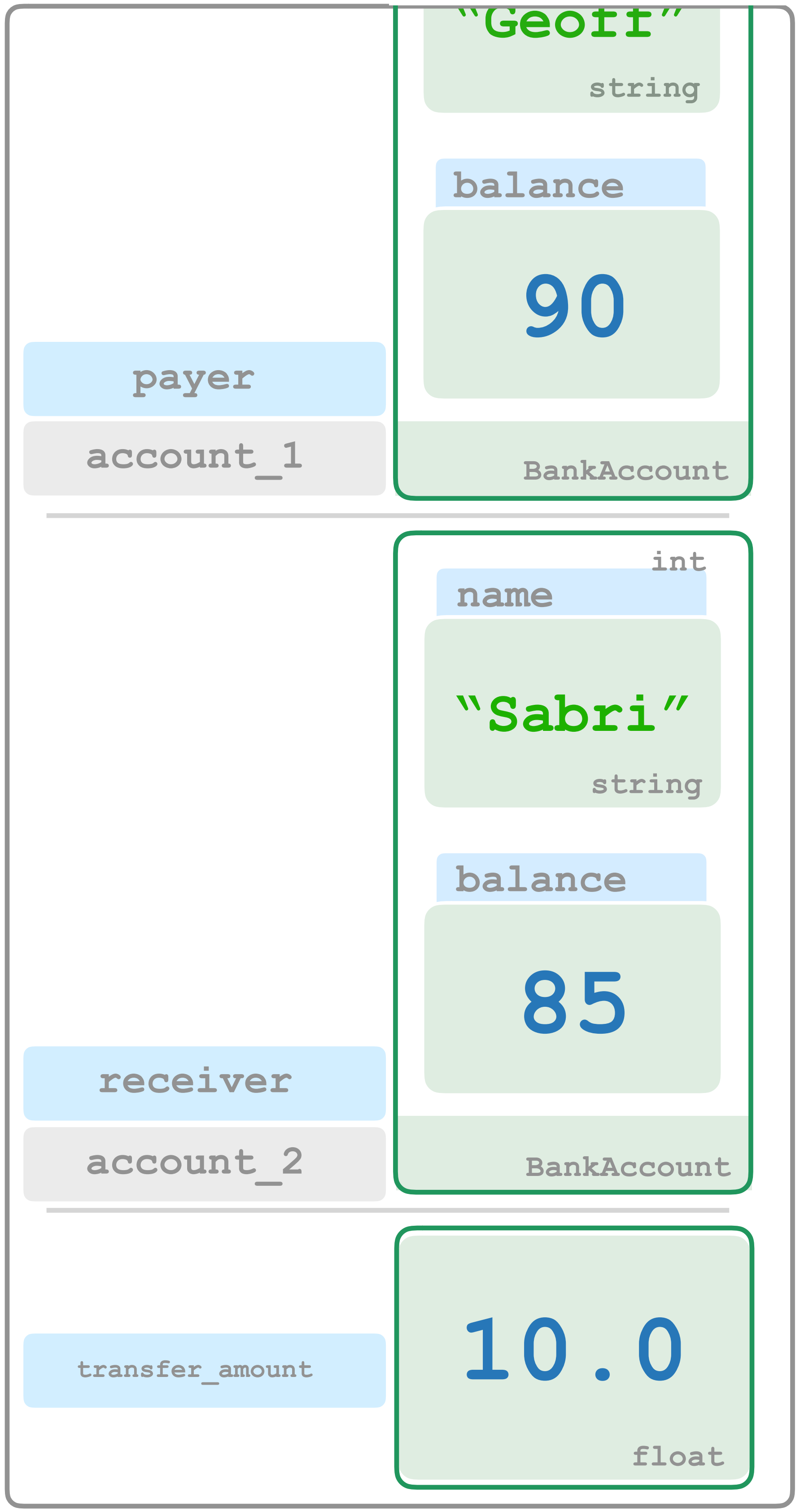
  transfer(account_1, account_2)
  print("Geoff has R$" + str(account_1.balance))
  print("Sabri has R$" + str(account_2.balance))
```

Output



```
Geoff has R$100
Sabri has R$75
How much to transfer? 10
```

Memory



Code

```
from util import BankAccount, input_float

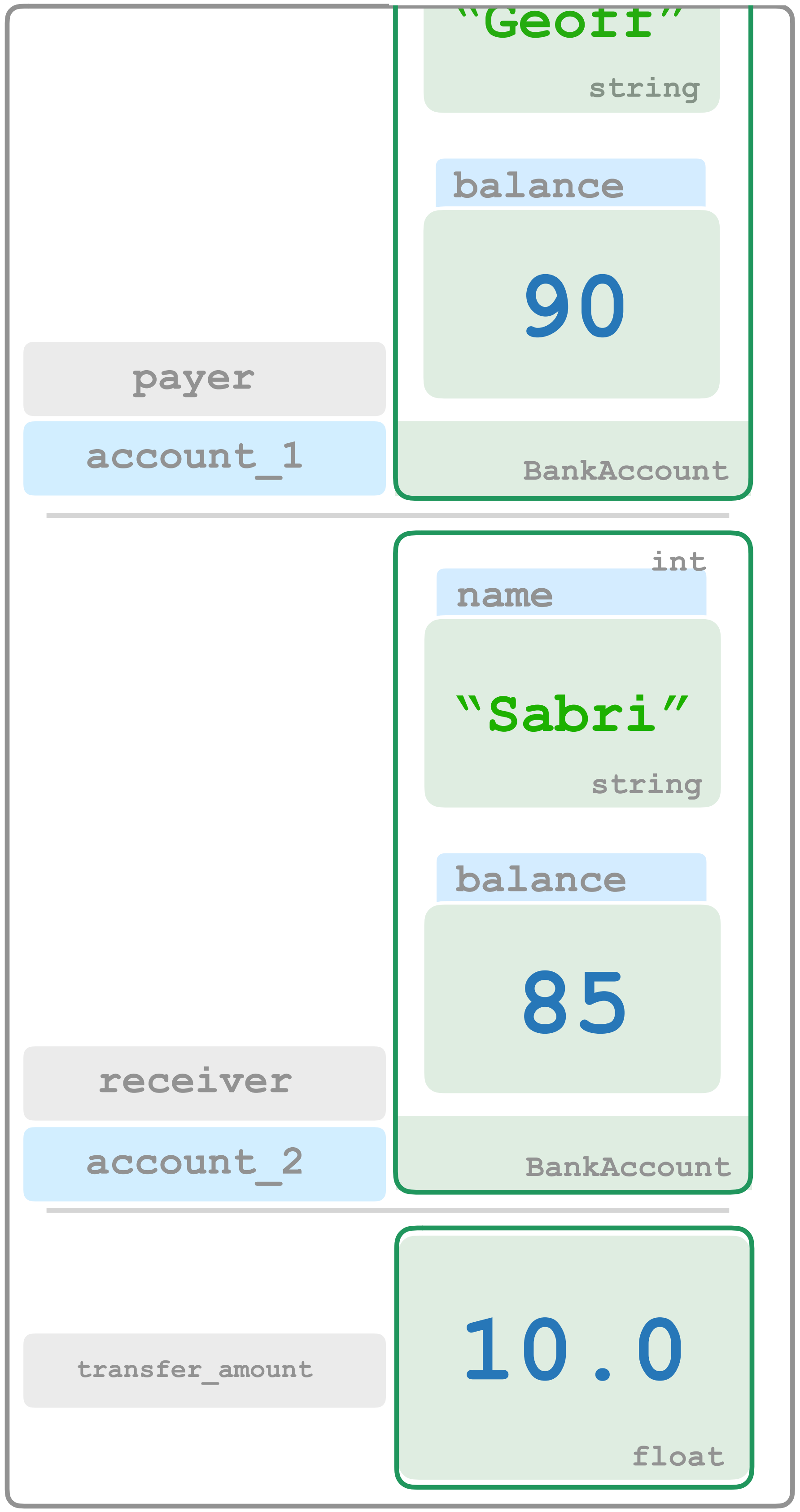
def transfer(payer, receiver):
  transfer_amount = input_float("How much to transfer?")
  payer.balance -= transfer_amount
  receiver.balance += transfer_amount

def main():
  account_1 = BankAccount("Geoff")
  account_1.balance = 100
  account_2 = BankAccount("Sabri")
  account_2.balance = 75
  print("Geoff has R$" + str(account_1.balance))
  print("Sabri has R$" + str(account_2.balance))
  transfer(account_1, account_2)
  print("Geoff has R$" + str(account_1.balance))
  print("Sabri has R$" + str(account_2.balance))
```

Output

```
Geoff has R$100
Sabri has R$75
How much to transfer? 10
```

Memory



"Geoff"
string
balance
90
payer
account_1
BankAccount
int
name
"Sabri"
string
balance
85
receiver
account_2
BankAccount
transfer_amount
10.0
float

Code

```
from util import BankAccount, input_float

def transfer(payer, receiver):
  transfer_amount = input_float("How much to transfer?")
  payer.balance -= transfer_amount
  receiver.balance += transfer_amount

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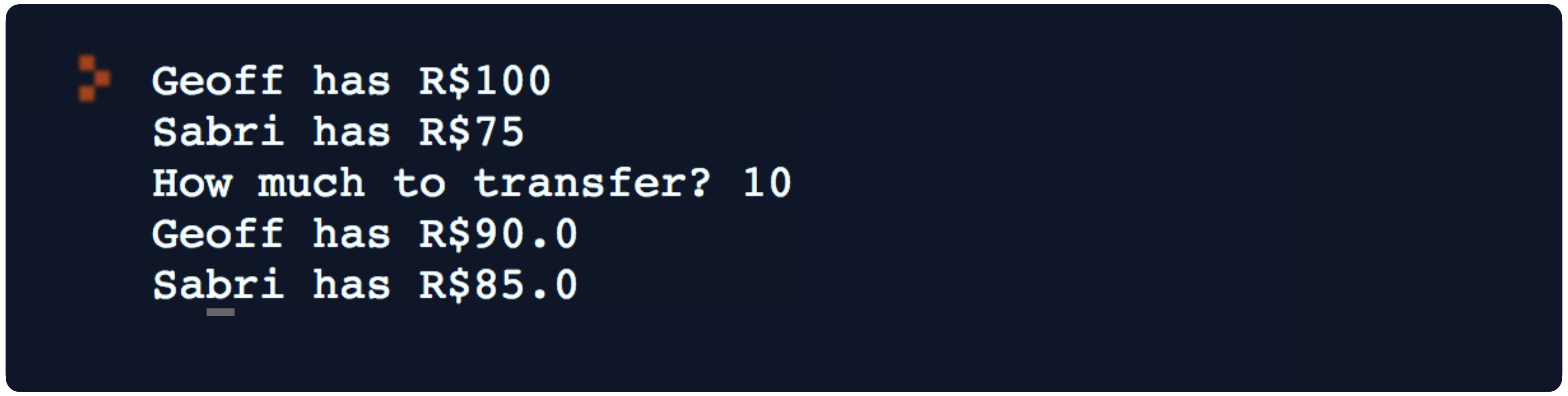
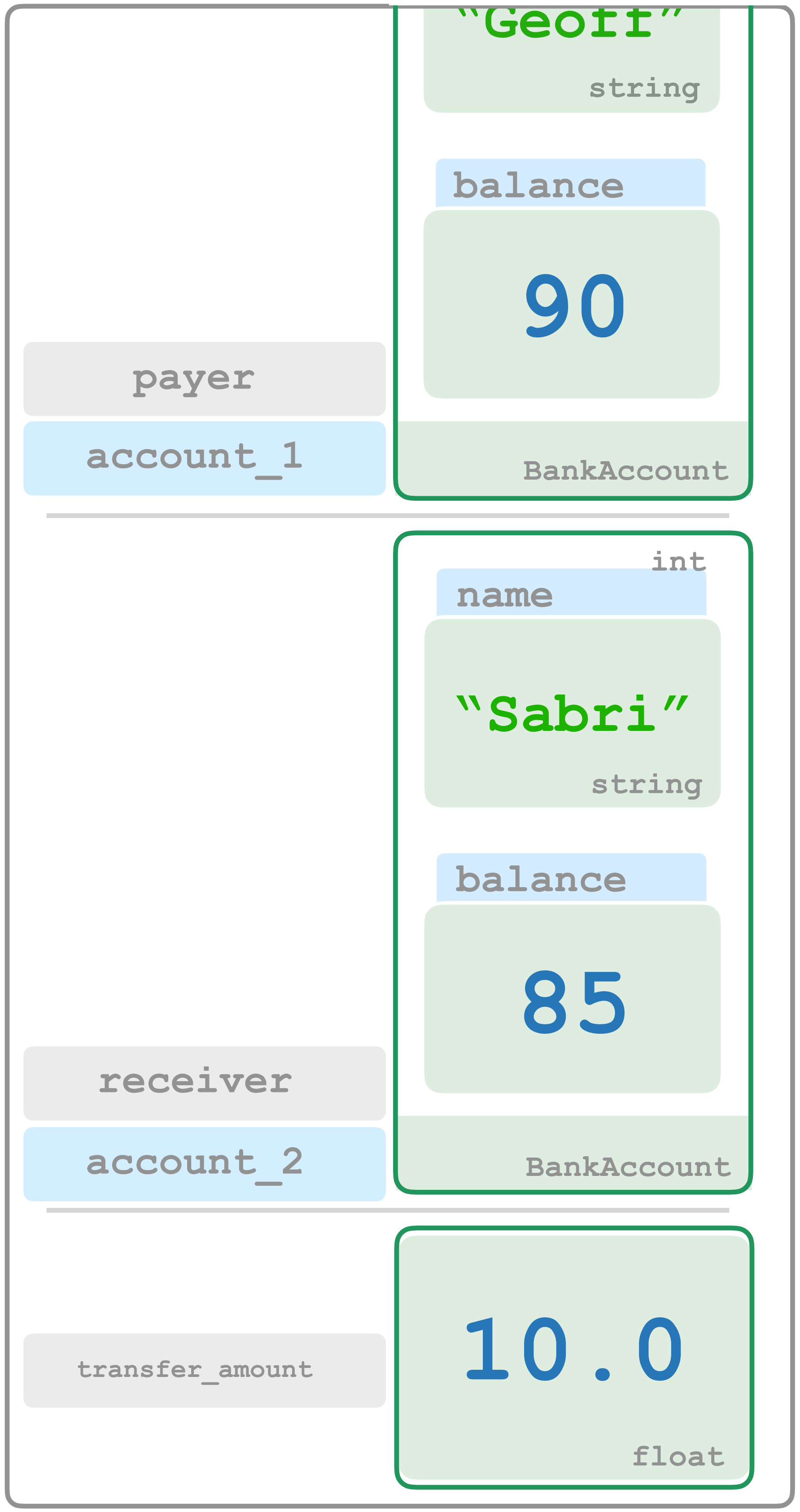
  transfer(account_1, account_2)
  print("Geoff has R$" + str(account_1.balance))
  print("Sabri has R$" + str(account_2.balance))
```

Output



```
Geoff has R$100
Sabri has R$75
How much to transfer? 10
Geoff has R$90.0
Sabri has R$85.0
```

Memory



Transfer (Link!)

How do we know what **functions** and **variables** are **available**?

Definition

Documentation - *Information about a class describing every usable function and object.*

Today’s **Exercises**

Caixa Eletrônico