מועד 2020 ב' 72

שאלה 4:

סימונים:

Expression	Type Variable
p	t_p
w	t_w
y	t_y
let p = (proc (w:?) -(w,7) 9)	t_0
in	
if zero?(p) then p else (proc(y:?) -(y,7) 20)	
(proc (w:?) -(w,7) 9)	t_1
proc (w:?) -(w,7)	t_2
-(w,7)	t_3
if zero?(p) then p else (proc (y:?) -(y,7) 20)	t_4
zero?(p)	t_5
(proc(y:?) -(y,7) 20)	t_6
proc(y:?) -(y,7)	t_7
-(y,7)	t_8

משוואות:

Expression	Equations
let p = (proc (w:?) -(w,7) 9)	$t_p=t_1$
in	$t_4=t_0$
if zero?(p) then p else (proc(y:?) -(y,7) 20)	
(proc (w:?) -(w,7) 9)	$t_2=(int \to t_1)$
proc (w:?) -(w,7)	$t_2=(t_w \to t_3)$
-(w,7)	$t_w=int$, $t_3=int$
if zero?(p) then p else (proc (y:?) -(y,7) 20)	$t_5=bool$, $t_p=t_4$, $t_6=t_4$
zero?(p)	$t_p=int$, $t_5=bool$
(proc(y:?) -(y,7) 20)	$t_7=(int \to t_6)$
proc(y:?) -(y,7)	$t_7=(t_y \to t_8)$
-(y,7)	$t_y=int$, $t_8=int$

Equations	Substitutions
$t_p = t_1$	
$t_4 = t_0$	
$t_2 = (int \to t_1)$	
$t_2 = (t_w \to t_3)$	
$t_w = int$	
$t_3 = int$	
$t_5 = bool$	
$t_p = t_4$	
$t_6 = t_4$	
$t_p = int$	
$t_7 = (int \to t_6)$	
$t_7 = (t_y \to t_8)$	
$t_y = int, t_8 = int$	

Equations	Substitutions
$t_4 = t_0$	$t_p = t_1$
$t_2 = (int \to t_1)$	
$t_2 = (t_w \to t_3)$	
$t_w = int$	
$t_3 = int$	
$t_5 = bool$	
$t_p = t_4$	
$t_6 = t_4$	
$t_p = int$	
$t_7 = (int \to t_6)$	
$t_7 = (t_y \to t_8)$	
$t_y = int, t_8 = int$	

$\Rightarrow$

Equations	Substitutions
$t_2 = (int \to t_1)$	$t_p = t_1$
$t_2 = (t_w \to t_3)$	$t_4 = t_0$
$t_w = int$	
$t_3 = int$	
$t_5 = bool$	
$t_p = t_4$	
$t_6 = t_4$	
$t_p = int$	
$t_7 = (int \to t_6)$	
$t_7 = (t_y \to t_8)$	
$t_y = int, t_8 = int$	

Equations	Substitutions
$t_2 = (t_w \to t_3)$	$t_p = t_1$
$t_w = int$	$t_4 = t_0$
$t_3 = int$	$t_2 = (int \to t_1)$
$t_5 = bool$	
$t_p = t_4$	
$t_6 = t_4$	
$t_p = int$	
$t_7 = (int \to t_6)$	
$t_7 = (t_y \to t_8)$	
$t_y = int, t_8 = int$	

Equations	Substitutions
$(int \to t_1) = (t_w \to t_3)$	$t_p = t_1$
$t_w = int$	$t_4 = t_0$
$t_3 = int$	$t_2 = (int \to t_1)$
$\Rightarrow$ $t_5 = bool$	
$t_p = t_4$	
$t_6 = t_4$	
$t_p = int$	
$t_7 = (int \to t_6)$	
$t_7 = (t_y \to t_8)$	
$t_y = int, t_8 = int$	

Equations	Substitutions
$t_w = int$	$t_p = t_1$
$t_1 = t_3$	$t_4 = t_0$
$t_w = int$ X	$t_2 = (int \to t_1)$
$t_3 = int$	
$t_5 = bool$	
$t_p = t_4$	
$t_6 = t_4$	
$t_p = int$	
$t_7 = (int \to t_6)$	
$t_7 = (t_y \to t_8)$	
$t_y = int, t_8 = int$	

Equations	Substitutions
$t_1 = t_3$	$t_p = t_1$
$t_3 = int$	$t_4 = t_0$
$t_5 = bool$	$t_2 = (int \to t_1)$
$\Rightarrow$ $t_p = t_4$	$t_w = int$
$t_6 = t_4$	
$t_p = int$	
$t_7 = (int \to t_6)$	
$t_7 = (t_y \to t_8)$	
$t_y = int$	
$t_8 = int$	

Equations	Substitutions
$t_3 = int$	$t_p = t_3$
$t_5 = bool$	$t_4 = t_0$
$t_p = t_4$	$f_2 = (int \to t_3)$
$t_6 = t_4$	$f_w = int$
$t_p = int$	$f_1 = t_3$
$t_7 = (int \to t_6)$	
$t_7 = (f_9 \to f_8)$	
$t_9 = int$	
$f_8 = int$	

Equations	Substitutions
$t_5 = bool$	$t_p = int$
$t_p = t_4$	$t_4 = t_0$
$t_6 = t_4$	$f_2 = (int \to int)$
$t_p = int$	$f_w = int$
$t_7 = (int \to t_6)$	$f_1 = int$
$t_7 = (f_9 \to f_8)$	$t_3 = int$
$t_9 = int$	
$f_8 = int$	

Equations	Substitutions
$t_p = t_4$	$t_p = int$
$t_6 = t_4$	$t_4 = t_0$
$t_p = int$	$f_2 = (int \to int)$
$t_7 = (int \to t_6)$	$f_w = int$
$t_7 = (f_9 \to f_8)$	$f_1 = int$
$t_9 = int$	$t_3 = int$
$f_8 = int$	$t_5 = bool$

Equations	Substitutions
$int = t_4$	$t_p = int$
$t_6 = t_4$	$t_4 = t_0$
$t_p = int$	$f_2 = (int \to int)$
$t_7 = (int \to t_6)$	$f_w = int$
$t_7 = (f_9 \to f_8)$	$f_1 = int$
$t_9 = int$	$t_3 = int$
$f_8 = int$	$t_5 = bool$

Equations	Substitutions
$t_6 = t_4$	$t_p = int$
$t_p = int$	$t_0 = int$
$t_7 = (int \to t_6)$	$f_2 = (int \to int)$
$t_7 = (f_9 \to f_8)$	$f_w = int$
$t_9 = int$	$f_1 = int$
$f_8 = int$	$t_3 = int$
	$t_5 = bool$
	$int = t_4$

Equations	Substitutions
$int = int$ X	$t_p = int$
$t_p = int$ X	$t_0 = int$
$t_7 = (int \to t_6)$	$f_2 = (int \to int)$
$t_7 = (f_9 \to f_8)$	$f_w = int$
$t_9 = int$	$f_1 = int$
$f_8 = int$	$t_3 = int$
	$t_5 = bool$
	$int = t_4$

Equations	Substitutions
$t_7=(t_9 \to t_8)$	$t_p=int$
$t_9=int$	$t_0=int$
$t_8=int$	$t_2=(int \to int)$
	$t_w=int$
	$t_1=int$
	$t_3=int$
	$t_5=bool$
	$int=t_4$
	$t_7=(int \to t_6)$

$\Rightarrow$

Equations	Substitutions
$(int \to t_6)=(t_9 \to t_8)$	$t_p=int$
$t_9=int$	$t_0=int$
$t_8=int$	$t_2=(int \to int)$
	$t_w=int$
	$t_1=int$
	$t_3=int$
	$t_5=bool$
	$int=t_4$
	$t_7=(int \to t_6)$

Equations	Substitutions
$t_9=int$	$t_p=int$
$t_6=t_8$	$t_0=int$
$t_9=int$ X	$t_2=(int \to int)$
$t_8=int$	$t_w=int$
	$t_1=int$
	$t_3=int$
	$t_5=bool$
	$int=t_4$
	$t_7=(int \to t_6)$

$\Rightarrow$

Equations	Substitutions
	$t_p=int$
	$t_0=int$
	$t_2=(int \to int)$
	$t_w=int$
	$t_1=int$
	$t_3=int$
	$t_5=bool$
	$int=t_4$
	$t_7=(int \to int)$
	$t_9=int$
	$t_6=int$
	$t_8=int$

לסיכום, הטיפוס של התוכנית כולה יהיה $t_0=int$.