

(1) The fox, the goose and the grain

A farmer has to transport a fox, a goose, and some grain across a river. He has a boat which he can row back and forth from shore to shore. He can take himself and one other thing in the boat. However, unless he is present, the goose will eat the grain and the fox will eat the goose. How can he transport all three things across the river? What is the fewest number of crossings needed?

(2) The fox, the goose, the grain, and the dog

This time, the farmer has to transport a fox, a dog, a goose, and some grain across a river. He has a boat which can carry himself and either the fox, dog, goose, or grain. If the farmer isn't present, the fox cannot be left with either the dog or the goose, or both. If need be, the goose can be left with the grain provided the dog is present because the dog will guard the grain and won't eat the goose. Help the farmer cross the river. What is the fewest number of crossings needed?

(3) The Missionaries and the Cannibals

Three missionaries and three cannibals had to cross a river in a boat which held two people. If some missionaries were outnumbered, on either shore, by the cannibals, their missions were over. How would all six cross the river, given that all of them could row? What is the fewest number of crossings needed?

(4) Quarrelsome Boys

A father took his sons out for a picnic and had to cross a river in a small boat. The boys were born one year apart. Two boys would fight each other if their ages differed by one year, provided that the father was not around to stop it.

Given that only the father could row, how could this family cross the river peacefully (and what is the fewest number of crossings needed), if

- (a) there were three boys and the boat held two people;
- (b) there were five boys and the boat held three people, and the father could stop fights on the boat;
- (c) there were five boys and the boat held three people, but the father could not stop fights on the boat?

(5) Soldiers and Children

Two soldiers have to cross a river. They have discovered a small boat in which is being rowed by two children. The boat can only carry two children or a single soldier. How did the soldiers get across the river and afterwards leave the two children with their boat? What is the fewest number of crossings needed? (If you can solve this with 2 soldiers, then you can solve it for 358 soldiers!)