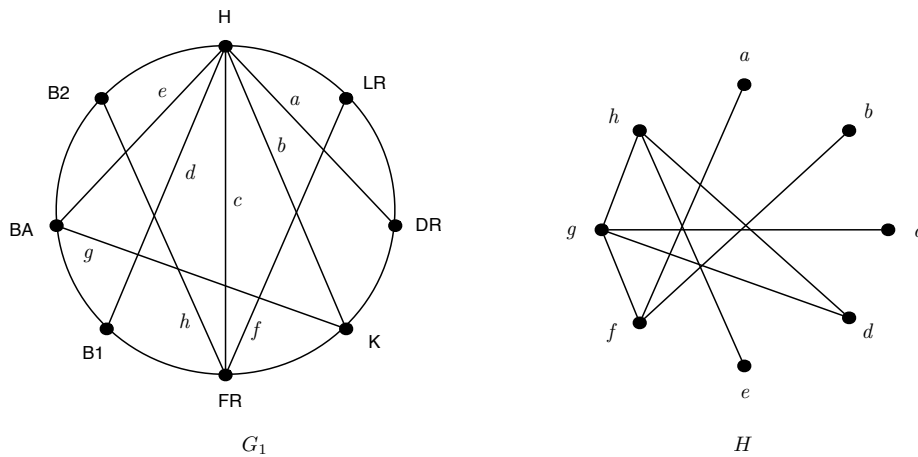


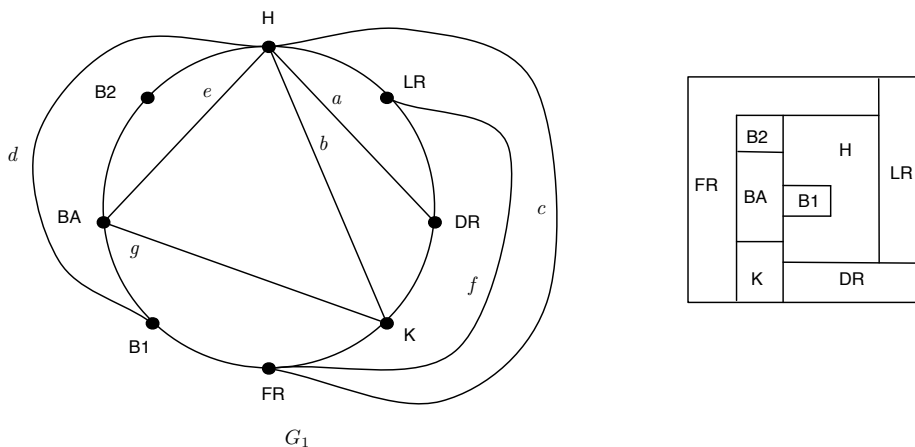
► **Problem 13.3-13**

A contractor is building a single-story house for a newly married couple. The house is to consist of a living room, dining room, family room, kitchen, two bedrooms, bathroom, and hall. The couple insists that all rooms border on the hall. The kitchen is to share a wall with the dining room, family room, and bathroom. Both bedrooms should share a wall with the bathroom and the family room. The living room is to border the family room and the dining room. Is it possible for the contractor to meet the couple's demands? If not, how close could the contractor come to meeting all requirements? Justify your answer.

Solution. In the answer, we use the abbreviated names: LR for living room; DR for dining room; FR for family room; K for kitchen; B1 and B2 for bedrooms; BA for bathroom; and H for hall. The graph depicting this situation is shown below.



Since H has a triangle, $\chi(H) = 3$ and it is impossible to construct the desired house. We could make $\chi(H) = 2$ by removing any of d, g, h . The most practical of these to remove might be the h in which case G_1 becomes as shown on the left. One possible corresponding house plan is at the right.



□