1 Problem

This is an ancient puzzle. It dates back to times of Charlesmagne:

Three jealous husbands with their wives must cross a river in a boat with no boatman. The boat can carry only two of them at once. How can they all cross the river so that no wife is left in the company of other men without her husband being present? Both men and women may row. All husbands are jealous in extreme. They do not trust their unaccompanied wives to be with another man, even if the other man’s wife is also present.

(a)(4pts) Solve the puzzle.
(b)(2pts) Write a generalization of the puzzle.
(c)(4pts) Solve it.

2 Problem - Josephus Problem

The problem is named after Flavius Josephus, a Jewish historian living in the 1st century. As the legend goes, he and his 40 comrade soldiers were trapped in a cave, surrounded by Romans. They chose suicide over capture and decided that they would form a circle and start killing themselves using a step of three. As Josephus did not want to die, he was able to find the safe place, and stayed alive with his comrade, later joining the Romans who captured them. (The only statement given by Josephus himself is that by luck, or maybe by the hand of God, he and another man remained the last and gave up to the Romans.)

(a)(4pts) What position in the circle was the safe place? Explain.
(b)(2pts) Write a generalization of the puzzle.
(c)(4pts) Solve it.

3 Problem - Alibaba and 40 robbers

Alibaba and his gang of 40 robbers have gotten their hands on a hoard of 100 gold coins and wish to divide the loot. They are democratic robbers, in their own way, and it is their custom to make such divisions in the following manner: The youngest robber, at the present that was Aladdin, makes a proposal about the division and everybody votes on it, including the proposer. If 50% or more are in favor, the proposal passes and it is implemented forthwith. Otherwise the proposer is beheaded and the procedure is repeated with the next youngest robber. All the robbers enjoy beheadings, but if given a choice they prefer cold, hard cash(coins). They obviously do not want to be beheaded themselves. All
robbers are rational and know that the other robbers are also rational. Moreover no two robbers are equally young, so there is a precise age order. The gold coins are indivisible, and arrangements to share coins are not permitted, because no robbers trusts his fellows to stick to such an arrangement. It is every man for himself. What proposal should Alladin make to save his life and get as many coins as possible?

(a) (4pts) What proposal should Alladin make to save his life and get as many coins as possible?
(b) (2pts) Write a generalization of the puzzle.
(c) (4pts) Solve it.