

Polycube Perception Puzzles

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Polycube apartments are built by joining cubes together, and they have windows in every wall, ceiling, and floor. Build polycube apartments so that each apartment has a straight line of sight from one of their windows to a window of each of the other apartments. Windows right up against each other are okay! Diagonal views are not okay.

Challenge 1. Build 4 apartments that can all see each other, using at most 2 cubes each.

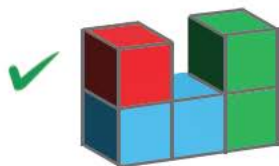
Challenge 2. Build 5 apartments that can all see each other, using at most 3 cubes each.

Challenge 3. Build 6 apartments that can all see each other, using at most 4 cubes each.

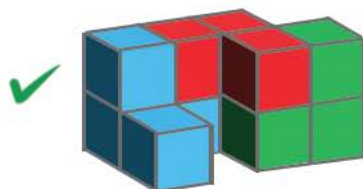
Challenge 4. Build 7 apartments that can all see each other, using at most 5 cubes each.

Challenge 5. What's the smallest total number of cubes you need (counting all the cubes in all the apartments) for challenges 1-4?

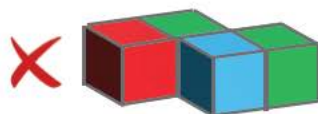
Examples of three polycube apartments (one red apartment, one blue apartment, and one green apartment)



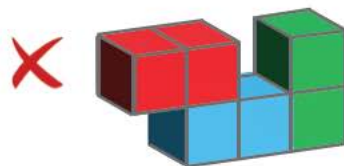
This configuration works! Red, blue, and green can all see each other through a window. Gaps between windows, like between red and green here, are okay.



This configuration works! Twisty shapes, and apartments on top of each other, are okay. Some pairs of apartments having more than one window to each other is okay.



This configuration doesn't work! Red can't see blue diagonally, and green can't be disconnected.



This configuration doesn't work! The red apartment isn't supported. It will fall.

