Exercise 1 Use the proof rule for assignment and logical implication as appropriate to show the validity of
a.) $\vdash_{\text{par}} (| x > 0 | y = x + 1 (| y > 1 |)$
b.) $\vdash_{\text{par}} (| T | y = x; y = x + y (| y = 3 \cdot x |)$
c.) $\vdash_{\text{par}} (| x > 1 | a = 1; y = x; y = y - a (| y > 0 \land x > y |)$

Exercise 2 Prove the validity of the sequent $\vdash_{\text{par}} (| T | P (| z = \min(x, y) |)$ where $P$ is

$$
\text{if } (x > y) \{ \\
\quad z = y; \\
\} \text{ else } \\
\quad z = x;
$$

Exercise 3 Show that $\vdash_{\text{par}} (| x \geq 0 | \text{Copy1 (| y = x |}$ is valid, where $\text{Copy1}$ denotes the code

$$
a = x; \\
y = 0; \\
\text{while } (a != 0) \{ \\
\quad y = y+1; \\
\quad a = a-1; \\
\}
$$

Exercise 4 Show that $\vdash_{\text{par}} (| y \geq 0 | \text{Multi1 (| z = y \cdot x |}$ is valid, where $\text{Multi1}$ denotes the code

$$
a = 0; \\
z = 0; \\
\text{while } (a != y) \{ \\
\quad z = z+x; \\
\quad a = a+1; \\
\}
$$

Exercise 5 Show that $\vdash_{\text{par}} (| y = y_0 \land y \geq 0 | \text{Multi2 (| z = x \cdot y_0 |}$ is valid, where $\text{Multi2}$ denotes the code

$$
z = 0; \\
\text{while } (y != 0) \{ \\
\quad z = z+x; \\
\quad y = y-1; \\
\}$$