# Dijkstra's Algorithm - Exercises (Sol'ns) (6 pages; 14/8/19)

(1) The network below represents roads between towns, with the weights being distances in miles.There are fire-stations in towns A and G. If a fire breaks out in town T, use Dijkstra's algorithm to decide which town should send a fire-engine (assuming that journey times are proportional to distance)? What route(s) are recommended?
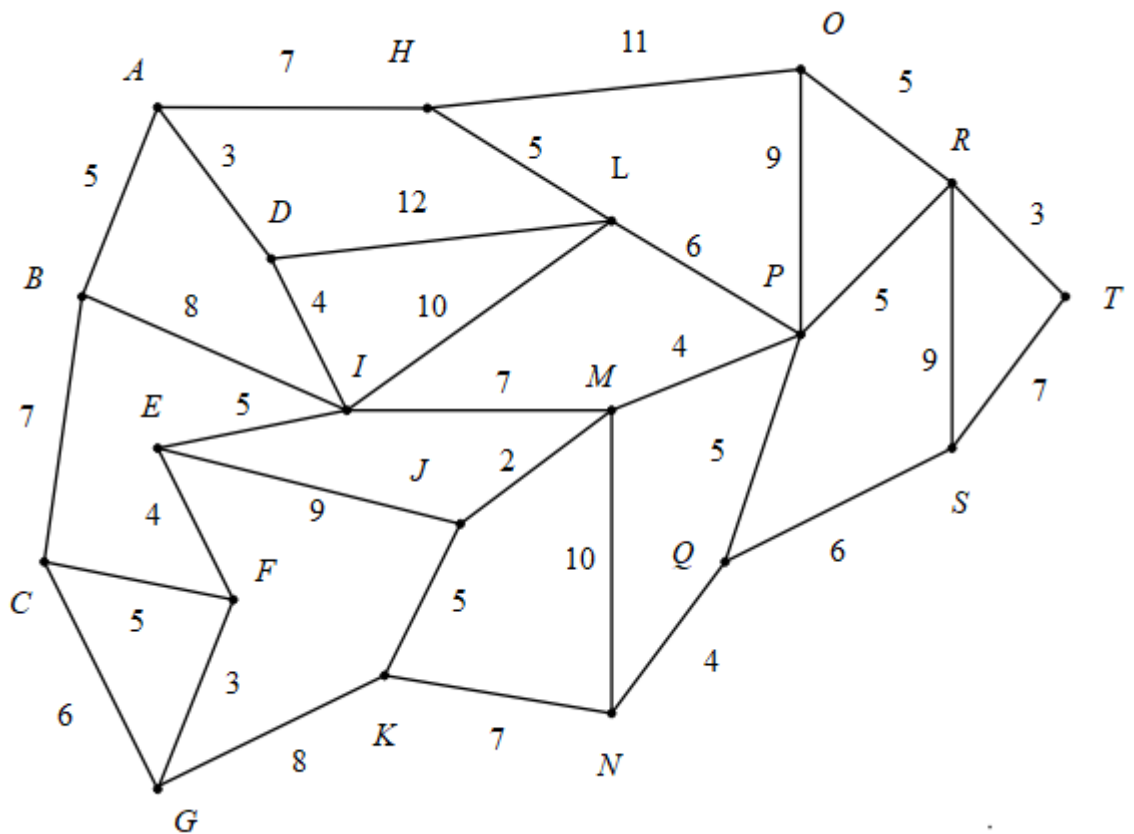
Solution

Find shortest distances from T. The sequence of labelling is as follows:

[For exam answers, the boxes should be drawn on the network - leaving plenty of room for them!]

T	1	0

R		
3		

S		
7		

R	2	3
3		

O		
8		

P		
8		

S	3	7
7		

Q		
13		

O	4	8
8		

(Alternatively, P could be given a permanent label instead; and similarly for other nodes later on.)

H		

19	

P	5	8
8		

L		
14		

M		
12		

M	6	12
12		

I		
19		

J		
14		

N		
22		

Q	7	13
13		

N		

22,17	

L	8	14
14		

D		
26		

J	9	14
14		

E		
23		

K		
19		

N	10	17
22,17		

H	11	19
19		

A		
26		

I	12	
19		

D		
26,23		

B		
27		

K	13	19
19		

G		
27		

E	14	23
23		

F		
27		

D	15	23
26,23		

A	16	26
26		

B	17	27
27		

C		
34		

G	18	27
27		

C		
34,33		

F	19	27
27		

C		
34,33,32		

C	20	32
32		

So A is 26 miles away, compared to 27 for G; ie A should send the fire engine.

The routes with a distance of 26 miles are AHLPRT and AHORT.