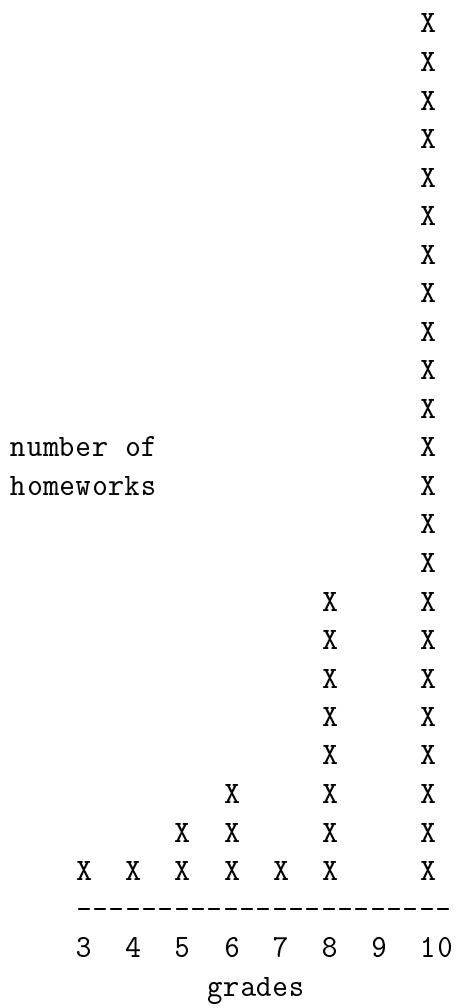
Automata Theory: Solutions 8



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:

$S \to aSa \mid A \mid aC \mid aD$
$A \to aBa \mid aCa \mid F$
$B \to aBa \mid \lambda$
$C \to aC \mid bD$
$D \to aD \mid bC$
$E \to aD \mid \lambda$
$F \to aa \mid aFa$

The simplification gives the following result:

$S \to aSa \mid aBa \mid aFa \mid aa$
$B \to aBa \mid aa$
$F \to aa \mid aFa$

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

$S \to aSa \mid aa$