

1)

$$a) \frac{+ \langle (5) \cdot !l_2 - (9+1), s \rangle}{\langle ((3+2) \cdot !l_2) - (9+1), s \rangle}$$

$$b) \text{Seq}_2 \frac{\langle \text{Skip}, l_1 := 44, s[l_0 \mapsto 7] \rangle}{\langle l_0 := 7, l_1 := 44, s \rangle}$$

c)

$$\text{if}_1 \frac{\langle \text{if } 2 > 0 \text{ then } l_0 := !l_0 - 1 \text{ else } l_1 := !l_1 + 3, s \rangle}{\langle \text{if } !l_0 > 0 \text{ then } l_0 := !l_0 - 1 \text{ else } l_1 := !l_1 + 3, s \rangle}$$

$$\begin{aligned} 2) a) & \langle ((3+2) \cdot !l_2 - (9+1), s) \rangle \\ & \langle ((5) \cdot !l_2 - (10), s) \rangle \\ & \langle ((5) \cdot 3 - 10, s) \rangle \\ & \langle (15 - 10), s \rangle \\ & \langle 5, s \rangle \end{aligned}$$

$$\begin{aligned} b) & \langle \text{if } !l_0 > 0 \text{ then } l_0 := !l_0 - 1 \text{ else } l_1 := !l_1 + 3, s \rangle \\ & \langle \text{if } 2 > 0 \text{ then } l_0 := l_0 - 1 \text{ else } l_1 := l_1 + 3, s \rangle \\ & \langle l_0 := l_0 - 1, s \rangle \\ & \langle l_0 := 2 - 1, s \rangle \\ & \langle l_0 := 1, s \rangle \end{aligned}$$