

HW1

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1. 4950. Since the diameter is 1, it means every nodes should be link together. For there are 100 nodes, there must be $100 \cdot 99 / 2 = 4950$ links.
2. 99. When the diameter can be up to 2, we can make a node to be center and other 99 nodes to be host. 99 nodes links to the center, then the diameter will be 2 for each node.
3. 50. For the degree of the nodes be 2, it means all nodes will links together as a circle. So for any nodes, the longest edge will be $100 / 2 = 50$.
4. NO, it's impossible. By Moore Bound, let $n_{d,k}$ be the maximum possible number of vertices for a graph with degree at most d and diameter k. Then $n_{d,k} \leq M_{d,k}$, where $M_{d,k}$ is the Moore bound. If $d = 3$, $k = 5$, $M_{d,k} =$

$$1 + 3 \cdot \frac{(3-1)^5 - 1}{3-2} = 94$$

$94 < 100$, so the answer of this question is impossible.