CHAPTER 6

Stacks

Figure 6.1

Stack of cafeteria dishes

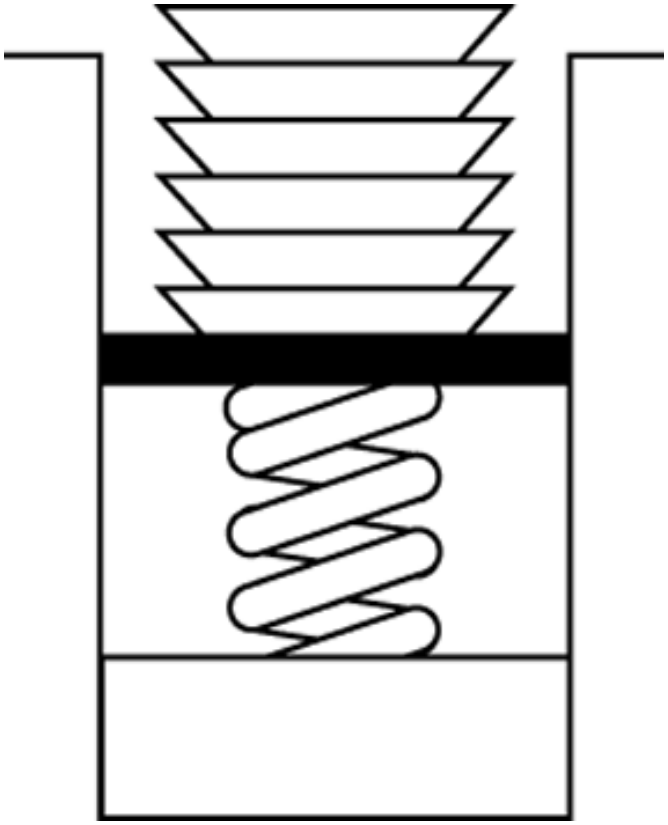

Figure 6.2

Traces of the algorithm that checks for balanced braces

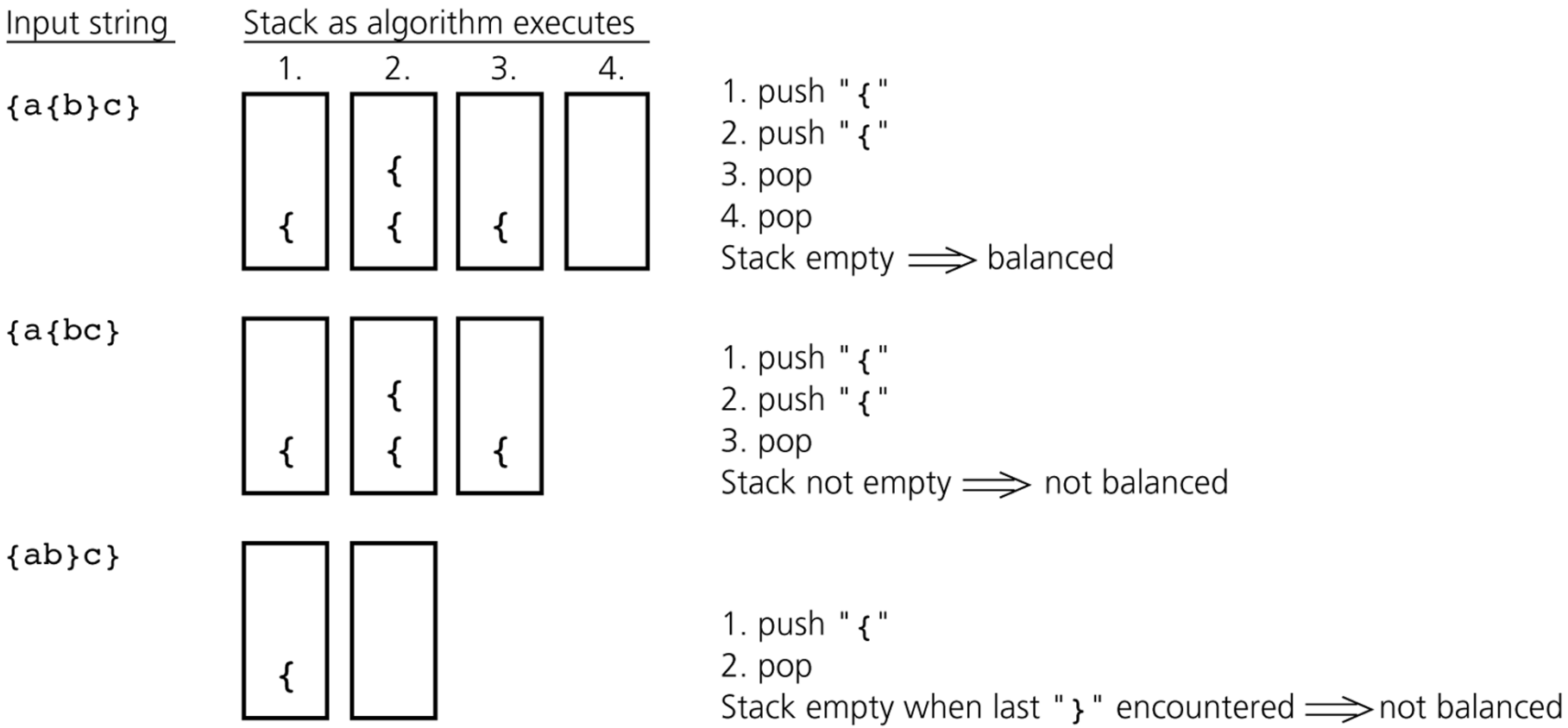

Figure 6.3

Implementation of the ADT stack that use a) an array; b) a linked list; c) an ADT list

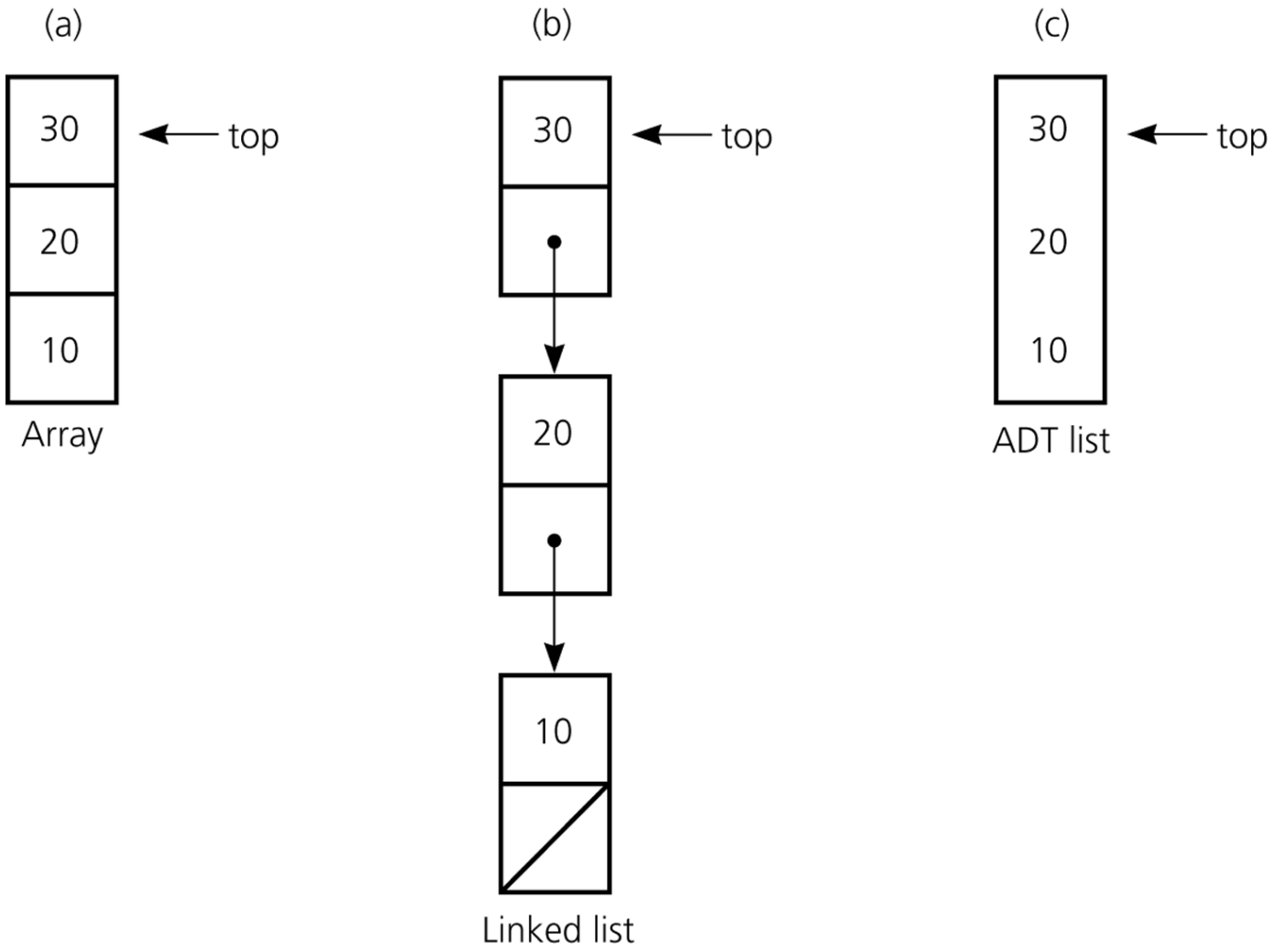

Figure 6.4

An array-based implementation

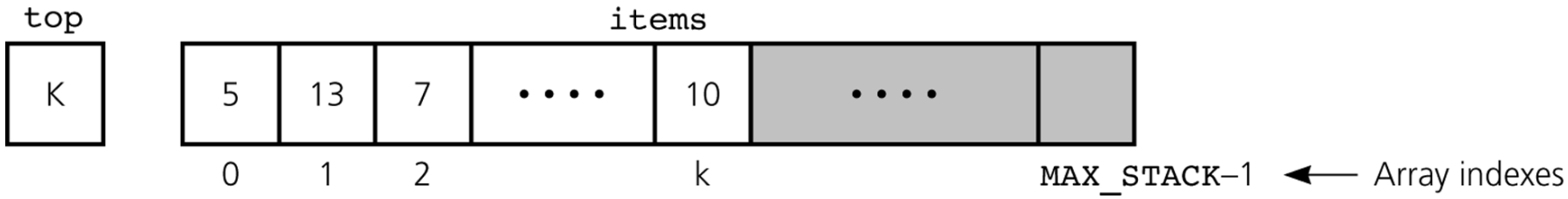

Figure 6.5

A reference-based implementation

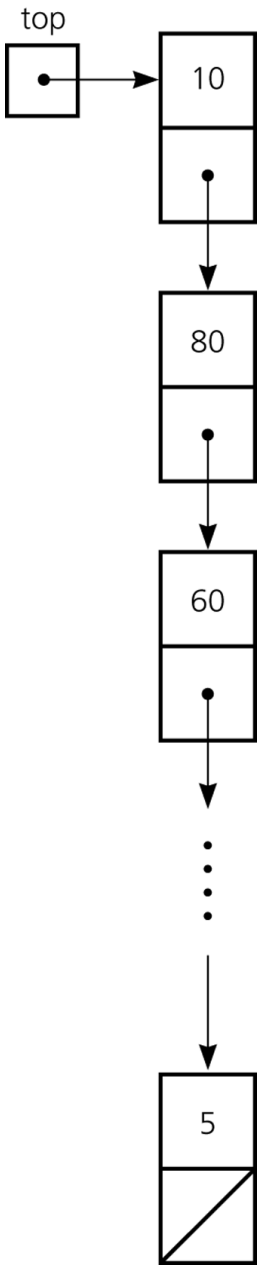

Figure 6.6

An implementation that uses the ADT list

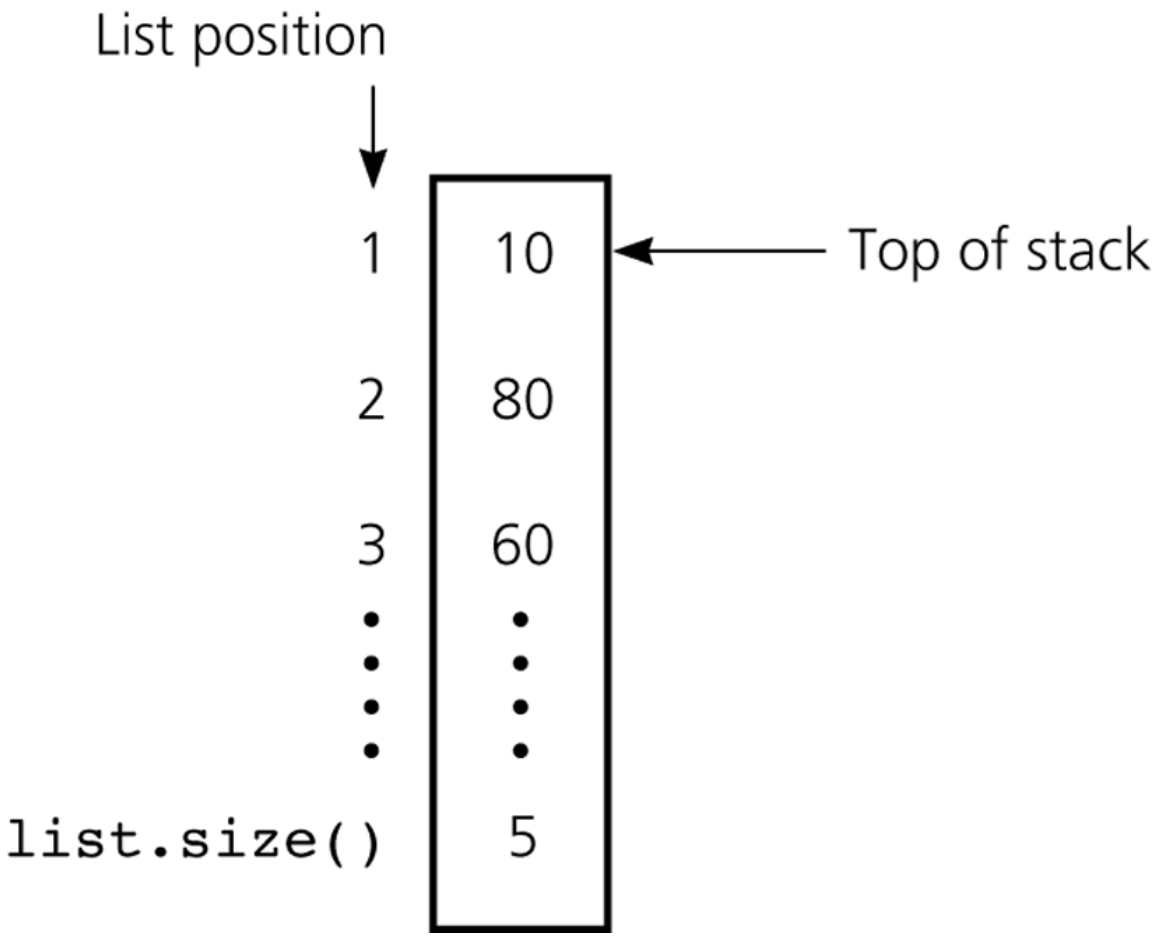

Figure 6.7

The action of a postfix calculator when evaluating the expression 2 * (3 + 4)

Key entered	Calculator action		Stack (bottom to top)
2	push 2		2
3	push 3		2 3
4	push 4		2 3 4
+	operand2 = pop stack	(4)	2 3
	operand1 = pop stack	(3)	2
	result = operand1 + operand2	(7)	2
	push result		2 7
*	operand2 = pop stack	(7)	2
	operand1 = pop stack	(2)	
	result = operand1 * operand2	(14)	
	push result		14

Figure 6.8

A trace of the algorithm that converts the infix expression *a* - (*b* + *c* * *d*)/*e* to postfix form

ch	stack (bottom to top)	postfixExp	
a		a	
–	–	a	
(	– (	a	
b	– (	ab	
+	– (+	ab	
c	– (+	abc	
*	– (+ *	abc	
d	– (+ *	abcd	
)	– (+	abcd*	Move operators
	– (	abcd*+	from stack to
	–	abcd*+	**postfixExp** until " ("
/	– /	abcd*+	
e	– /	abcd*+e	Copy operators from
		abcd*+e/–	stack to **postfixExp**

Figure 6.9

Flight map for HPAir

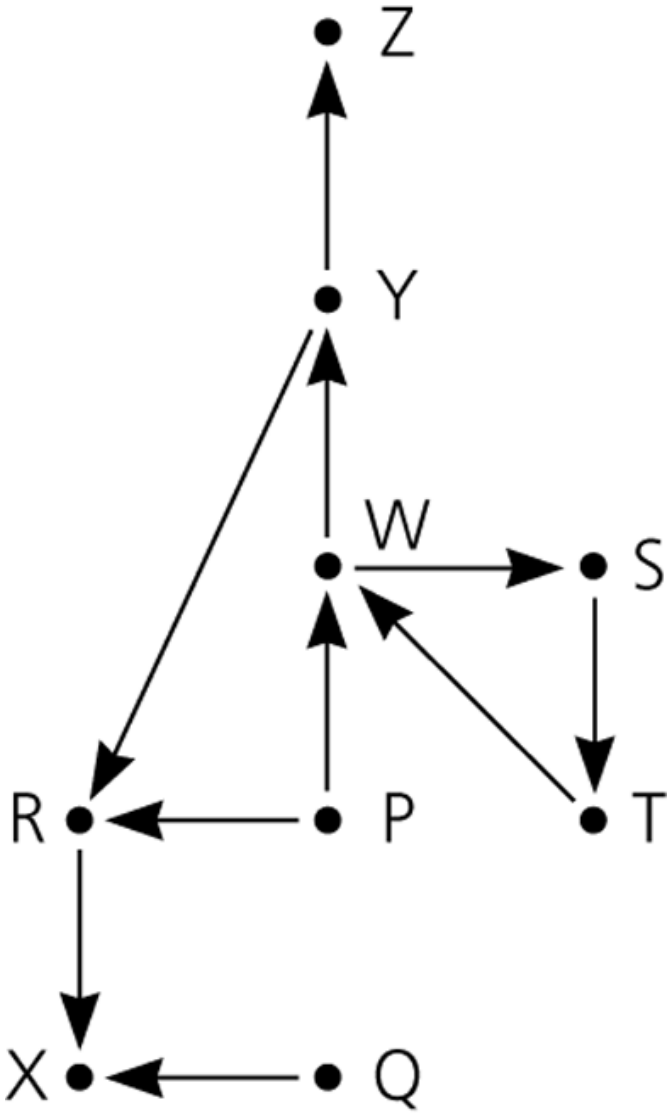

Figure 6.10

The stack of cities as you travel a) from *P*; b) to *R*; c) to *X*; d) back to *R*; e) back to *P*; f) to *W*

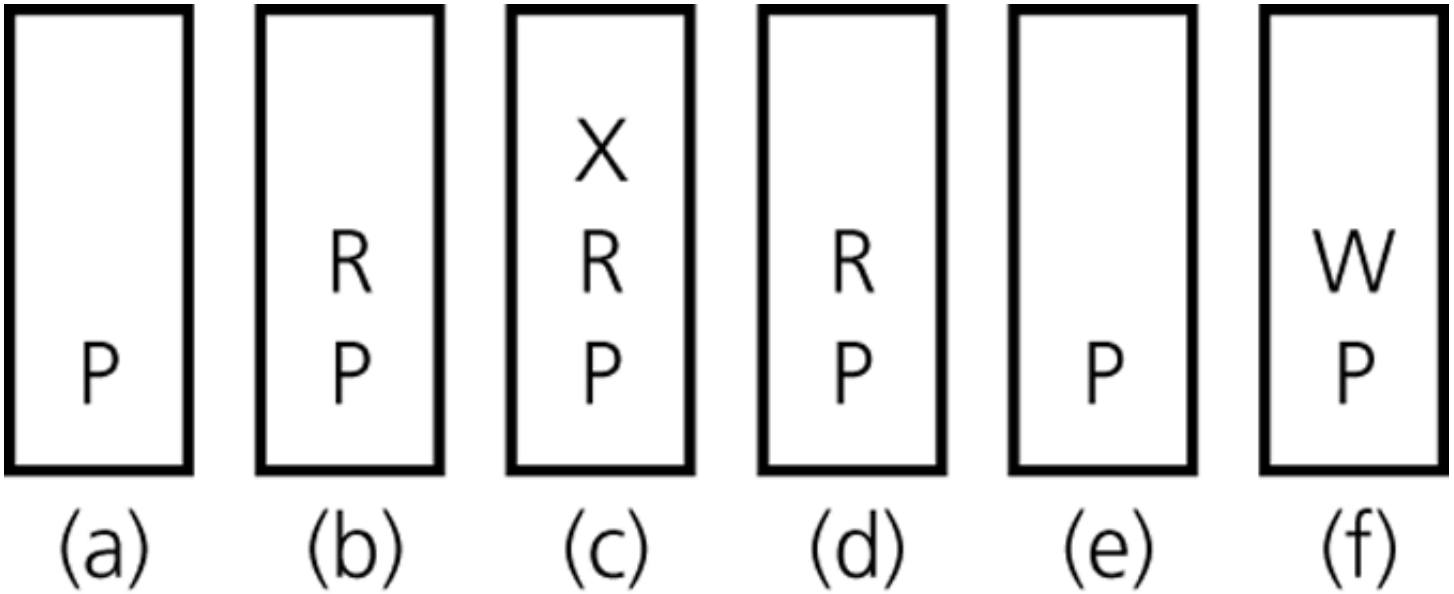

Figure 6.11

The stack of cities a) allowing revisits and b) after backtracking when revisits are not allowed

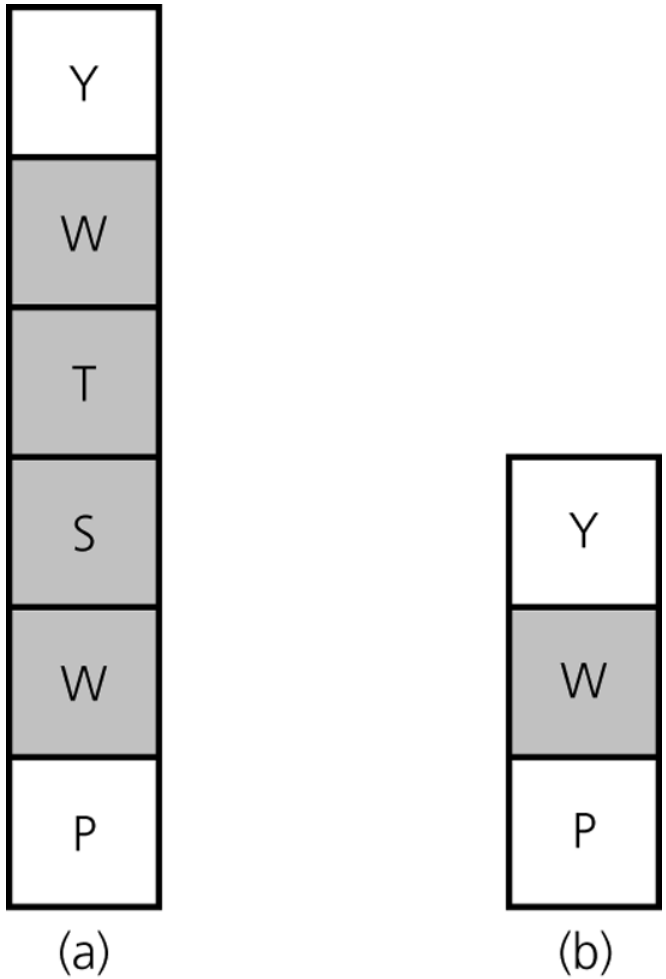

Figure 6.12

A trace of the search algorithm, given the flight map in Figure 6-9

Action	Reason	Contents of stack (bottom to top)
Push P	Initialize	P
Push R	Next unvisited adjacent city	P R
Push X	Next unvisited adjacent city	P R X
Pop X	No unvisited adjacent city	P R
Pop R	No unvisited adjacent city	P
Push W	Next unvisited adjacent city	P W
Push S	Next unvisited adjacent city	P W S
Push T	Next unvisited adjacent city	P W S T
Pop T	No unvisited adjacent city	P W S
Pop S	No unvisited adjacent city	P W
Push Y	Next unvisited adjacent city	P W Y
Push Z	Next unvisited adjacent city	P W Y Z

Figure 6.13

A piece of a flight map

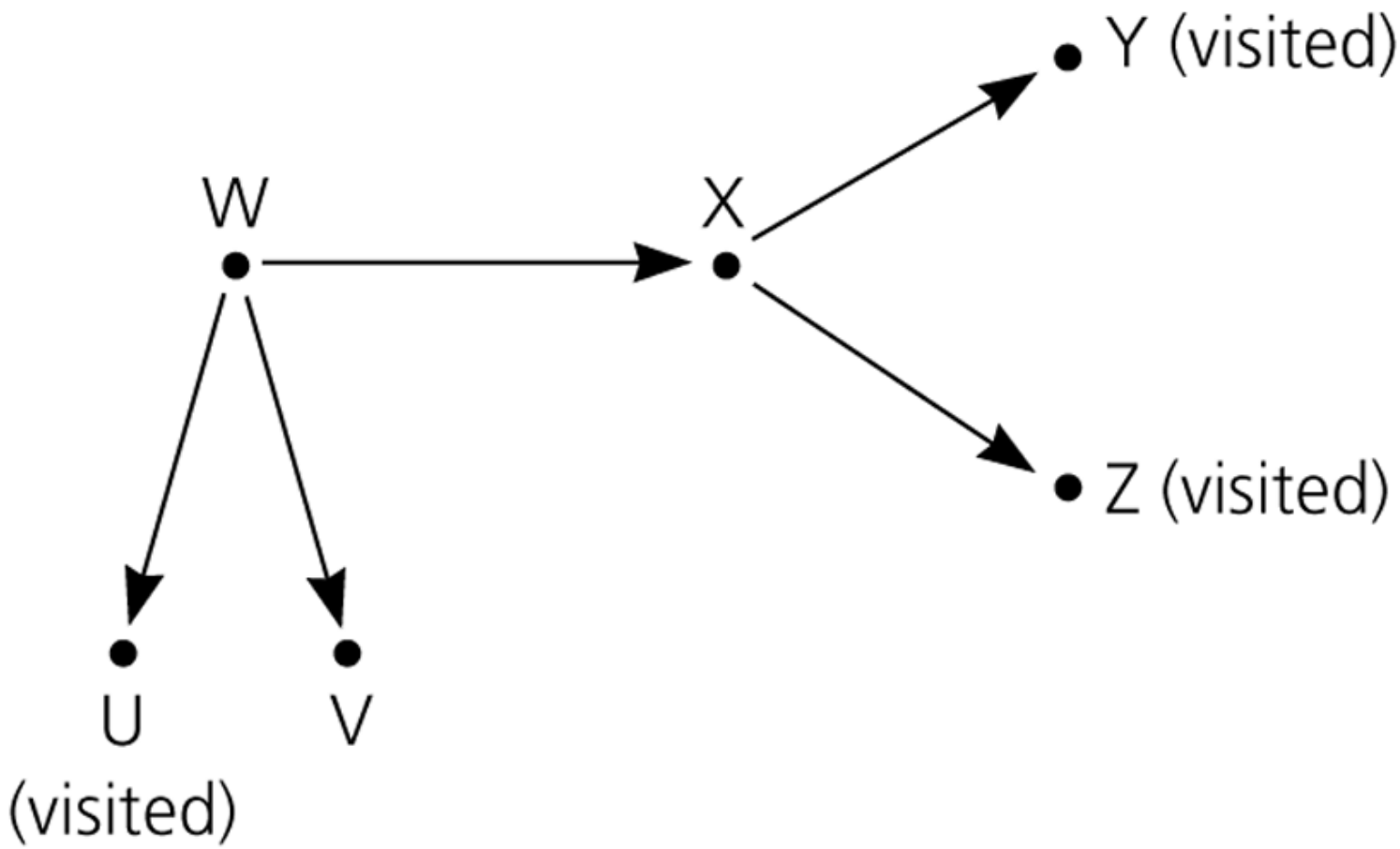

Figure 6.14

Visiting city *P*, then *R*, then *X*: a) box trace versus b) stack

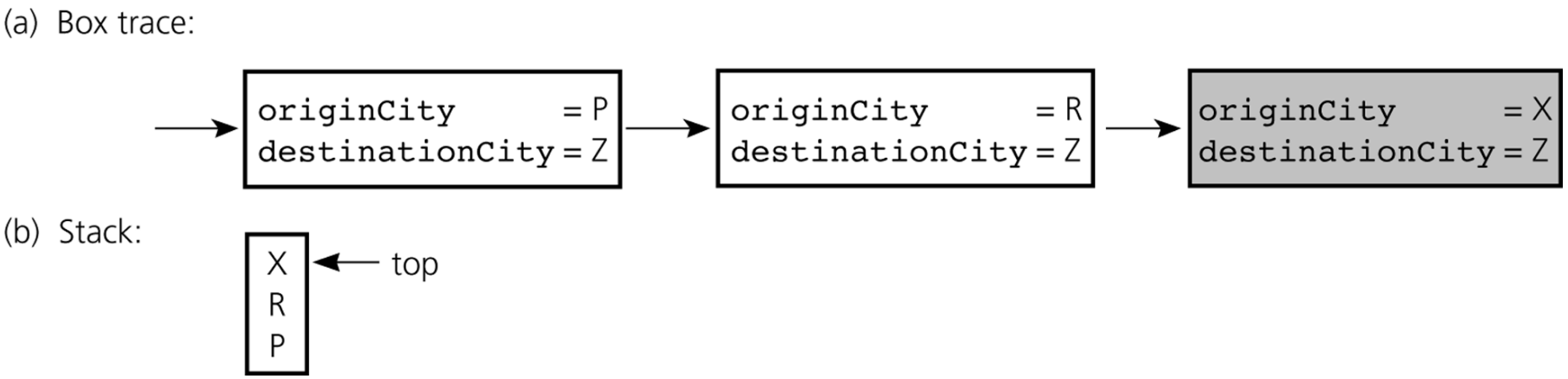

Figure 6.15

Backtracking from city *X*, then *R*, then *P*: a) box trace versus b) stack

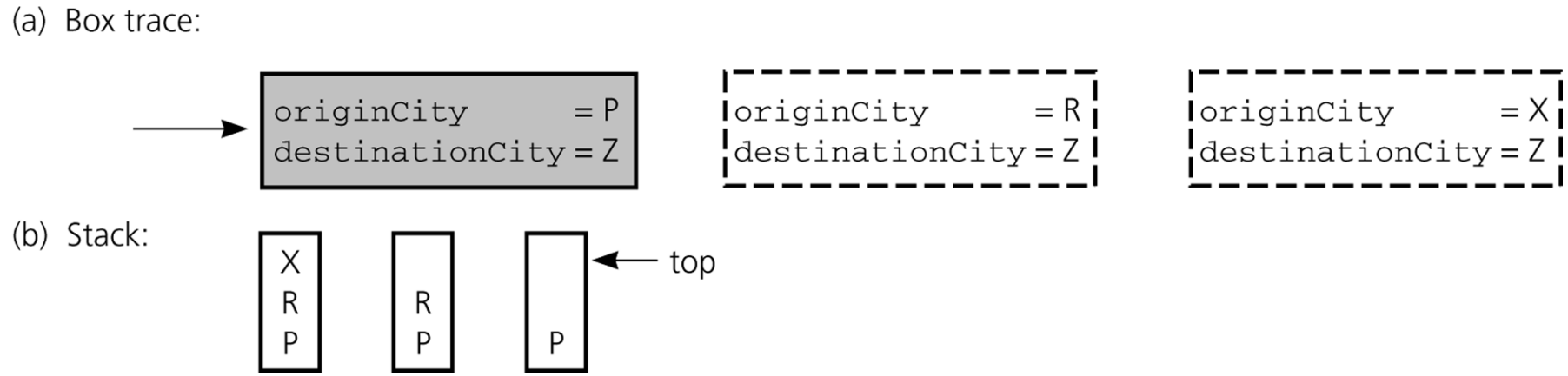

Figure 6.16

Flight map for Self-Test Exercise 9 and Exercise 11

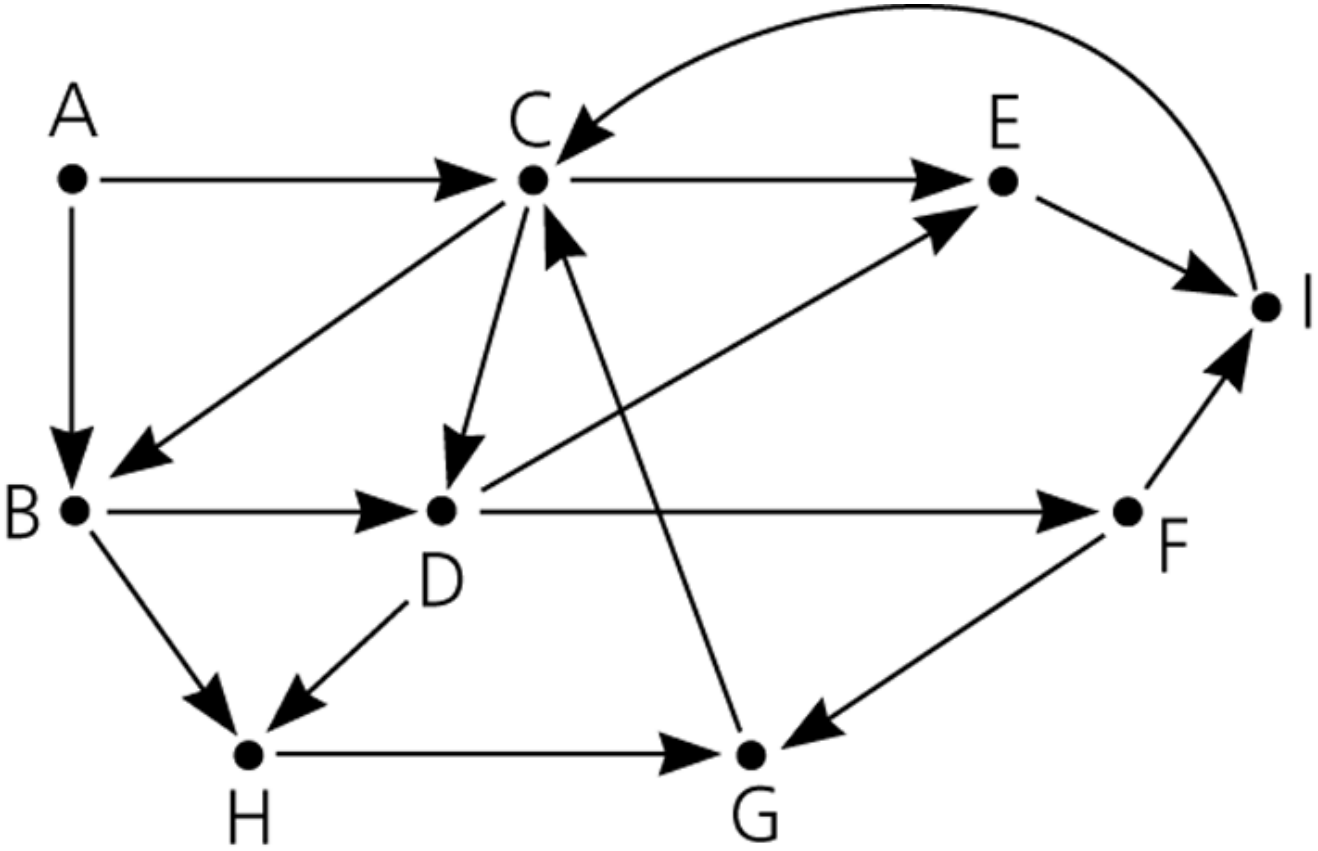

Figure 6.17

Railroad switching system for Exercise 2

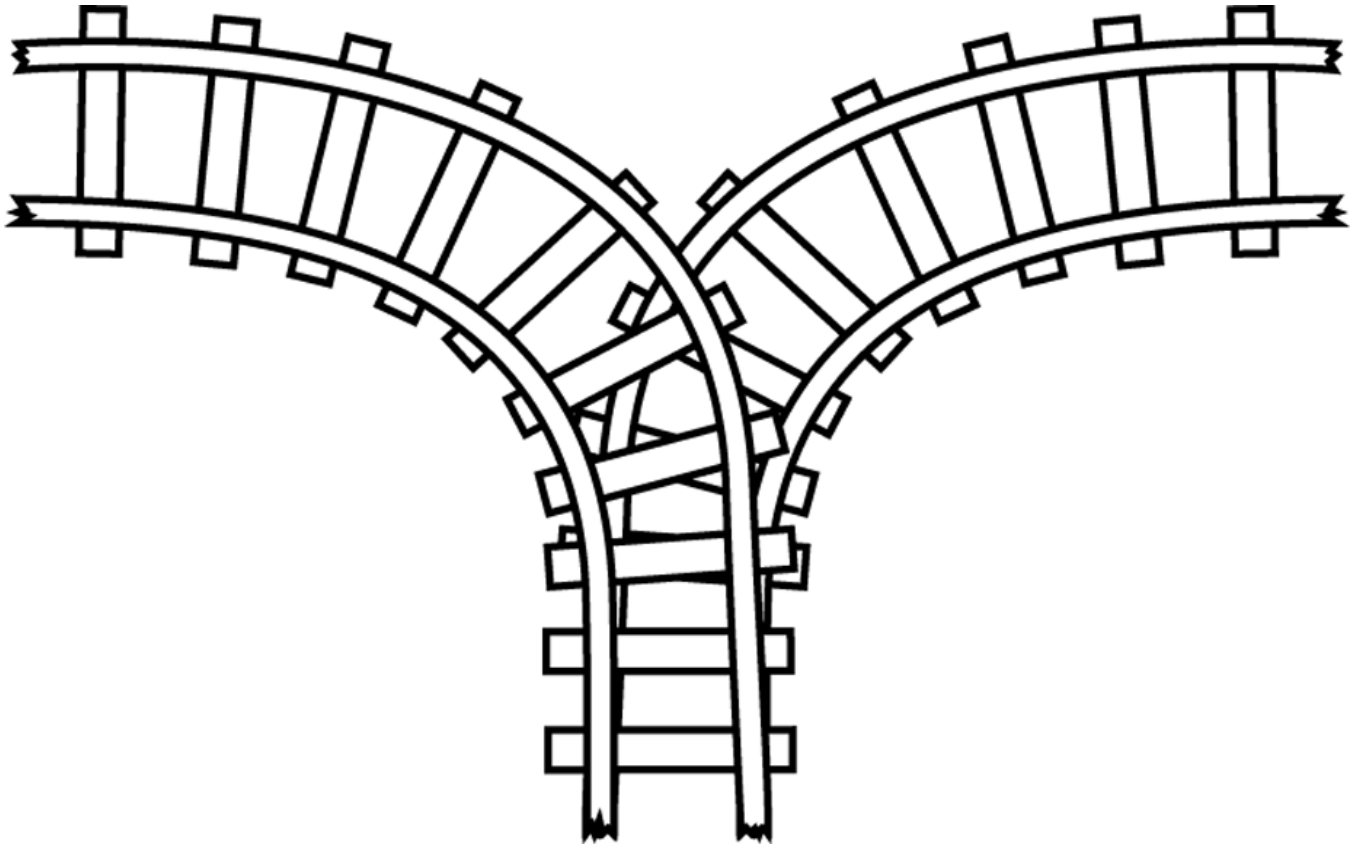

Figure 6.18

Adjacency list for the flight map in Figure 6-9