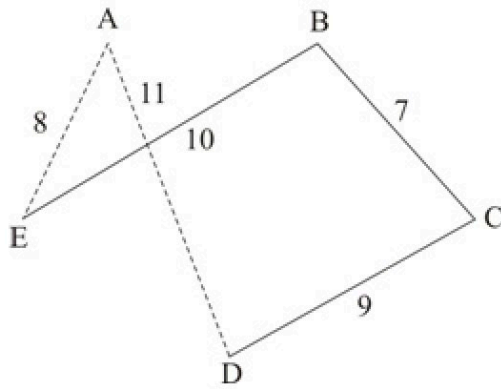


Exercise 5C

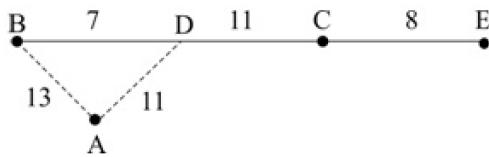
1 a



Weight of residual minimum spanning tree = 26  
 Two shortest arcs from *A* are *AE* and *AD*.  
 Lower bound =  $26 + 8 + 11 = 45$ .

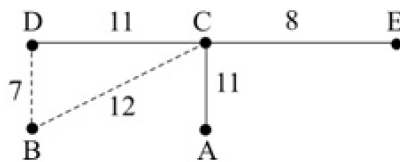
b The lower bound corresponds to a Hamiltonian cycle, so it is an optimal solution.

2 a *Deleting A*



Weight of residual minimum spanning tree = 26  
 Two shortest arcs are *AD* and *AB*.  
 Lower bound =  $26 + 11 + 13 = 50$

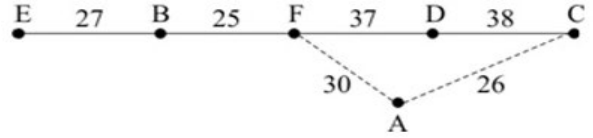
*Deleting B*



Weight of residual minimum spanning tree = 30  
 Two shortest arcs are *BD* and *BC*.  
 Lower bound =  $30 + 7 + 12 = 49$

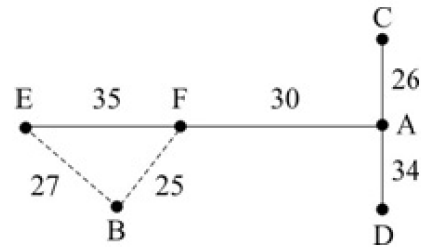
b The better lower bound is 50 since it is higher.

3 a *Deleting A*



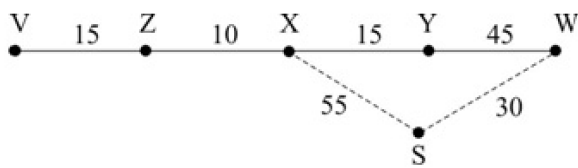
Weight of residual minimum spanning tree = 124  
 Two shortest arcs are *AC* and *AF*.  
 Lower bound =  $127 + 26 + 30 = 183$ .

*Deleting B*



Weight of residual minimum spanning tree = 125  
 Two shortest arcs are *BF* and *BE*.  
 Lower bound =  $125 + 25 + 27 = 177$ .

- b The better lower bound is 183 because it is higher.
- c Combining the answer to part b and Exercise 5B Question 4, we get  $183 < \text{optimal value} \leq 190$   
 The first inequality is sharp as the lower bound does not correspond to a Hamiltonian cycle.

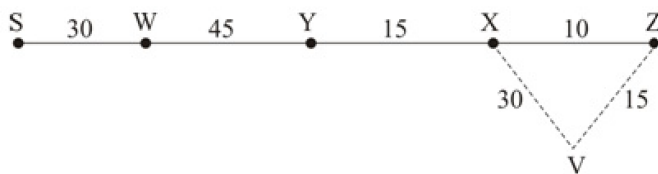
4 a *Deleting S*

Weight of residual minimum spanning tree = 85

Two shortest arcs are  $SW$  and  $SX$ .

Lower bound =  $85 + 30 + 55 = 170$ .

*Deleting V*



Weight of residual minimum spanning tree = 100

Two shortest arcs are  $VZ$  and  $VX$ .

Lower bound =  $100 + 15 + 30 = 145$ .

- b** The better lower bound is 170 because it is higher.
- c** Combining the upper bound with the better lower bound, we get  
 $170 < \text{optimal value} \leq 190$   
 The first inequality is sharp as the lower bound does not correspond to a Hamiltonian cycle.