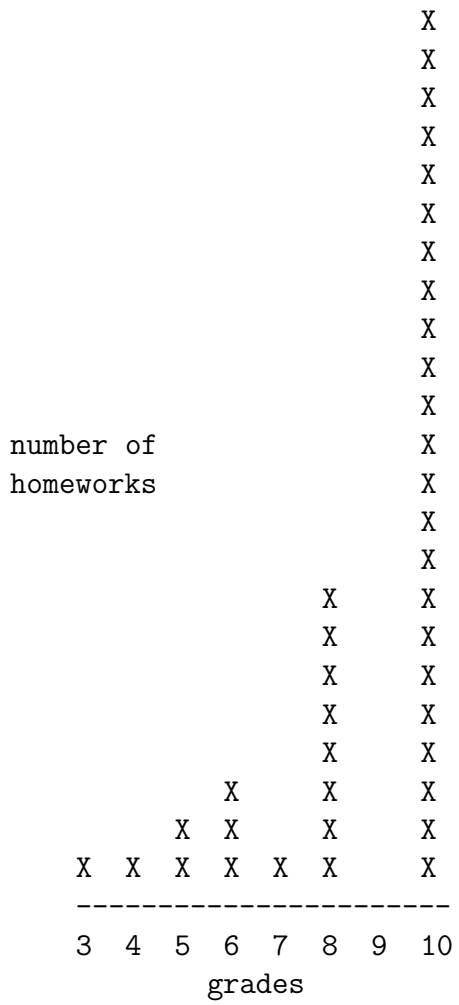
Automata Theory: Solutions 8



Problem 1
Find simple grammars for the following languages:

(a) $\{(aa)^n b : \ n \geq 0\}$

$S \to aA \mid b$
$A \to aS$

(b) $\{a^n b^n : \ n \geq 1\}$

$S \to aA$
$A \to aAB \mid b$
$B \to b$

Problem 2
Simplify the following grammar:

$$
\begin{aligned}
S &\to aSa \mid A \mid aC \mid aD \\
A &\to aBa \mid aCa \mid F \\
B &\to aBa \mid \lambda \\
C &\to aC \mid bD \\
D &\to aD \mid bC \\
E &\to aD \mid \lambda \\
F &\to aa \mid aFa
\end{aligned}
$$

The simplification gives the following result:

$$
\begin{aligned}
S &\to aSa \mid aBa \mid aFa \mid aa \\
B &\to aBa \mid aa \\
F &\to aa \mid aFa
\end{aligned}
$$

Since S, B, and F give rise to the same strings, we can remove B and F:

$$S \to aSa \mid aa$$