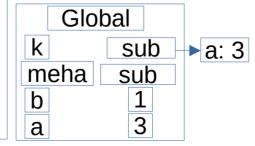
```
int a = 2 + 1, b = 1;
sub meha(int c) {
      b := a + c:
sub k (int b, sub go, sub ku) {
      sub meha(int c) {
            a := b - c;
      int a = 6 + 1;
      if (b < 3 * (2 + 1)) {
            k(b + 3 * (2 + 1), meha, qo);
      ext{} else if (b < 6 * (2 + 1)) {
            k(b + 3 * (2 + 1), ku, meha);
      } else {
            int b = 6 - b
            go(a + b);
            ku(a - b);
      print(a, b)
k(a, meha, meha);
print(a, b)
```

## Alcance Dinamico y Clausura con Asociacion Superficial

Las clausuras se realizan Al Ejecutar las subrutinas



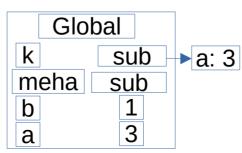
```
int a = 2 + 1, b = 1;
sub meha(int c) {
      b := a + c;
sub k (int b, sub go, sub ku) {
      sub meha(int c) {
            a := b - c;
      int a = 6 + 1;
      if (b < 3 * (2 + 1)) {
            k(b + 3 * (2 + 1), meha, go);
     ext{} else if (b < 6 * (2 + 1)) {
            k(b + 3 * (2 + 1), ku, meha);
      } else {
            int b = 6 - b
            go(a + b);
            ku(a - b);
                                                 Global
                                             k
      print(a, b)
                                             meha
k(a, meha, meha);
print(a, b)
                                             a
```

sub

sub

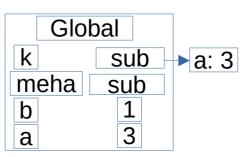
**▶**a: 3

```
int a = 2 + 1, b = 1;
sub meha(int c) {
      b := a + c;
sub k (int b, sub go, sub ku) {
      sub meha(int c) {
            a := b - c;
      int a = 6 + 1;
      if (b < 3 * (2 + 1)) {
            k(b + 3 * (2 + 1), meha, go);
      ellipsymbol{} else if (b < 6 * (2 + 1)) {
            k(b + 3 * (2 + 1), ku, meha);
      } else {
            int b = 6 - b
            go(a + b);
            ku(a - b);
      print(a, b)
k(a, meha, meha);
print(a, b)
```



4 a: 7
3 meha: sub
2 ku: meha(global)
1 go: meha(global)
0 b: 3

```
int a = 2 + 1, b = 1;
sub meha(int c) {
      b := a + c;
sub k (int b, sub go, sub ku) {
      sub meha(int c) {
            a := b - c;
      int a = 6 + 1;
      if (b < 3 * (2 + 1)) {
            k(b + 3 * (2 + 1), meha, go);
      ext{} else if (b < 6 * (2 + 1)) {
            k(b + 3 * (2 + 1), ku, meha);
      } else {
            int b = 6 - b
            go(a + b);
            ku(a - b);
      print(a, b)
k(a, meha, meha);
print(a, b)
```



4 a: 7

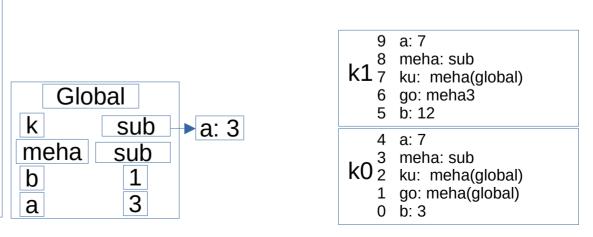
0 b: 3

3 meha: sub

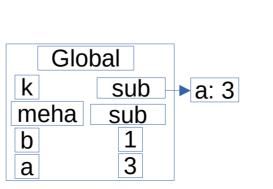
k0 2 ku: meha(global)

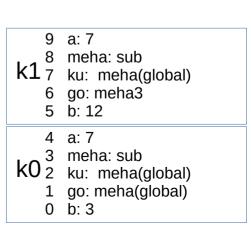
1 go: meha(global)

```
int a = 2 + 1, b = 1;
sub meha(int c) {
      b := a + c;
sub k (int b, sub go, sub ku) {
      sub meha(int c) {
            a := b - c;
      int a = 6 + 1;
      if (b < 3 * (2 + 1)) {
            k(b + 3 * (2 + 1), meha, go);
      ellipsymbol{} else if (b < 6 * (2 + 1)) {
            k(b + 3 * (2 + 1), ku, meha);
      } else {
            int b = 6 - b
            go(a + b);
            ku(a - b);
      print(a, b)
k(a, meha, meha);
print(a, b)
```



```
int a = 2 + 1, b = 1;
sub meha(int c) {
      b := a + c;
sub k (int b, sub go, sub ku) {
      sub meha(int c) {
            a := b - c;
      int a = 6 + 1;
      if (b < 3 * (2 + 1)) {
            k(b + 3 * (2 + 1), meha, go);
      \} else if (b < 6 * (2 + 1)) {
            k(b + 3 * (2 + 1), ku, meha);
      } else {
            int b = 6 - b
            go(a + b);
            ku(a - b);
      print(a, b)
k(a, meha, meha);
print(a, b)
```



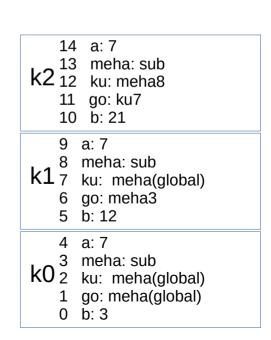


```
int a = 2 + 1, b = 1;
sub meha(int c) {
      b := a + c;
sub k (int b, sub go, sub ku) {
      sub meha(int c) {
            a := b - c;
      int a = 6 + 1;
      if (b < 3 * (2 + 1)) {
            k(b + 3 * (2 + 1), meha, go);
      ellipsymbol{} else if (b < 6 * (2 + 1)) {
            k(b + 3 * (2 + 1), ku, meha);
      } else {
            int b = 6 - b
            go(a + b);
            ku(a - b);
                                                   Global
                                               k
      print(a, b)
                                              meha
k(a, meha, meha);
                                               b
print(a, b)
                                               a
```

sub

sub

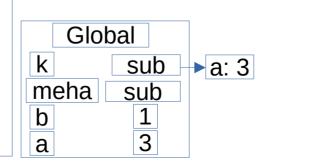
**▶** a: 3

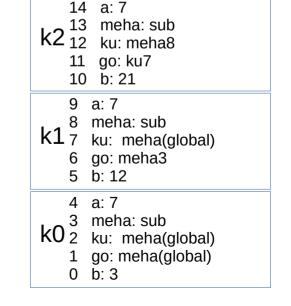


```
int a = 2 + 1, b = 1;
sub meha(int c) {
      b := a + c;
sub k (int b, sub go, sub ku) {
      sub meha(int c) {
            a := b - c;
      int a = 6 + 1;
                                                                                          15 b: -15
      if (b < 3 * (2 + 1)) {
                                                                                             a: 7
            k(b + 3 * (2 + 1), meha, go);
                                                                                          13 meha: sub
                                                                                      k2 13 lilella. 3ub
ku: meha8
      ellipse if (b < 6 * (2 + 1)) {
                                                                                          11 go: ku7
            k(b + 3 * (2 + 1), ku, meha);
                                                                                          10 b: 21
      } else {
            int b = 6 - b
                                                                                          9 a: 7
                                                                                          8 meha: sub
            go(a + b);
                                                                                      k1 7 ku: meha(global)
            ku(a - b);
                                                 Global
                                                                                          6 go: meha3
                                                                                          5 b: 12
                                             k
                                                         sub
                                                                 ▶ a: 3
      print(a, b)
                                                                                          4 a: 7
                                             meha
                                                        sub
                                                                                          3 meha: sub
                                                                                      k0 2 ku: meha(global)
k(a, meha, meha);
                                             b
print(a, b)
                                                                                          1 go: meha(global)
                                             a
                                                                                          0 b: 3
```

```
int a = 2 + 1. b = 1:
sub meha(int c) {
      b := a + c:
sub k (int b, sub go, sub ku) {
      sub meha(int c) {
            a := b - c:
      int a = 6 + 1;
      if (b < 3 * (2 + 1)) {
            k(b + 3 * (2 + 1), meha, go);
      ext{} else if (b < 6 * (2 + 1)) {
            k(b + 3 * (2 + 1), ku, meha);
      } else {
            int b = 6 - b
            go(a + b);
            ku(a - b);
      print(a, b)
k(a, meha, meha);
print(a, b)
```

Como se esta ejecutando go se le crea la clausura Recordando que go11 = ku7= meha(global)





15 b: -15

```
int a = 2 + 1, b = 1;
sub meha(int c) {
      b := a + c:
sub k (int b, sub go, sub ku) {
      sub meha(int c) {
            a := b - c;
      int a = 6 + 1;
      if (b < 3 * (2 + 1)) {
            k(b + 3 * (2 + 1), meha, go);
      ellipse if (b < 6 * (2 + 1)) {
            k(b + 3 * (2 + 1), ku, meha);
      } else {
            int b = 6 - b
            go(a + b);
            ku(a - b);
      print(a, b)
k(a, meha, meha);
print(a, b)
```

Global

sub

sub

**▶** a: 3

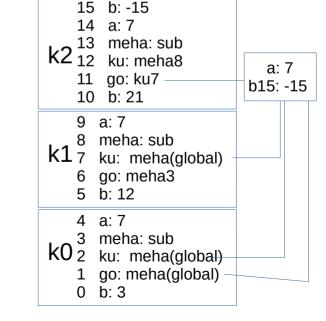
k

b

a

meha

Como hay alcance estatico, en la clausura Tenemos... a es 7 y b es global



```
int a = 2 + 1, b = 1;
sub meha(int c) {
      b := a + c;
sub k (int b, sub go, sub ku) {
      sub meha(int c) {
            a := b - c;
                                                                                9011_{17} b<sub>15: 7-8 = -1</sub>
                                                                                      16 c: 7-15 = -8
      int a = 6 + 1;
                                                                                      15 b: -15 -1
      if (b < 3 * (2 + 1)) {
                                                                                      14 a: 7
            k(b + 3 * (2 + 1), meha, qo);
                                                                                      13 meha: sub
                                                                                  k2 13 ku: meha8
      ellipse if (b < 6 * (2 + 1)) {
                                                                                                              a: 7
                                                                                      11 go: ku7 -
            k(b + 3 * (2 + 1), ku, meha);
                                                                                                            b15: -15
                                                                                      10 b: 21
      } else {
                                                                                      9 a: 7
            int b = 6 - b
                                                                                      8 meha: sub
            go(a + b);
                                                                                  k17 ku: meha(global)
            ku(a - b);
                                                 Global
                                                                                      6 go: meha3
                                                                                      5 b: 12
                                             k
                                                         sub
                                                                 ▶a: 3
      print(a, b)
                                                                                      4 a: 7
                                             meha
                                                        sub
                                                                                      3 meha: sub
                                                                                  k0 2 ku: meha(global)
k(a, meha, meha);
                                             b
print(a, b)
                                                                                      1 go: meha(global)
                                             a
                                                                                      0 b: 3
```

```
int a = 2 + 1, b = 1;
sub meha(int c) {
      b := a + c;
sub k (int b, sub go, sub ku) {
      sub meha(int c) {
            a := b - c;
      int a = 6 + 1;
      if (b < 3 * (2 + 1)) {
            k(b + 3 * (2 + 1), meha, go);
      ellipsymbol{} else if (b < 6 * (2 + 1)) {
            k(b + 3 * (2 + 1), ku, meha);
      } else {
            int b = 6 - b
            go(a + b);
            ku(a - b);
      print(a, b)
k(a, meha, meha);
print(a, b)
```

## Hacemos la clausura de ku12

Global

sub

sub

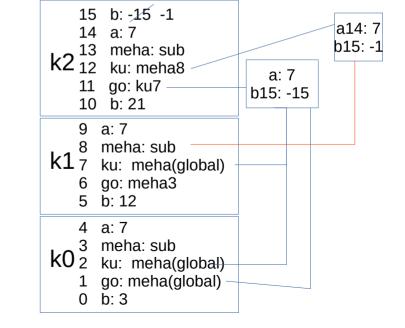
**▶** a: 3

k

b

a

meha



```
int a = 2 + 1, b = 1;
sub meha(int c) {
      b := a + c:
sub k (int b, sub go, sub ku) {
      sub meha(int c) {
            a := b - c;
      int a = 6 + 1;
      if (b < 3 * (2 + 1)) {
            k(b + 3 * (2 + 1), meha, qo);
      ellipse if (b < 6 * (2 + 1)) {
            k(b + 3 * (2 + 1), ku, meha);
      } else {
            int b = 6 - b
            go(a + b);
            ku(a - b);
      print(a, b)
k(a, meha, meha);
print(a, b)
```

## a14 se convierte en -9

Global

sub

sub

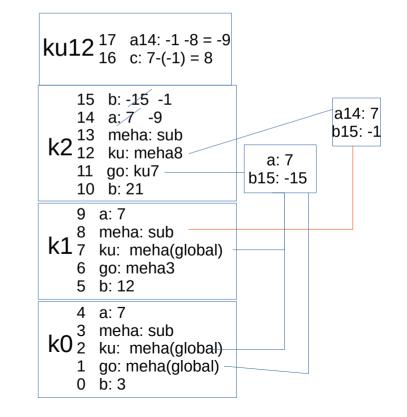
**▶** a: 3

k

b

a

meha

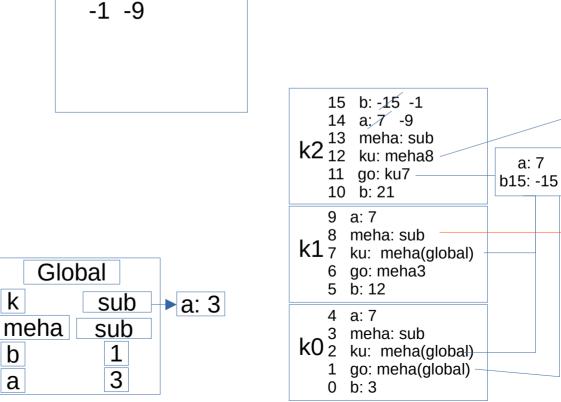


```
int a = 2 + 1, b = 1;
sub meha(int c) {
     b := a + c;
sub k (int b, sub go, sub ku) {
      sub meha(int c) {
            a := b - c;
      int a = 6 + 1;
                                                                                    15 b: -15 -1
     if (b < 3 * (2 + 1)) {
                                                                                    14 a: 7 -9
           k(b + 3 * (2 + 1), meha, qo);
                                                                                    13 meha: sub
                                                                                k2 13 ku: meha8
     ellipse if (b < 6 * (2 + 1)) {
                                                                                                            a: 7
                                                                                    11 go: ku7
           k(b + 3 * (2 + 1), ku, meha);
                                                                                                         b15: -15
                                                                                    10 b: 21
      } else {
                                                                                    9 a: 7
           int b = 6 - b
                                                                                    8 meha: sub
           go(a + b);
                                                                                k17 ku: meha(global)
           ku(a - b);
                                                Global
                                                                                    6 go: meha3
                                                                                    5 b: 12
                                            k
                                                       sub
                                                                ▶ a: 3
      print(a, b)
                                                                                    4 a: 7
                                            meha
                                                       sub
                                                                                    3 meha: sub
k(a, meha, meha);
                                                                                k0 2 ku: meha(global)
                                            b
print(a, b)
                                                                                      go: meha(global)
                                            a
                                                                                    0 b: 3
```

a14: 7

b15: -1

```
int a = 2 + 1, b = 1;
sub meha(int c) {
      b := a + c;
sub k (int b, sub go, sub ku) {
      sub meha(int c) {
            a := b - c;
      int a = 6 + 1;
      if (b < 3 * (2 + 1)) {
            k(b + 3 * (2 + 1), meha, qo);
      ellipse if (b < 6 * (2 + 1)) {
            k(b + 3 * (2 + 1), ku, meha);
      } else {
            int b = 6 - b
            go(a + b);
            ku(a - b);
      print(a, b)
k(a, meha, meha);
print(a, b)
```



a14: 7

b15: -1

a: 7

Salida

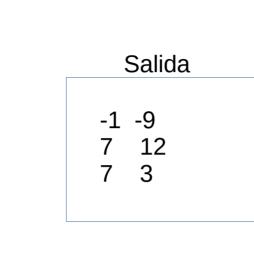
```
int a = 2 + 1, b = 1;
sub meha(int c) {
     b := a + c;
                                                          Salida
sub k (int b, sub go, sub ku) {
      sub meha(int c) {
                                                       -1 -9
           a := b - c;
      int a = 6 + 1;
      if (b < 3 * (2 + 1)) {
                                                                                                                     a14: 7
           k(b + 3 * (2 + 1), meha, go);
                                                                                                                     b15: -1
     ext{less if (b < 6 * (2 + 1)) {}}
                                                                                                            a: 7
           k(b + 3 * (2 + 1), ku, meha);
                                                                                                          b15: -15
      } else {
                                                                                       a: 7
           int b = 6 - b
                                                                                    8 meha: sub
           go(a + b);
                                                                                 k17 ku: meha(global)
           ku(a - b);
                                                Global
                                                                                     6 go: meha3
                                                                                     5 b: 12
                                            k
                                                        sub
                                                                ▶a: 3
      print(a, b)
                                                                                     4 a: 7
                                            meha
                                                       sub
                                                                                     3 meha: sub
                                                                                 k0 2 ku: meha(global)
k(a, meha, meha);
                                            b
print(a, b)
                                                                                       go: meha(global)
                                            a
                                                                                     0 b: 3
```

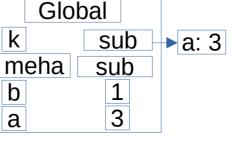
```
int a = 2 + 1, b = 1;
sub meha(int c) {
     b := a + c;
                                                         Salida
sub k (int b, sub go, sub ku) {
      sub meha(int c) {
                                                      -1 -9
           a := b - c;
                                                          12
      int a = 6 + 1;
     if (b < 3 * (2 + 1)) {
                                                                                                                    a14: 7
           k(b + 3 * (2 + 1), meha, go);
                                                                                                                    b15: -1
     ellipse if (b < 6 * (2 + 1)) {
                                                                                                           a: 7
           k(b + 3 * (2 + 1), ku, meha);
                                                                                                         b15: -15
     } else {
                                                                                      a: 7
           int b = 6 - b
                                                                                    8 meha: sub
           go(a + b);
                                                                                k17 ku: meha(global)
           ku(a - b);
                                                Global
                                                                                    6 go: meha3
                                                                                    5 b: 12
                                            k
                                                       sub
                                                                ▶ a: 3
     print(a, b)
                                                                                    4 a: 7
                                            meha
                                                       sub
                                                                                    3 meha: sub
k(a, meha, meha);
                                                                                k0 2 ku: meha(global)
                                            b
print(a, b)
                                                                                      go: meha(global)
                                            a
                                                                                    0 b: 3
```

```
int a = 2 + 1, b = 1;
sub meha(int c) {
      b := a + c;
                                                          Salida
sub k (int b, sub go, sub ku) {
      sub meha(int c) {
                                                       -1 -9
            a := b - c;
                                                           12
      int a = 6 + 1;
      if (b < 3 * (2 + 1)) {
           k(b + 3 * (2 + 1), meha, go);
      \frac{1}{2} else if (b < 6 * (2 + 1)) {
                                                                                                             a: 7
           k(b + 3 * (2 + 1), ku, meha);
                                                                                                           b15: -15
      } else {
           int b = 6 - b
           go(a + b);
            ku(a - b);
                                                 Global
                                             k
                                                        sub
                                                                 ▶ a: 3
      print(a, b)
                                                                                        a: 7
                                             meha
                                                        sub
                                                                                     3 meha: sub
k(a, meha, meha);
                                                                                  k0 2 ku: meha(global)
                                             b
print(a, b)
                                                                                     1 go: meha(global)
                                             a
                                                                                     0 b: 3
```

```
int a = 2 + 1, b = 1;
sub meha(int c) {
      b := a + c;
                                                          Salida
sub k (int b, sub go, sub ku) {
      sub meha(int c) {
                                                       -1 -9
            a := b - c;
                                                           12
                                                            3
      int a = 6 + 1;
      if (b < 3 * (2 + 1)) {
           k(b + 3 * (2 + 1), meha, go);
      ellipsymbol{} else if (b < 6 * (2 + 1)) {
                                                                                                             a: 7
           k(b + 3 * (2 + 1), ku, meha);
                                                                                                           b15: -15
      } else {
           int b = 6 - b
            go(a + b);
            ku(a - b);
                                                 Global
                                             k
                                                        sub
                                                                 ▶ a: 3
      print(a, b)
                                                                                        a: 7
                                             meha
                                                        sub
                                                                                     3 meha: sub
k(a, meha, meha);
                                                                                  k0 2 ku: meha(global)
                                             b
print(a, b)
                                                                                     1 go: meha(global)
                                             a
                                                                                     0 b: 3
```

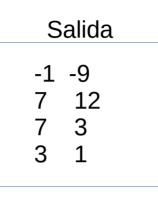
```
int a = 2 + 1, b = 1;
sub meha(int c) {
      b := a + c;
sub k (int b, sub go, sub ku) {
      sub meha(int c) {
            a := b - c;
      int a = 6 + 1;
      if (b < 3 * (2 + 1)) {
            k(b + 3 * (2 + 1), meha, go);
      ext{} else if (b < 6 * (2 + 1)) {
            k(b + 3 * (2 + 1), ku, meha);
      } else {
            int b = 6 - b
            go(a + b);
            ku(a - b);
                                              k
      print(a, b)
k(a, meha, meha);
                                              b
print(a, b)
                                              a
```

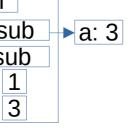




```
int a = 2 + 1, b = 1;
sub meha(int c) {
     b := a + c;
                                                         Salida
sub k (int b, sub go, sub ku) {
                                                        -1 -9
     sub meha(int c) {
                                                           12
           a := b - c;
                                                            3
     int a = 6 + 1;
     if (b < 3 * (2 + 1)) {
           k(b + 3 * (2 + 1), meha, go);
     ext{} else if (b < 6 * (2 + 1)) {
           k(b + 3 * (2 + 1), ku, meha);
     } else {
           int b = 6 - b
           go(a + b);
           ku(a - b);
                                                Global
                                            k
                                                       sub
      print(a, b)
                                            meha
                                                       sub
k(a, meha, meha);
                                            b
print(a, b)
```

a





```
int a = 2 + 1, b = 1;
sub meha(int c) {
      b := a + c;
sub k (int b, sub go, sub ku) {
      sub meha(int c) {
            a := b - c;
      int a = 6 + 1;
      if (b < 3 * (2 + 1)) {
            k(b + 3 * (2 + 1), meha, go);
      ellipsymbol{} else if (b < 6 * (2 + 1)) {
            k(b + 3 * (2 + 1), ku, meha);
      } else {
            int b = 6 - b
            go(a + b);
            ku(a - b);
      print(a, b)
k(a, meha, meha);
print(a, b)
```

```
Salida
-1 -9
7 12
7 3
3 1
```

Finaliza la ejecucion