Habits of Mind #2

Crossing the River

A group of adults (teachers and parents) go on a camping trip with a group of 4th grade students. On the first day, the campers (adults and students) come to a river. It's not a very wide river, but it is too deep to wade across. Fortunately, the campers find a canoe. Unfortunately, the canoe is not very big. Even more unfortunately, the adults are rather big and only one adult can fit in the canoe at one time. Fortunately, the 4th grade students are quite small, small enough that the canoe will hold any two of the students. It is not possible to fit one adult and one child in the canoe at the same time. Fortunately, the students have experience with canoes and can all safely row across the river by themselves.

(a) Suppose that there are four adults and two students on the camping trip. Is it possible to get the entire camping group across the river? If yes, how many one-way trips across the river will it take to get all six people across the river?

(b) What if there were 5 adults and only one student on the trip? Is it possible to get the entire group across the river? If yes, how many one-way trips will it take?

(c) What if there were 5 adults and 2 students? Is it possible to get the entire group across the river? If yes, how many one-way trips will it take?

(d) What if there were 4 adults and 6 students? Is it possible to get the entire group across the river? If yes, how many one-way trips will it take?

(e) How can this problem be generalized? That is, how can you solve the problem for any number of adults and any number of students? If there is no general solution, then can you solve any special cases?

Due Date: At the beginning of class on Wednesday, September 8.