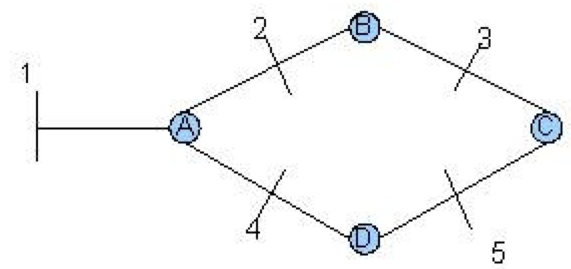


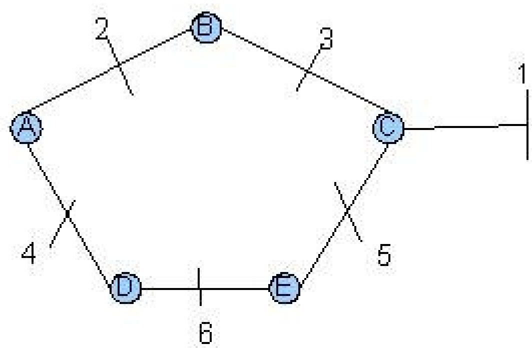
Problem 15.6. Using just the specification in the book, which is rather ambiguous, the following is the simplest example I could come up with that seemed reasonable to me. I will be interested to see what else folks came up with.

Assumptions:

1. All distances are 1.
2. The routers broadcast their routing tables every 30 seconds (Comer 4th ed 16.3.2, page 297).
3. The timeout period for a route is 180 seconds (Comer 4th ed 16.3.2, page 298) – the entire scenario takes place in less than 180 seconds, so no routes time out.
4. The hold-down period is 60 seconds (Comer 4th ed 16.3.3, page 300).
5. The routes to network 1 have stabilized at:
    1. Router A: Distance 1 to network 1, over local interface
    2. Router B: Distance 2 to network 1, through router A
    3. Router C: Distance 3 to network 1, through router B.
    4. Router D: Distance 2 to network 1, through router A.

Time	***Event***
0	Routers broadcast distances to network 1 and others (we're only interested in network 1).
1	Routers B and D go down.
2	Router A loses connectivity to network 1 (the end of the hold down time will be 62). It broadcasts the unavailability of network 1 (ie, distance infinity).
30	A broadcasts unavailability of 1; C broadcasts “distance 3 to network 1, through B”. No one sees either broadcast.
60	A broadcasts unavailability of 1; C broadcasts “distance 3 to network 1, through B”. No one sees either broadcast.
62	A's hold down ends
63	D recovers, knows only connected networks (4 and 5), broadcasts the information (nothing about network 1).
90	C broadcasts “distance 3 to network 1, through B”

Time	*Event*
	A broadcasts – either nothing about network 1 or distance infinity (ie, 15) to network 1
90+	D receives C's broadcast, records “distance 4 to network 1, through C” D ignores A's information, if any, about 1 (the path is not as good as the path through C).
93	D broadcasts “distance 4 to network 1, through C”
93+	A uses D's information for network 1, records “distance 5 to network 1, through D”
94	B recovers, broadcasts “distance 1 to networks 2 and 3, through local interfaces”
120	C broadcasts “distance 2 to network 1 through B” - B should ignore this, because B was the source of the information. A broadcasts “distance 5 to network 1, through D” - B should use this, the best “useful” information.
	Loop has formed!



15.9. This one is relatively easy; the key is that all the routers have correct information about the network, except for one that is missing a crucial link.

Assumptions: Using the above diagram, suppose that all distances are 1 except over network 3, which is 100. Using SPF, all routers start with a global broadcast of information about locally attached networks and their distances. Suppose all information gets to all routers EXCEPT the information from C and E, which doesn't get to A. Then all routers except A know the actual network topology, and route in such a way as to avoid network 3. A doesn't know about network 5, so it thinks it has to use network 3 to get to network 1, i.e., if A wants to send a message to network 1, it first sends it to B. B knows that the shortest route to C is actually through A, so B sends it back.

Thus we have a loop.