Q4a

i. 1,2,4,3,5,6



ii 1,2,3,4,5,6

b.)

For these questions I start by figuring out if there is some node that is always going to have be in one place - in this case it’s 2, because no other node has degree 6. Now, once we have 2 fixed, we can consider some other node. I chose 1, but it doesn’t really matter. 1 can go to 6 different places. Once we have 1 fixed, we have to take 7 with it, so there’s only 1 choice for 7. We then do the same for another node. I chose 3. 3 can now go to 4 different places. Once we fix 3, 4 must go with it, because 4 must be connected to 3, so there’s only one choice for 3. Then, there are 2 choices for 5, and as before 1 choice for 6. Multiplying all the choices gives 48. I’m not sure if this is correct but that was my working for this one.

c.)

i. If we are using k colours then each node in the graph can be assigned a colour out of the k colours in such a way that no adjacent nodes will share the same colour.

ii. think about how G can be bipartite when it’s two colourable, then consider how arcs can only exist between these two partitions, and how each node has the same degree (let’s call it d). If one partition has n nodes, and the other has m nodes, then the sum of arcs of those partitions = d \* n and d \* m respectively. Since arcs can only exist between partitions, these two must be equal. Then we get n = m after dividing both sides by d

d.)

I. G is an undirected, unweighted graph with no loops or edges, where each pair of vertices has at most one arc connecting them

ii. If G is not connected there must be some component with less than n/2 nodes. But this leads to a contradiction since a node in this component can’t have degree >= n/2, since there aren’t n/2 nodes to connect to.