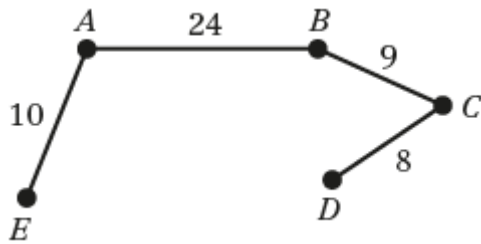


The travelling salesman problem 5B

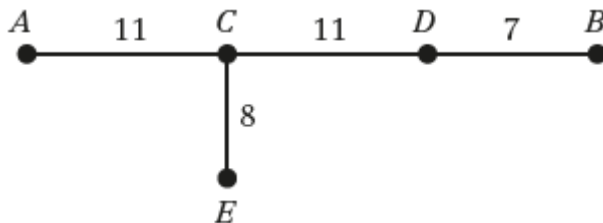
- 1 a Initial upper bound = 2×51
= 102



- b Use DE as a shortcut
Route length = $51 + 28 = 79$

- c Route A B C D E A length 79

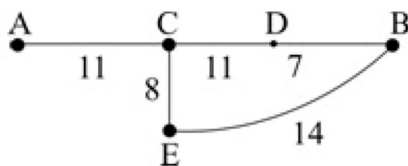
- 2 a



- b Initial upper bound = $2 \times 37 = 74$

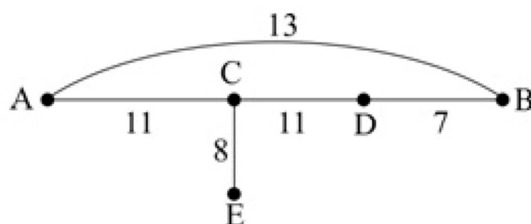
- c For example

- i use BE as a shortcut



or

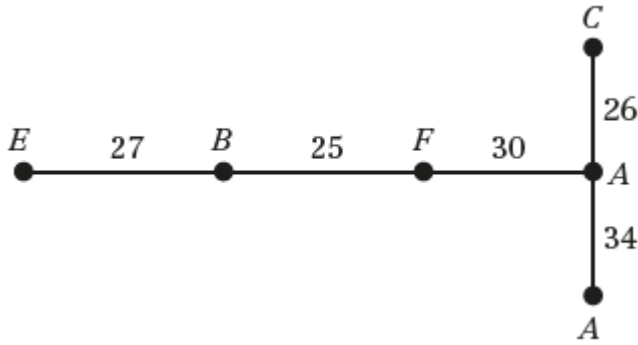
- ii use AB as a shortcut



Other answers also possible

- d i Using BE route is A C E B D C A length 62
ii Using AB route is A C E C D B A length 58

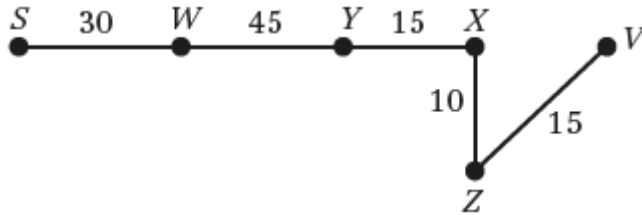
3 a Initial upper bound = $2 \times 142 = 284$



b Many possibilities: for example DE or EC or DF and EC

c DE gives A C A F B E D A length 231
 EC gives A D A F B E C A length 217
 DF and EC gives A C E D F D A length 190

4 a



Initial upper bound = $2 \times 115 = 230$

b For example arc VS

c Route S W Y X Z V S length 190