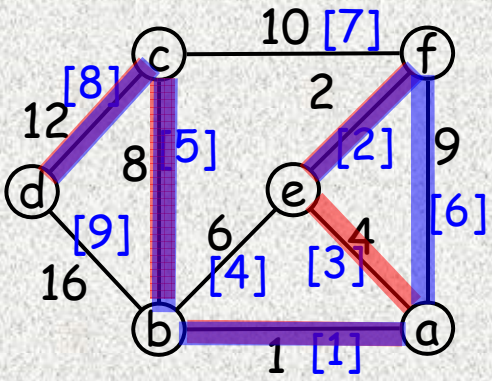
Problem: Minimum Spanning Trees

G = (V, E)
undirected/connected



Cost= 1+2+4+8+12
= 27
(an MST)

Kruskal's Algorithm:
(Greedy Method: smallest weighted first + no cycle)

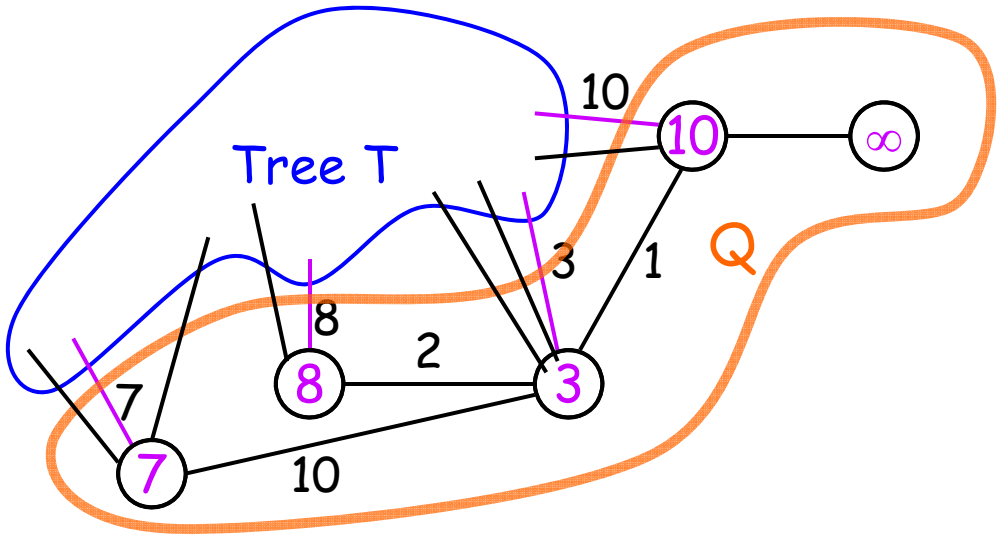
Step 1: sort edges by lengths

Step 2: for i = 1 to |E|

select the i-th edge as a tree edge
if it induces no cycle.

* u 和 T 之 間 可 能 有 很 多 edges

key[u] 只 記 住 最 短 的 一 條



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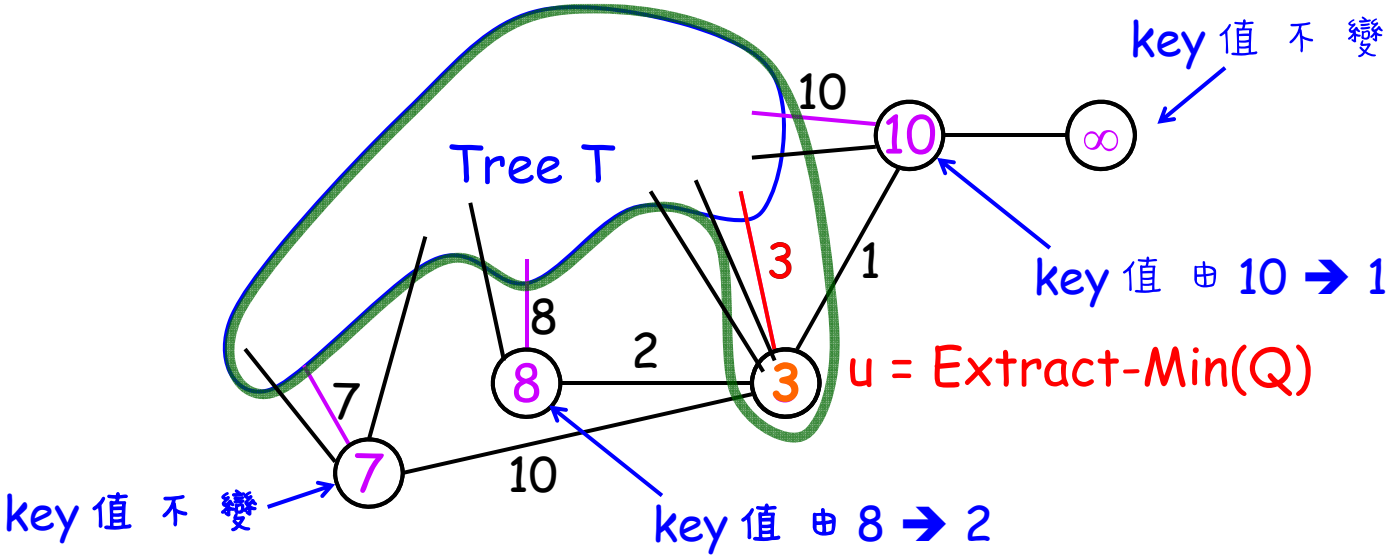

		array	b. heap	f. heap
Steps 1~5:	Build Q	O(V)	O(V)	O(V)
Step 7:	V times Extract-Min	$O(V^2)$	O(V lg V)	O(V lg V)
Steps 8~11:	E times Decrease-Key	O(E)	O(E lg V)	O(E)
		$O(V^2+E)$	O(E lg V)	O(E + Vlg V)

Procedure	Binary heap (worst-case)	Fibonacci heap (amortized)	array
MAKE-HEAP	$\Theta(1)$	$\Theta(1)$	$O(1)$
INSERT	$\Theta(\lg n)$	$\Theta(1)$	$O(1)$
MINIMUM	$\Theta(1)$	$\Theta(1)$	$O(n)$
EXTRACT-MIN	$\Theta(\lg n)$	$O(\lg n)$	$O(n)$
UNION	$\Theta(n)$	$\Theta(1)$	$O(n)$
DECREASE-KEY	$\Theta(\lg n)$	$\Theta(1)$	$O(1)$
DELETE	$\Theta(\lg n)$	$O(\lg n)$	$O(1)$
build	$O(n)$	$O(n)$	$O(n)$

(See 22-1)