Tell

$binop$ ::= `Add` | `Sub` | `Mul` | `Div` | `Mod`
| `And` | `Or`
| `Eq` | `Neq` | `Lt` | `Gt` | `Leq` | `Geq`

$expr$ ::= `Var(string)` | `Cst_i(int)` | `Cst_f(float)` | `Cst_b(bool)`
| `Binop`$(binop, expr, expr)$
| `Unop`$(unop, expr)$

instr ::= `Affect`$(\texttt{string}, expr)$
| `Block`$(instr\ \texttt{list})$
| `IfThenElse`$(expr, instr, instr)$
| `While`$(expr, instr)$

$c = \langle x \to 0, y \to 41 \rangle$

$I_1 = \text{Binop}(\text{Add}, x, y)$

$I_2 = \text{Unop}(\text{Min}, y)$

$I_3 = \text{Binop}(\text{Eq}, x, \text{Binop}(\text{Sub}, y, 4))$

$I_4 = \text{Affect}(x, \text{Binop}(\text{Add}, 12, x))$

$I_5 = \text{Affect}(x, \text{Binop}(\text{Sub}, y, 1))$

$I_6 = \text{Block}(I_4, I_5)$

$I_7 = \text{ITE}(\text{Binop}(\text{Leq}, y, 0), \text{Affect}(x, 10), \text{Affect}(x, -10))$

$I_8 = \text{While}(\text{Binop}(\text{Gt}, x, -1), \text{Affect}(x, \text{Binop}(\text{Sub}, x, 1)))$

$[\![I_1]\!](c) = [\![\text{Add}]\!]([\![x]\!]_c)([\![y]\!]_c)$
$= [\![\text{Add}]\!](0)(4)$
$= + : 0\ 4$
$= 4$

$[\![[\![I_2]\!](c) = [\![\text{Min}]\!]([\![y]\!]_c)$
$= [\![\text{Min}]\!](4)$
$= -4$

$[\![\text{Sub}]\!]([\![y]\!]_c)([\![4]\!]_c) = [\![\text{Sub}]\!](4)(4)$
$= 0$

$[\![I_3]\!](c) = ([\![\text{Eq}]\!]([\![x]\!]_c))(0) = \text{True}$

$[\![I_4]\!](c) = [\![\text{Affect}(x, 12)]\!](c)$
$= c[x \leftarrow ([\![12]\!]_c)]$
$= \langle c[x \leftarrow 12] \rangle$
$\langle x \to 4, y \to 4 \rangle$

$[[I_5]](e) = [[Affect(x, Binop(Sub, y, 1))]](e)$

$= e[x \leftarrow [[Sub]]\ [y]_e\ [1]_e]$

$= e[x \leftarrow [[Sub]]\ 4\ 1]$

$= e[x \leftarrow -_m\ 4\ 1]$

$= e[x \leftarrow 3]$

$\langle x \to 3, y \to 4 \rangle \to e'$

$[[I_6]](e) = [[Block(I_4, I_5)]](e)$

$= [[I_5]]([[I_4]](e)) \to e'$

$= [[I_5]](\langle x \to 12, y \to 4 \rangle)$

$= [[Affect(x, Binop(Sub, y, 1))]](e')$

$= e'[x \leftarrow 3]$

$\langle x \to 3, y \to 4 \rangle$

$[[I_7]](e) =$ Suit $v = [y \leq 0]_e$

$= [[Leq]]\ [y]_e\ [0]_e$

$= \leq_m\ 4\ 0$

$=$ False

Done $e[x \leftarrow 10]$

$\langle x \to 10, y \to 4 \rangle$

$[[I_8]](e) =$ Suit $v = [x > -1]_e$

$= [[Gt]]\ [x]_e\ [-1]_e$

$= >_m\ 0\ -1$

$=$ True

Done $[[I_8]](e) = [[I_8]](e[x \leftarrow -1])$

$= [[I_8]](\langle x \to -1, y \to 4 \rangle) \to e'$

$[[I_8]](e') =$ Suit $v = [x > -1]_e$

$= >_m\ -1\ -1$

$=$ False

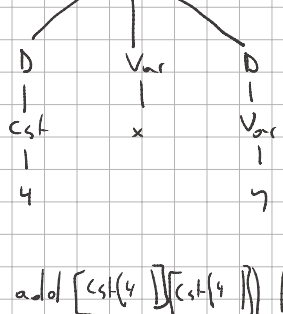
Done $[[I_8]](e) = e'$

CORRECTION

Exercice 1

$M = \langle x \to 4, y \to 1 \rangle$

$c_1 = A\,|\,D\,|\,Cst(4)|, Var(x), D\,|\,Var(y)|\,|$



$[c_1]_M = add\ |\ add\ [Cst(4)]_M\ [Cst(4)]_M\ |\ sub\ [Var(x)]_M\ |\ add\ [Var(y)]_M\ [Var(y)]_M\ |\ )$

$= add\ (add\ 4\ 4\ |\ sub\ 4\ |\ add\ 1\ 1\ |\ |$
$= add\ 8\ |\ sub\ 4\ 2\ |$
$= add\ 8\ 2$
$= 10$

Valeur de c_1 pas définie si x ou y pas définie

Exercice 2

$I = Seq(Incr(x), If(c_1, Cst(10), Aff(a, Cst(1)), Aff(b, Cst(2)), Aff(c_1, Cst(3)))$

$[[I]](M) = [[If(c_1, Cst(10), Aff(a, Cst(1))), Aff(b, Cst(2)), Aff(c, Cst(3))]]([[Incr(x)]](M)$