# Networks Milford Pass National Park

Milford Pass National Park is a national park in South Island which has several Department of Conservation huts that are linked by tramping tracks.

**The distances between the huts in kilometres are shown in the following table.**

| Ace | | | | | | | |
|---|---|---|---|---|---|---|---|
| 40 | Beck | | | | | | |
| ..... | 26 | Cap | | | | | |
| ..... | ..... | 47 | David | | | | |
| 35 | 27 | ..... | ..... | Eddy | | | |
| ..... | ..... | 28 | 31 | ..... | Freddy | | |
| ..... | ..... | ..... | 28 | 36 | 10 | Gum | |
| ..... | ..... | ..... | 38 | 45 | ..... | 16 | Happy |

1 Uncle Jim wants to tramp from Beck hut to Happy hut. What is the distance of the shortest route between these two huts?

2 Two trampers would like to walk all the tracks in the park without repeating any track, although they are happy to visit a hut more than once. They would like to start at Ace hut and finish at Gum hut.

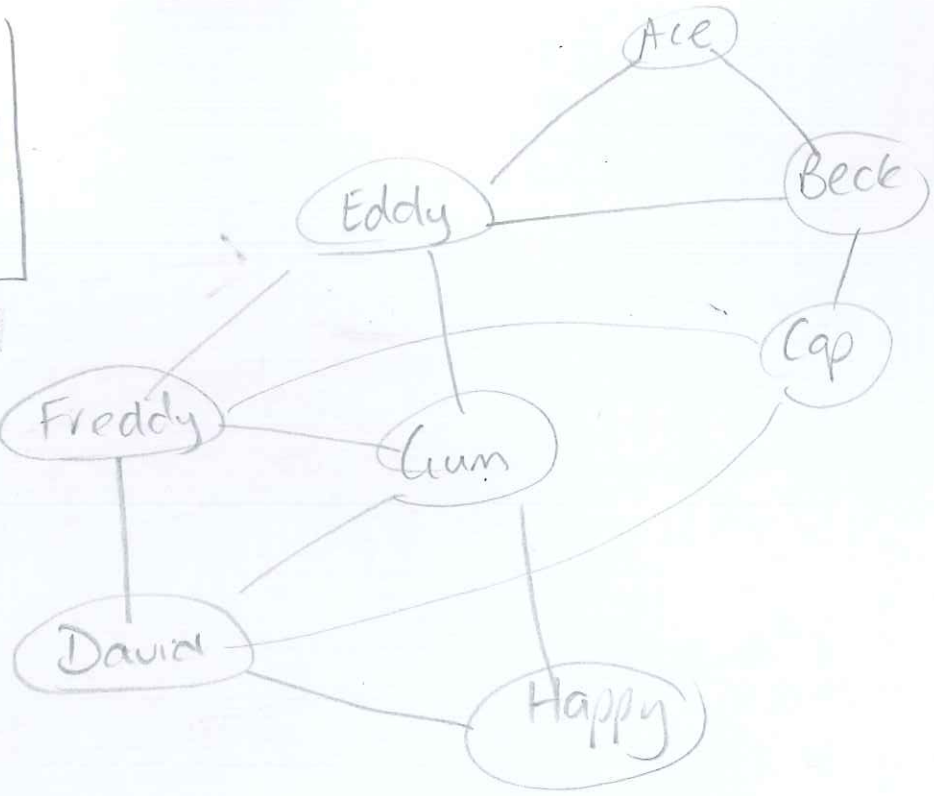
Is this possible? Explain your answer.

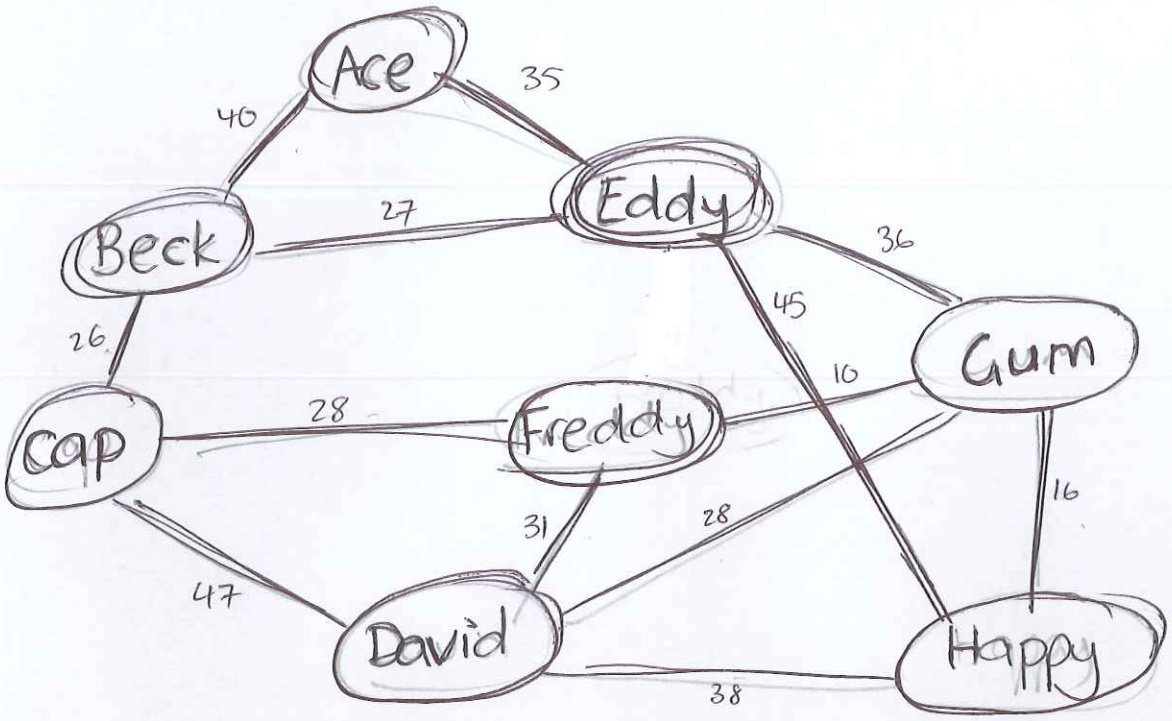
3 The Department of Conversation decide to close some tracks because the environment is very fragile, but they wish to leave a network of tracks so that it is possible to travel from one hut to any other.

a) Which tracks should they leave open so that the minimum length of track will be needed?

b) What is the minimum length of track needed?

Network development version 1



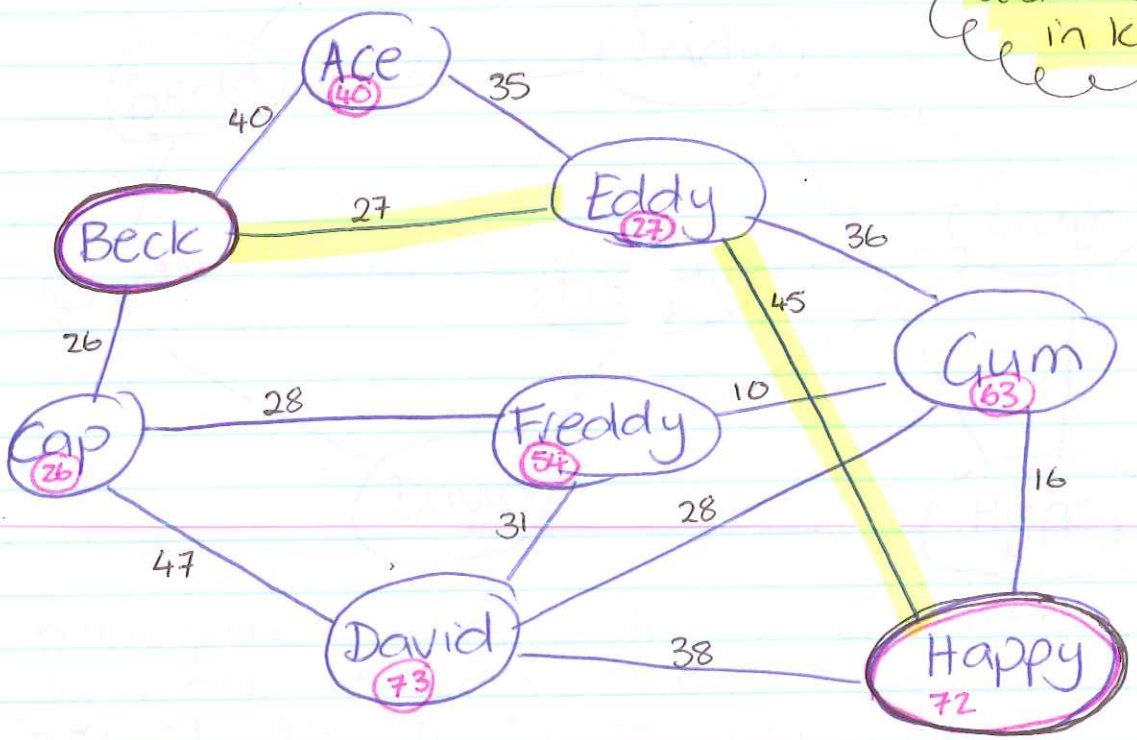




Version 2

done one in pen darkly so easy to trace!

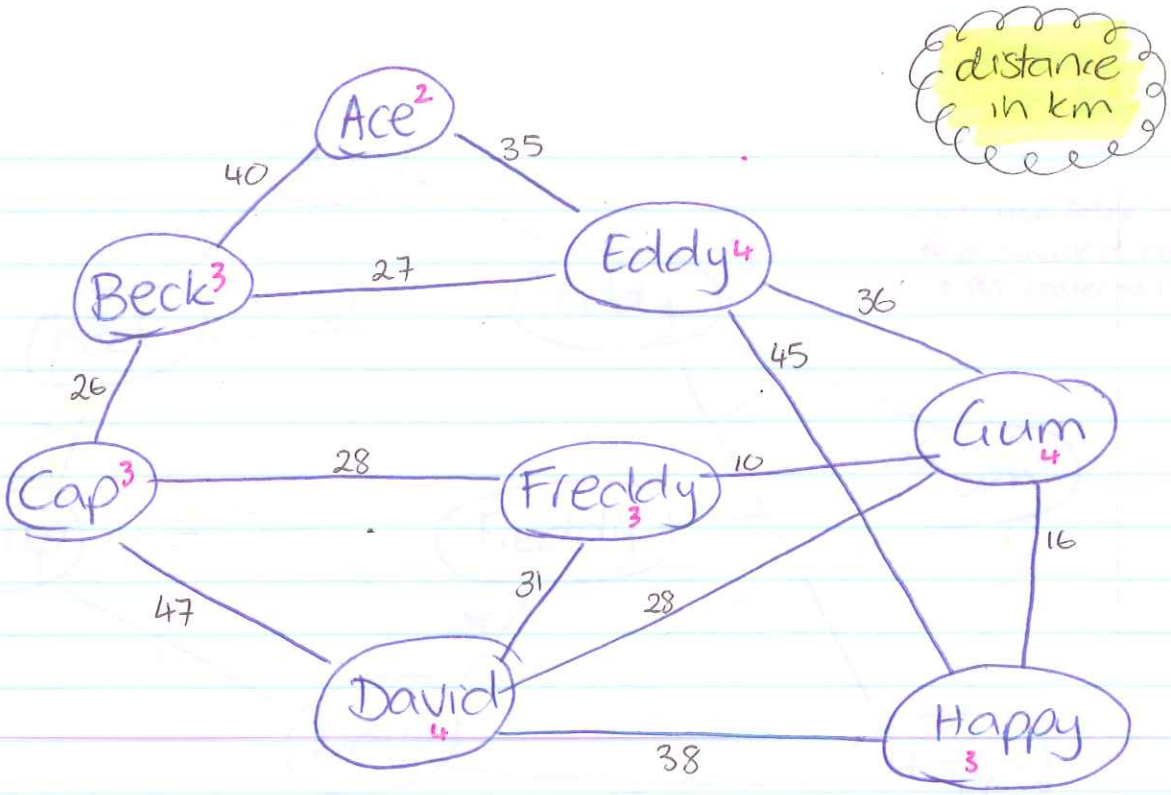
→ check paths again carefully as adding info (I found an error!)

# Milford Pass National Park




① Shortest route between Beck hut and Happy Hut
→ shortest path.

The shortest path between Beck hut & Happy Hut is
Beck → Eddy → Happy and is 72km.
Any othe routes will be a longer distance, for example Beck → Eddy → Gum → Happy is 7km longer (79km).

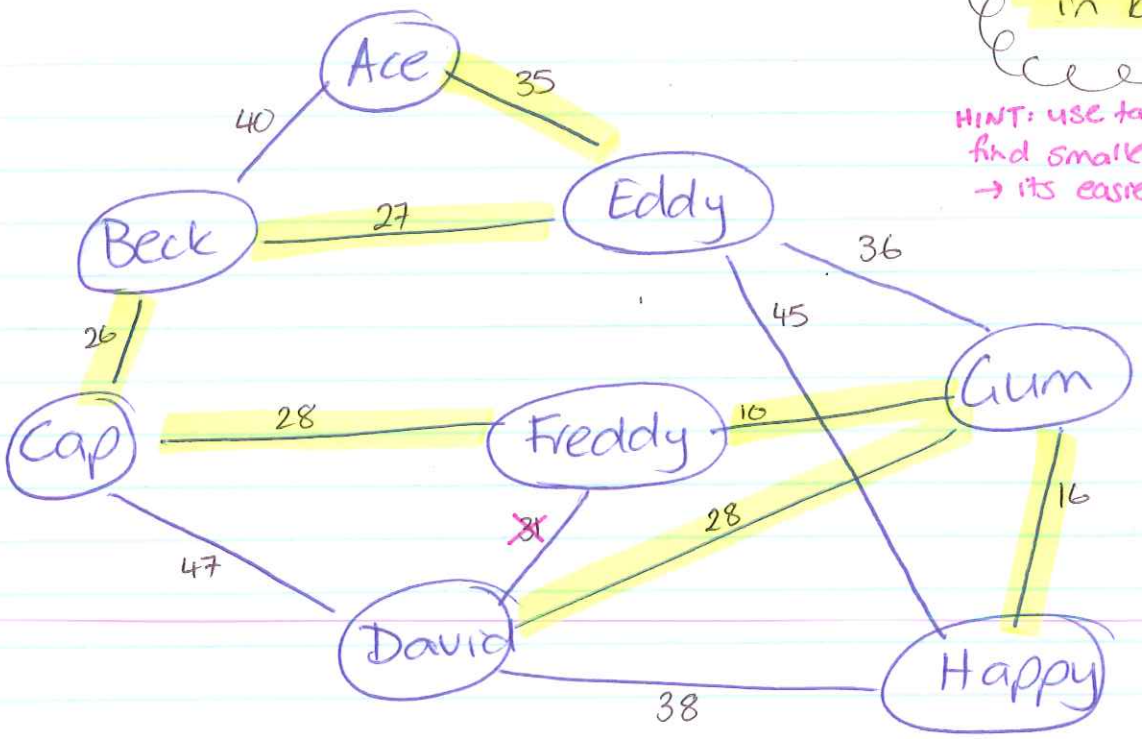



(2) walking the tracks without repeating any track → traversable?
Start at Ace, finish at Gum.

This network of tracks is NOT traversable. That is, the trampers will not be able to walk all the tracks without repeating any track. This is because there are 4 huts which have an odd number of tracks coming off. For the network of tracks to be traversable, there would either need to be tracks added between Beck & Freeddy, Cap and Happy (for example) or tracks removed. (remove cap - Freddy & trampers can start at Beck & finish at Happy as these are then the only odd huts)

distance in km

HINT: use table to find smallest numbes → its easier to look at!




(3) Closing tracks but leaving a network
a) so that it is possible to travel to all
b) huts using minimum length of track
→ minimum spanning tree.

The tracks DoC should keep open are highlighted above, and total a minimum of 170km

Paths were chosen from the shortest, ensuring a cycle wasn't created. This is why David - Freddy isn't highlighted - it would make a cycle.