Problem 7.1

Part b

$(q, 0011, Z_0) \vdash (q, 011, XZ_0) \vdash (q, 11, XXZ_0) \vdash (q, 1, XXZ_0) \vdash (q, \epsilon, XXZ_0) \vdash (p, \epsilon, XZ_0) \vdash (p, \epsilon, Z_0) \vdash (p, \epsilon, \epsilon)$

Part c

$(q, 010, Z_0) \vdash (q, 10, XZ_0) \vdash (q, 0, XXZ_0) \vdash (q, \epsilon, XXXZ_0) \vdash (p, \epsilon, XXZ_0) \vdash (p, \epsilon, XXZ_0) \vdash (p, \epsilon, XZ_0) \vdash (p, \epsilon, Z_0) \vdash (p, \epsilon, \epsilon)$

Problem 7.2

Part a

Here is the definition for the transition function, δ:

$\delta(q, \epsilon, E) = \{(q, TE')\}$

$\delta(q, \epsilon, E') = \{(q, +TE'), (q, -TE')\}$

$\delta(q, \epsilon, T) = \{(q, FT')\}$

$\delta(q, \epsilon, T') = \{(q, *FT'), (q, /FT')\}$

$\delta(q, \epsilon, T') = \{(q, /FT')\}$

$\delta(q, \epsilon, \epsilon) = \{(q, \epsilon)\}$

$\delta(q, +, +) = \{(q, \epsilon)\}$

$\delta(q, -, -) = \{(q, \epsilon)\}$

$\delta(q, a, a) = \{(q, \epsilon)\}$

$\delta(q, b, b) = \{(q, \epsilon)\}$

$\delta(q, c, c) = \{(q, \epsilon)\}$

Part b

$(a, a+b*c, Z_0) \vdash (q, +b*c, aZ_0) \vdash (q, +b*c, +TE'aZ_0) \vdash (q, b*c, TE'aZ_0) \vdash (q, b*c, FT'E'aZ_0) \vdash (q, b*c, bT'E'aZ_0) \vdash (q, *c, T'E'aZ_0) \vdash (q, *c, *FT'E'aZ_0) \vdash$

$(q, c, FT'E'aZ_0) \vdash (q, c, c\epsilon E'aZ_0) \vdash (q, \epsilon, \epsilon aZ_0) \vdash (q, \epsilon\epsilon)$

Problem 7.3

Part a

$X_{i,j}$ represents the variables that derive the string $a_i...a_j$.

Part b

For cell 14, you need to consider cells 13 and 41, 24 and 23

For cell 13, you need to consider cells 12 and 22, 11 and 23

For cell 24, you need to consider 23 and 33, 22 and 34

Part c

$\{N, S\}$	-	-	-
$\{N, S\}$	$\{N\}$	-	-
$\{N\}$	$\{N, P\}$	$\{N\}$	-
$\{N\}$	$\{N, V\}$	$\{N\}$	$\{N\}$
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Because the top left cell contains S, the string is in the language.

Part d

$\{N\}$			
$\{N\}$	$\{N\}$		
$\{N\}$	$\{N, P\}$	$\{N\}$	
$\{N\}$	$\{N, V\}$	$\{N, V\}$	$\{N\}$
Arizona	trains	trains	students

Because the top left cell doesn't contain S, the string is not in the language.