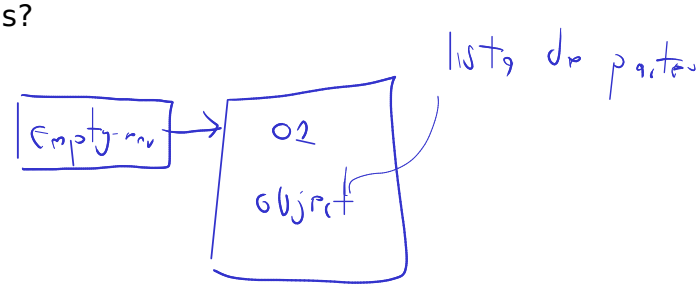
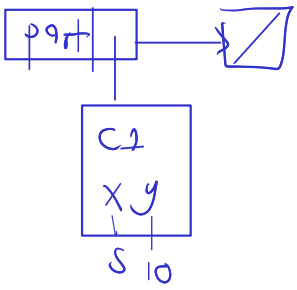
¿Dudas sobre objetos simples?

```
class c1 extends object
 field x
 field y

 method initialize()
  begin
   set x=5;
   set y=10;
   +(x,y)
  end

 method m1(n)
  *(+(n,x), -(n,y))

 let
   o1 = new c1()
 in
   send o1 m1(4)
```



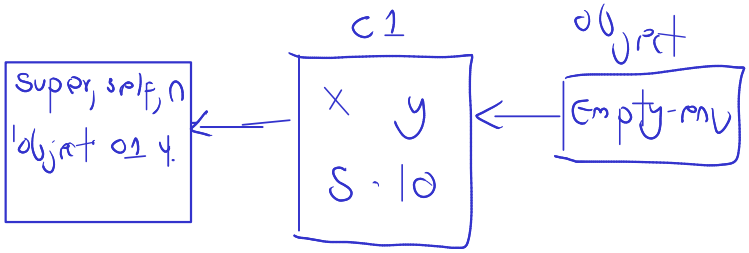
lista de pares

o1)



Lista de pares

Ejecución del método



*(+(n,x), -(n,y))

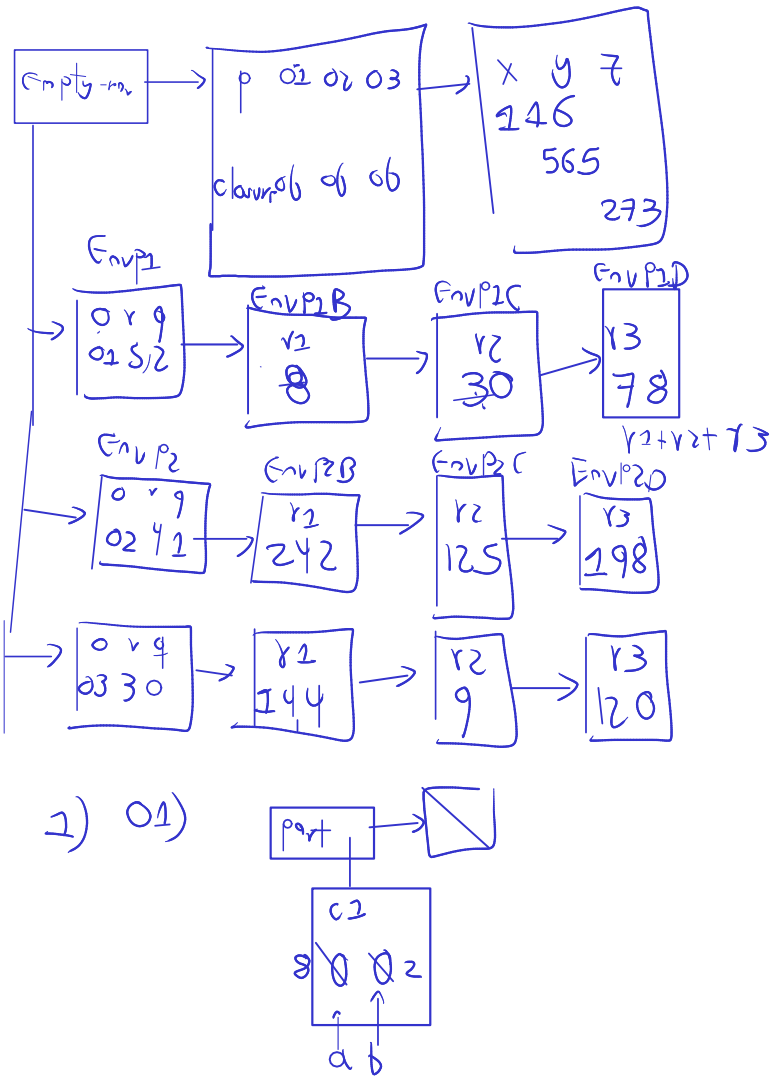
*(+(4,5), -(4,10))

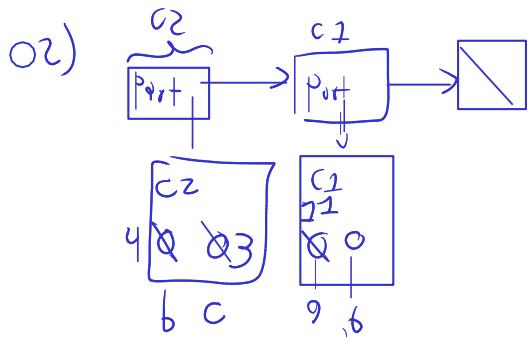
*(9, -6)

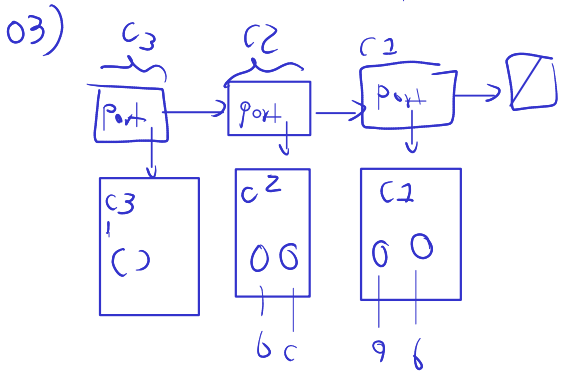
-54

Vista del objeto

```
class  c1 extends object
      field a
      field b
      method initialize () 0
      method  setup (k, l)
            begin
            set a=+(k,3);
            set b=l;
            8
            end
      method m1 (n) send self m2 (+(a,n))
      method m2 (n) *(n, -(a,b))
      method m4 (x, y) send self m1 (-(x,y))

class  c2 extends c1
      field b
      field c
      method  setup (k, l)
            begin
            set b=k;
            set c=-(k, l);
            super setup(+(b,k), -(1,l));
            send self m3(k)
            end
      method m2 (n) super m2(+(n, c))
      method m3 (n) send self m1(*(n,2))
      method m4 (n, m) +(m, super m4(n, m))

class  c3 extends c2
      method m2 (n) super m2(n)
      method m4 (n,m) *(+(n,m),b)

let  p=proc  (o, r, q)
          let  r1 = send o setup(r, q)
             in let  r2 = send o m4(q, r)
                    r3 = send o m1(r)
                    in +(r1, +(r2,r3 ))
    o1 = new c1()
    o2 = new c2()
    o3 = new c3()
    in let  x= (p o1 5 2)
           y= (p o2 4 1)
           z= (p o3 3 0)
           in send o2 m4(x, +(y,z))
```

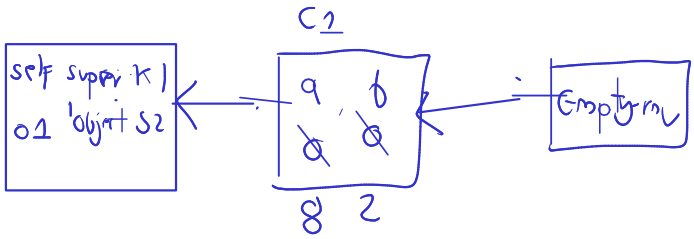






Envp1

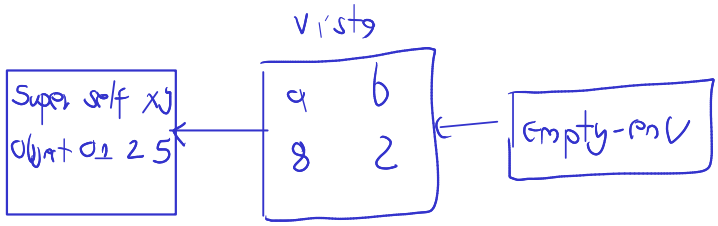
r1 = send o setup(r, q)



Env1B

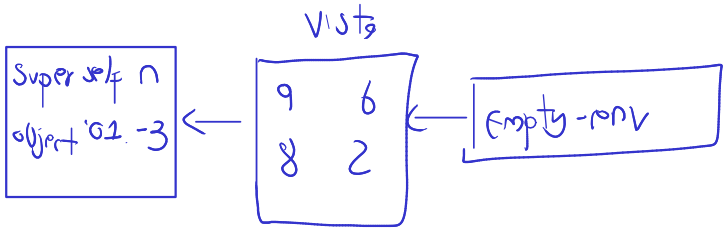
send o m4(q, r)

o1



send self m1 (-(x,y))

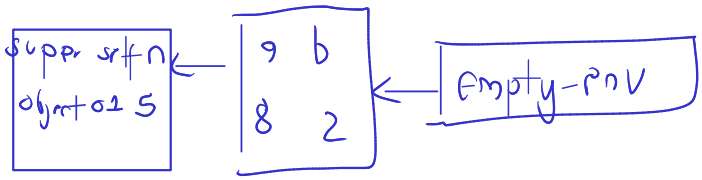
Send o1 m1(-3)



send self m2 (+(a,n))

Send o1 m2(+(8,-3))

Send o1 m2(5)



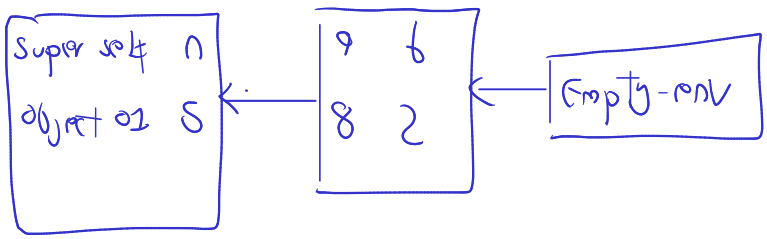
*(n, -(a,b))

*(5, 6) = 30

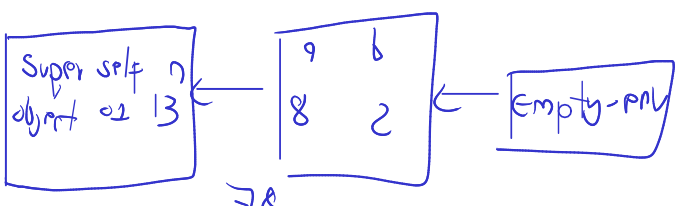
Env1C

Send o m1(1)

Send o1 m1(5)



send self m2 (+(a,n))
send o1 m2(13)



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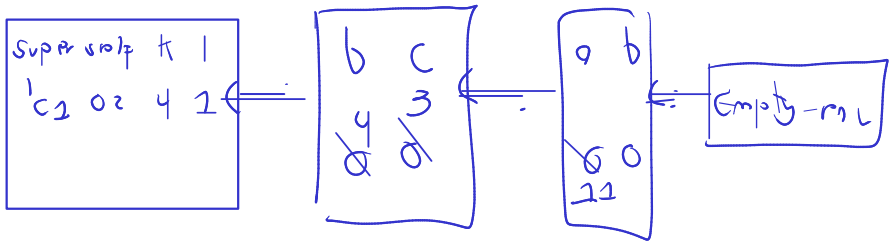
*(n, -(a,b)) *(13,6)

Segundo llamado

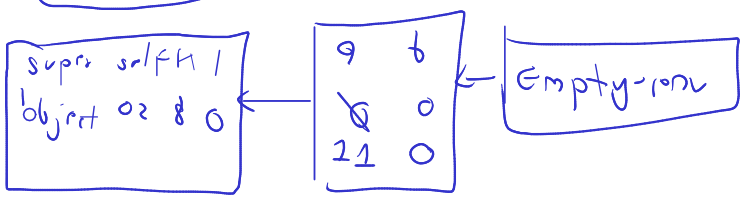
Esto se hace sobre el ambiente envP2

r1 = send o setup(r, q)
r1 = send o2 setup(4,1)



```
begin
        set b=k;
        set c=-(k, l);
        super setup(+(b,k), -(1,l));
        send self m3(k)
        end
```

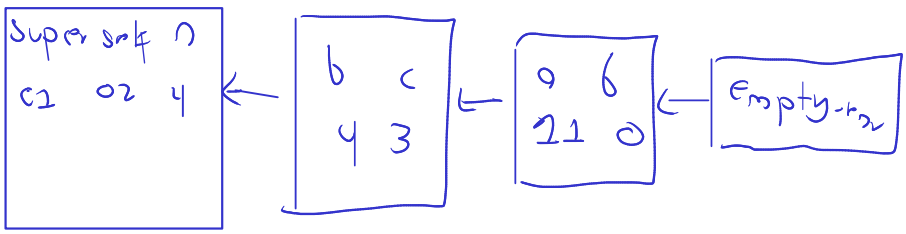
super setup(8, 0);



```
begin
 set a=+(k,3);
 set b=l;
 8
 end
```

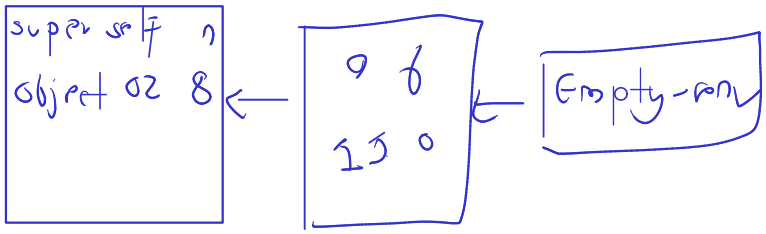
send self m3(k)
send o2 m3(4)

method m3 (n) send self m1(*(n,2))



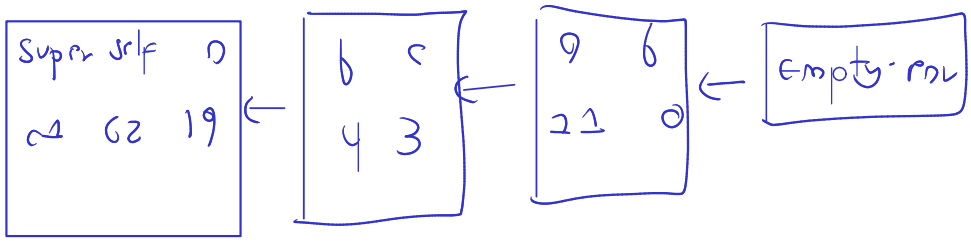
send self m1(*(n,2))
send o2 m1(8)

method m1 (n)
send self m2 (+(a,n)) <-- C1



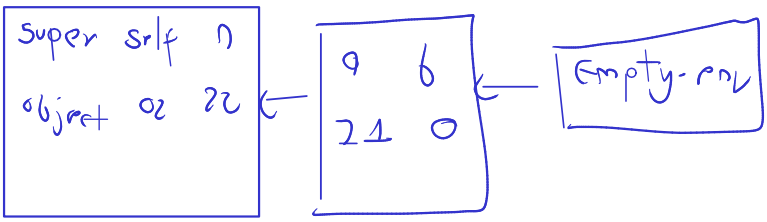
send o2 m2 (19)

method m2 (n) super m2(+(n, c)) ← c2



super m2(22)

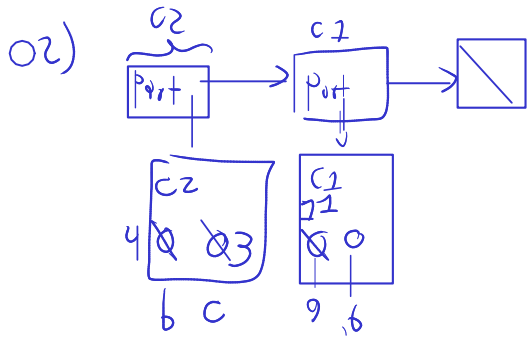
method m2 (n) *(n, -(a,b)) ← c1



*(n, -(9, 6))

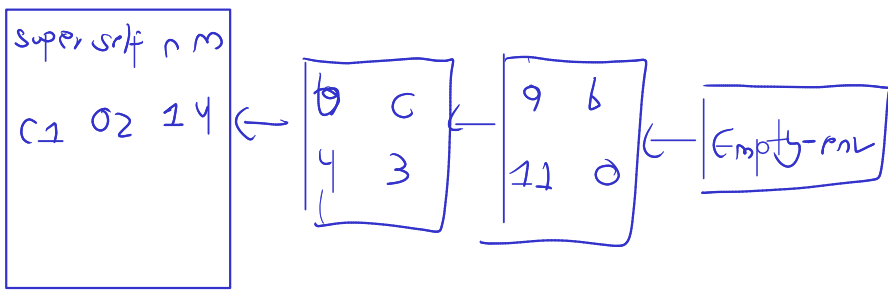
*(22, 21) = 242

```
class  c1 extends object
      field a
      field b
      method initialize () 0
      method  setup (k, l)
            begin
            set a=+(k,3);
            set b=l;
            8
            end
      method m1 (n) send self m2 (+(a,n))
      method m2 (n) *(n, -(a,b))
      method m4 (x, y) send self m1 (-(x,y))

class  c2 extends c1
      field b
      field c
      method  setup (k, l)
            begin
            set b=k;
            set c=-(k, l);
            super setup(+(b,k), -(1,l));
            send self m3(k)
            end
      method m2 (n) super m2(+(n, c))
      method m3 (n) send self m1(*(n,2))
      method m4 (n, m) +(m, super m4(n, m))

class  c3 extends c2
      method m2 (n) super m2(n)
      method m4 (n,m) *(+(n,m),b)

let  p=proc  (o, r, q)
          let  r1 = send o setup(r, q)
             in let  r2 = send o m4(q, r)
                   r3 = send o m1(r)
                   in +(r1, +(r2,r3 ))
   o1 = new c1()
   o2 = new c2()
   o3 = new c3()
   in let  x= (p o1 5 2)
         y= (p o2 4 1)
         z= (p o3 3 0)
         in send o2 m4(x, +(y,z))
```



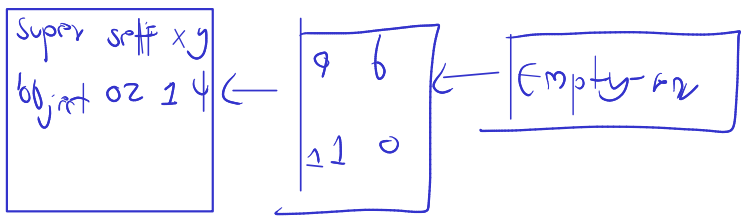
Env p2

Send o2 m4(7, 4)



+(m, super m4(n, m))

+(4, super m4(1,4)) = 12

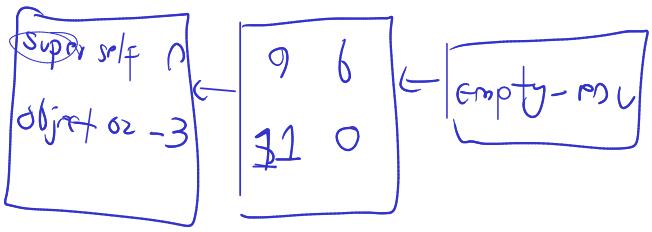


send self m1 (-(x,y))

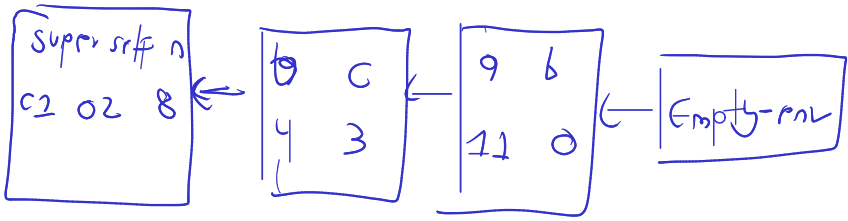
Send o2 m1 (-3)

```
class  c1 extends object
      field a
      field b
      method initialize () 0
      method  setup (k, l)
            begin
            set a=+(k,3);
            set b=l;
            8
            end
      method m1 (n) send self m2 (+(a,n))
      method m2 (n) *(n, -(a,b))
      method m4 (x, y) send self m1 (-(x,y))

class  c2 extends c1
      field b
      field c
      method  setup (k, l)
            begin
            set b=k;
            set c=-(k, l);
            super setup(+(b,k), -(1,l));
            send self m3(k)
            end
      method m2 (n) super m2(+(n, c))
      method m3 (n) send self m1(*(n,2))
      method m4 (n, m) +(m, super m4(n, m))

class  c3 extends c2
      method m2 (n) super m2(n)
      method m4 (n,m) *(+(n,m),b)

let  p=proc  (o, r, q)
          let  r1 = send o setup(r, q)
             in let  r2 = send o m4(q, r)
                   r3 = send o m1(r)
                   in +(r1, +(r2,r3 ))
    o1 = new c1()
    o2 = new c2()
    o3 = new c3()
    in let  x= (p o1 5 2)
          y= (p o2 4 1)
          z= (p o3 3 0)
          in send o2 m4(x, +(y,z))
```

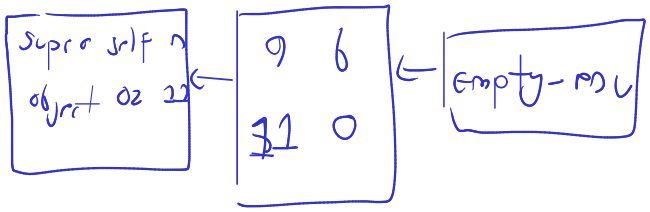
Send o2 m1(-3)



send self m2 (+(a,n))
send o2 m2(8)

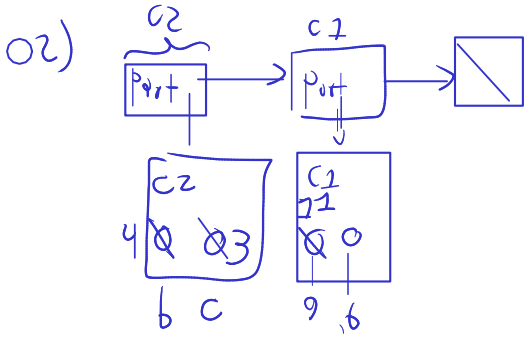


super m2(+(n, c))
super m2(11) c1

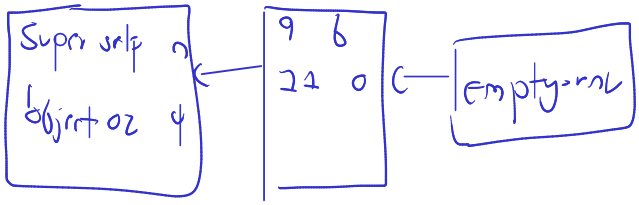


*(n, -(a,b))
*(11,11) = 121

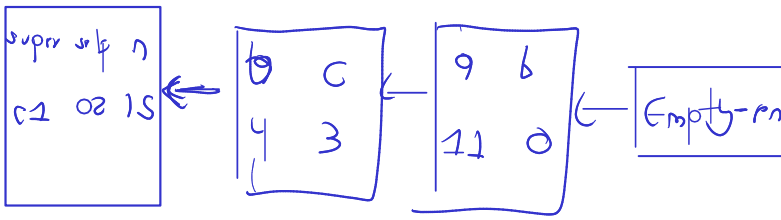
```
class  c1 extends object
      field a
      field b
      method initialize () 0
      method  setup (k, l)
            begin
            set a=+(k,3);
            set b=l;
            8
            end
      method m1 (n) send self m2 (+(a,n))
      method m2 (n) *(n, -(a,b))
      method m4 (x, y) send self m1 (-(x,y))

class  c2 extends c1
      field b
      field c
      method  setup (k, l)
            begin
            set b=k;
            set c=-(k, l);
            super setup(+(b,k), -(1,l));
            send self m3(k)
            end
      method m2 (n) super m2(+(n, c))
      method m3 (n) send self m1(*(n,2))
      method m4 (n, m) +(m, super m4(n, m))

class  c3 extends c2
      method m2 (n) super m2(n)
      method m4 (n,m) *(+(n,m),b)

let  p=proc  (o, r, q)
          let  r1 = send o setup(r, q)
              in let  r2 = send o m4(q, r)
                    r3 = send o m1(r)
                    in +(r1, +(r2,r3 ))
    o1 = new c1()
    o2 = new c2()
    o3 = new c3()
    in let  x= (p o1 5 2)
          y= (p o2 4 1)
          z= (p o3 3 0)
          in send o2 m4(x, +(y,z))
```



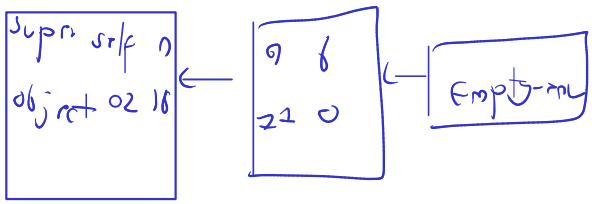
r3 = send o2 m1(4)



send self m2 (+(a,n))
send o2 m2(15)

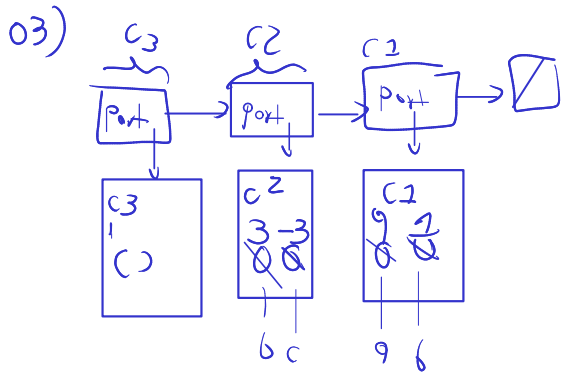


super m2(+(n, c))
super m2(18)

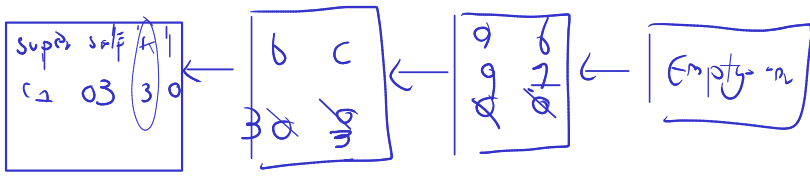


*(n, -(a,b))
*(18,11)
198

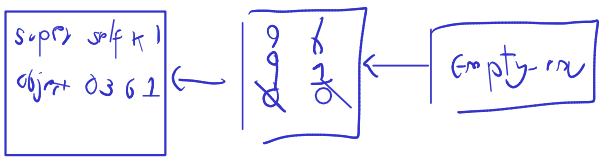
```
class  c1 extends object
      field a
      field b
      method initialize () 0
      method  setup (k, l)
            begin
            set a=+(k,3);
            set b=l;
            8
            end
      method m1 (n) send self m2 (+(a,n))
      method m2 (n) *(n, -(a,b))
      method m4 (x, y) send self m1 (-(x,y))

class  c2 extends c1
      field b
      field c
      method  setup (k, l)
            begin
            set b=k;
            set c=-(k, l);
            super setup(+(b,k), -(1,l));
            send self m3(k)
            end
      method m2 (n) super m2(+(n, c))
      method m3 (n) send self m1(*(n,2))
      method m4 (n, m) +(m, super m4(n, m))

class  c3 extends c2
      method m2 (n) super m2(n)
      method m4 (n,m) *(+(n,m),b)

let  p=proc  (o, r, q)
          let  r1 = send o setup(r, q)
              in let  r2 = send o m4(q, r)
                    r3 = send o m1(r)
                    in +(r1, +(r2,r3 ))
    o1 = new c1()
    o2 = new c2()
    o3 = new c3()
    in let  x= (p o1 5 2)
          y= (p o2 4 1)
          z= (p o3 3 0)
          in send o2 m4(x, +(y,z))
```



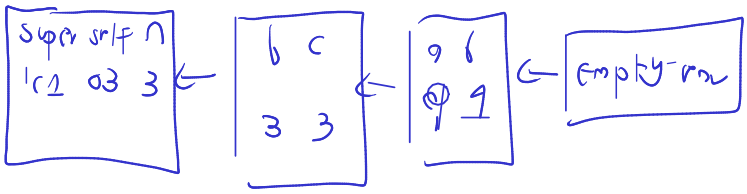
r1 = send o setup(r, q)
r1 = send o3 setup(3,0)



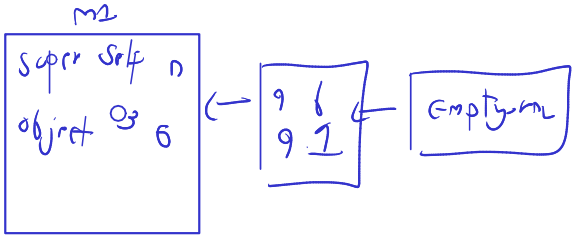
super setup(+(b,k), -(1,l));
super setup(6,1)



send o3 m3(3)

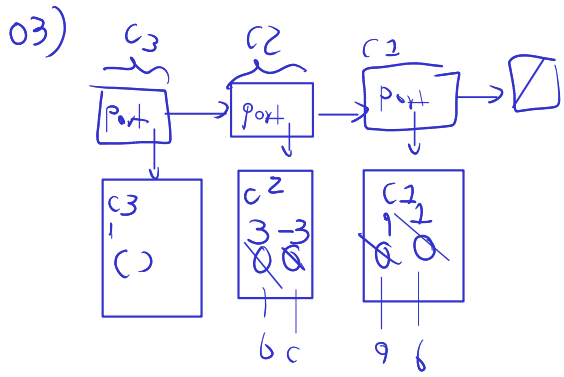


send self m1(*(n,2))
send o3 m1(6)

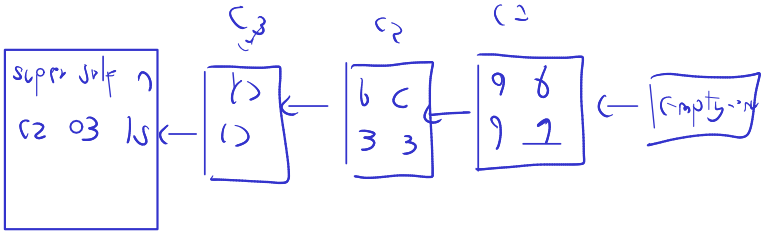


send self m2 (+(a,n))
send o3 m2(15)

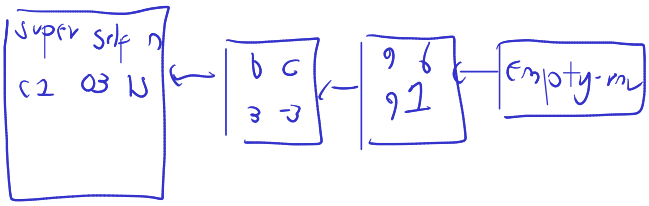
```
class  c1 extends object
      field a
      field b
      method initialize () 0
      method  setup (k, l)
            begin
            set a=+(k,3);
            set b=l;
            8
            end
      method m1 (n) send self m2 (+(a,n))
      method m2 (n) *(n, -(a,b))
      method m4 (x, y) send self m1 (-(x,y))

class  c2 extends c1
      field b
      field c
      method  setup (k, l)
            begin
            set b=k;
            set c=-(k, l);
            super setup(+(b,k), -(1,l));
            send self m3(k)
            end
      method m2 (n) super m2(+(n, c))
      method m3 (n) send self m1(*(n,2))
      method m4 (n, m) +(m, super m4(n, m))

class  c3 extends c2
      method m2 (n) super m2(n)
      method m4 (n,m) *(+(n,m),b)

let  p=proc  (o, r, q)
          let  r1 = send o setup(r, q)
             in let  r2 = send o m4(q, r)
                   r3 = send o m1(r)
                   in +(r1, +(r2,r3 ))
    o1 = new c1()
    o2 = new c2()
    o3 = new c3()
    in let  x= (p o1 5 2)
          y= (p o2 4 1)
          z= (p o3 3 0)
          in send o2 m4(x, +(y,z))
```



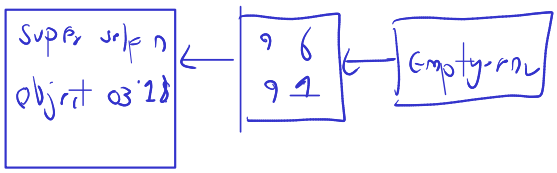
- send o3 m2(15)



- super m2(15)

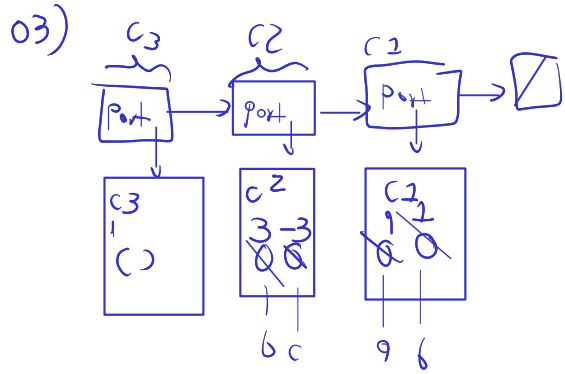


super m2(+(n, c))
super m2(18)

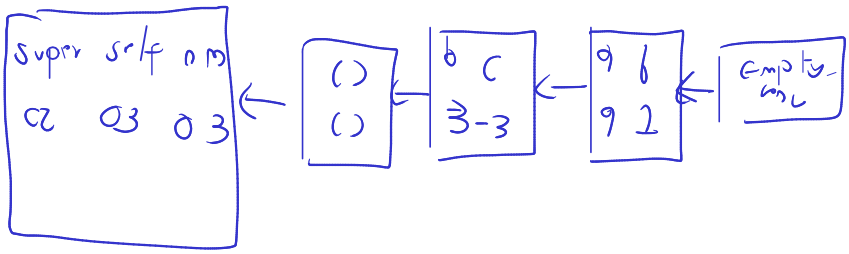


*(n, -(a,b))
*(18,8)
144

```
class  c1 extends object
      field a
      field b
      method initialize () 0
      method  setup (k, l)
            begin
            set a=+(k,3);
            set b=l;
            8
            end
      method m1 (n) send self m2 (+(a,n))
      method m2 (n) *(n, -(a,b))
      method m4 (x, y) send self m1 (-(x,y))

class  c2 extends c1
      field b
      field c
      method  setup (k, l)
            begin
            set b=k;
            set c=-(k, l);
            super setup(+(b,k), -(1,l));
            send self m3(k)
            end
      method m2 (n) super m2(+(n, c))
      method m3 (n) send self m1(*(n,2))
      method m4 (n, m) +(m, super m4(n, m))

class  c3 extends c2
      method m2 (n) super m2(n)
      method m4 (n,m) *(+(n,m),b)

let  p=proc  (o, r, q)
        let  r1 = send o setup(r, q)
           in let  r2 = send o m4(q, r)
                 r3 = send o m1(r)
                 in +(r1, +(r2,r3 ))
   o1 = new c1()
   o2 = new c2()
   o3 = new c3()
   in let  x= (p o1 5 2)
        y= (p o2 4 1)
        z= (p o3 3 0)
        in send o2 m4(x, +(y,z))
```



r2 = send o m4(q, r)
r2 = send o3 m4(0,3)

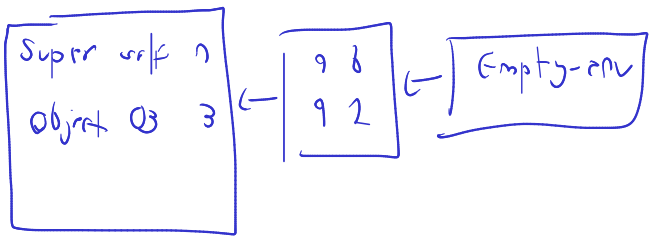


*(+(n,m),b)

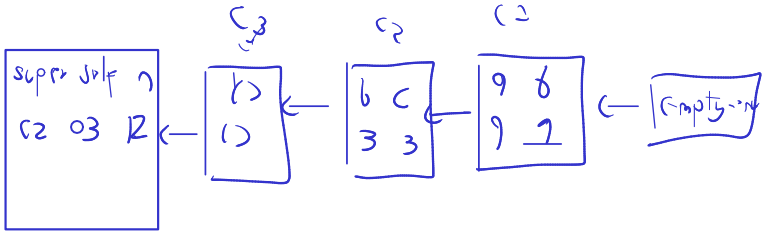
3,3

9

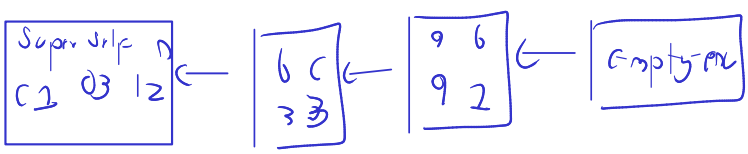
r3 = send o3 m1(3)



send self m2 (+(a,n))
send o3 m2(12)



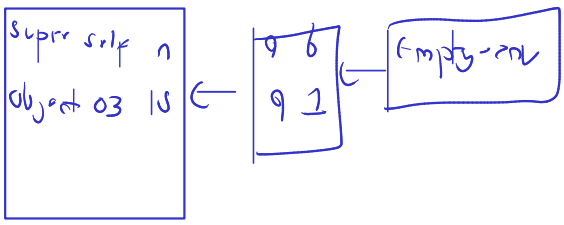
Super m2(12)



super m2(+(n, c))
super m2(15)

```
class  c1 extends object
      field a
      field b
      method initialize () 0
      method  setup (k, l)
            begin
            set a=+(k,3);
            set b=l;
            8
            end
      method m1 (n) send self m2 (+(a,n))
      method m2 (n) *(n, -(a,b))
      method m4 (x, y) send self m1 (-(x,y))

class  c2 extends c1
      field b
      field c
      method  setup (k, l)
            begin
            set b=k;
            set c=-(k, l);
            super setup(+(b,k), -(1,l));
            send self m3(k)
            end
      method m2 (n) super m2(+(n, c))
      method m3 (n) send self m1(*(n,2))
      method m4 (n, m) +(m, super m4(n, m))

class  c3 extends c2
      method m2 (n) super m2(n)
      method m4 (n,m) *(+(n,m),b)

let  p=proc  (o, r, q)
        let  r1 = send o setup(r, q)
           in let  r2 = send o m4(q, r)
                 r3 = send o m1(r)
                 in +(r1, +(r2,r3 ))
   o1 = new c1()
   o2 = new c2()
   o3 = new c3()
   in let  x= (p o1 5 2)
        y= (p o2 4 1)
        z= (p o3 3 0)
        in send o2 m4(x, +(y,z))
```

m2(15) ⟵ c1



*(n, -(a,b))

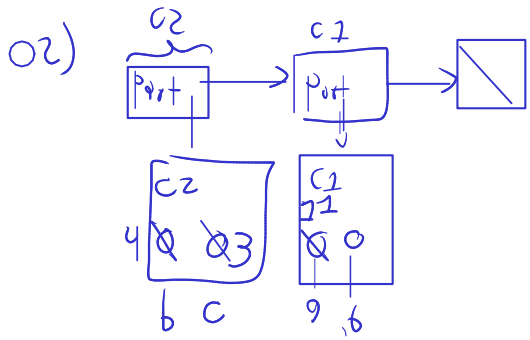
*(15,8)

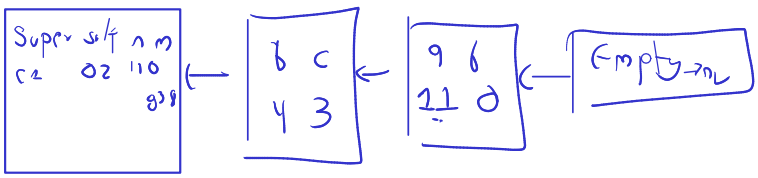
120

---

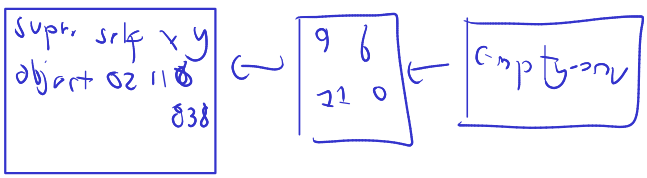
send o2 m4(x, +(y,z))

send o2 m4(116,838)

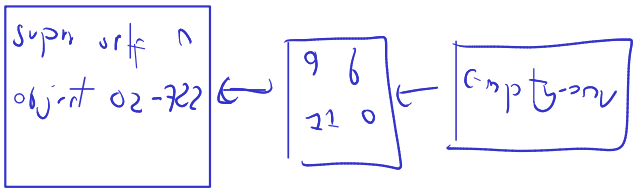




+(838, c2 m4(116,838))



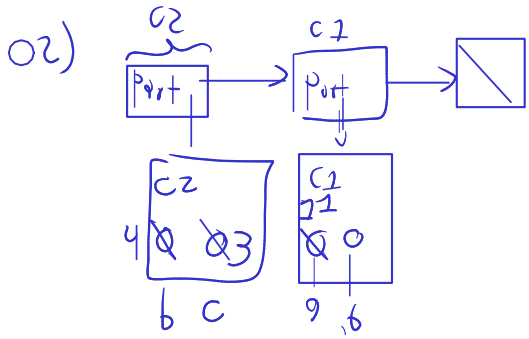
send self m1 (-(x,y))
send o2 m1(-722)

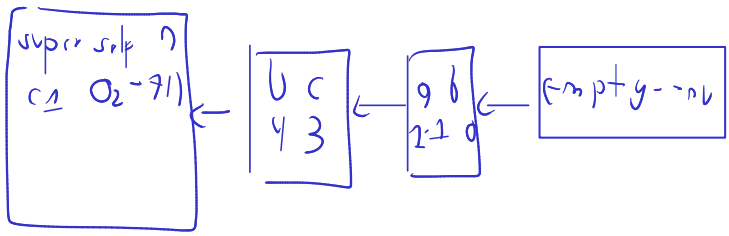


send self m2 (+(a,n))
send o2 m2(-711)

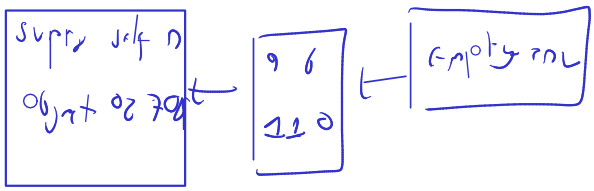
```
class  c1 extends object
      field a
      field b
      method initialize () 0
      method  setup (k, l)
            begin
            set a=+(k,3);
            set b=l;
            8
            end
      method m1 (n) send self m2 (+(a,n))
      method m2 (n) *(n, -(a,b))
      method m4 (x, y) send self m1 (-(x,y))

class  c2 extends c1
      field b
      field c
      method  setup (k, l)
            begin
            set b=k;
            set c=-(k, l);
            super setup(+(b,k), -(1,l));
            send self m3(k)
            end
      method m2 (n) super m2(+(n, c))
      method m3 (n) send self m1(*(n,2))
      method m4 (n, m) +(m, super m4(n, m))

class  c3 extends c2
      method m2 (n) super m2(n)
      method m4 (n,m) *(+(n,m),b)

let  p=proc  (o, r, q)
          let  r1 = send o setup(r, q)
              in let  r2 = send o m4(q, r)
                    r3 = send o m1(r)
                    in +(r1, +(r2,r3 ))
    o1 = new c1()
    o2 = new c2()
    o3 = new c3()
    in let  x= (p o1 5 2)
          y= (p o2 4 1)
          z= (p o3 3 0)
          in send o2 m4(x, +(y,z))
```

send o2 m2(-711)





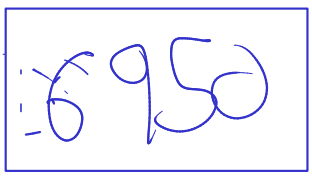
super m2(+(n, c))
super m2(-708)

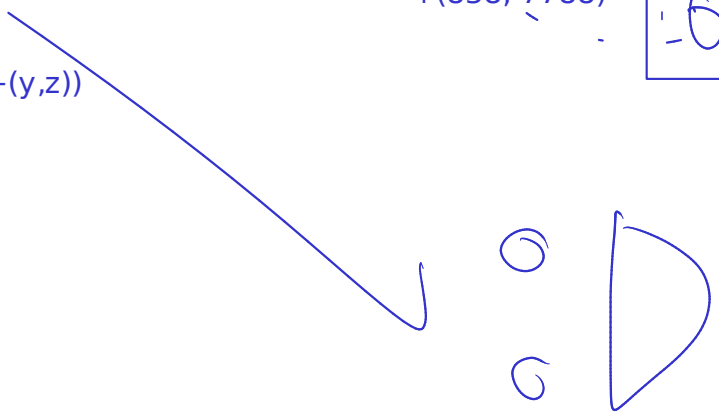


*(n, -(a,b))
*(-708,11)

-7788

+(838,-7788)





Variable	Valor	Al evaluar la expresión
r_1		$+(r_1, +(r_2,r_3))$ por efecto de la aplicación $(p\ o_1\ 5\ 2)$
r_2		$+(r_1, +(r_2,r_3))$ por efecto de la aplicación $(p\ o_1\ 5\ 2)$
r_3		$+(r_1, +(r_2,r_3))$ por efecto de la aplicación $(p\ o_1\ 5\ 2)$
x		send o_2 m4$(x, +(y,z))$ del cuerpo del let más interno
r_1		$+(r_1, +(r_2,r_3))$ por efecto de la aplicación $(p\ o_2\ 4\ 1)$
r_2		$+(r_1, +(r_2,r_3))$ por efecto de la aplicación $(p\ o_2\ 4\ 1)$
r_3		$+(r_1, +(r_2,r_3))$ por efecto de la aplicación $(p\ o_2\ 4\ 1)$
y		send o_2 m4$(x, +(y,z))$ del cuerpo del let más interno
r_1		$+(r_1, +(r_2,r_3))$ por efecto de la aplicación $(p\ o_3\ 3\ 0)$
r_2		$+(r_1, +(r_2,r_3))$ por efecto de la aplicación $(p\ o_3\ 3\ 0)$
r_3		$+(r_1, +(r_2,r_3))$ por efecto de la aplicación $(p\ o_3\ 3\ 0)$
z		send o_2 m4$(x, +(y,z))$ del cuerpo del let más interno

b) [**6 pts.**] Dibuje el ambiente en el que se evalua el cuerpo del método m4 en el proceso de evaluación de la expresión send o_2 m4$(x, +(y,z))$ del cuerpo del let más interno. Cuál es el resultado de evaluar esa expresión?