

Solutions to Crossing the River Problem

Crossing the River

You may want to try modeling this problem with 2 different kinds of small objects, such as pennies or paper clips, to represent the children and adults. In class, we recommend using colored cubes to represent the children and adults.

1) 33 trips

Explanation:

(Trip 1): Begin with 2 children going across

(Trip 2): Child #2 returns, leaving child #1 across the river

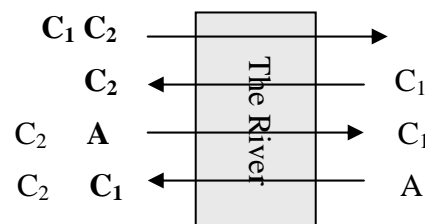
(Trip 3): An adult crosses the river alone

(Trip 4): Child #2 returns to bring the boat back

It takes 4 trips to get one adult across the river.

These same four trips repeat for each adult that needs to get across the river. That equals 32 trips for 8 adults. The last (33rd) trip is to bring the two children across the river together.

People in bold are the ones moving.



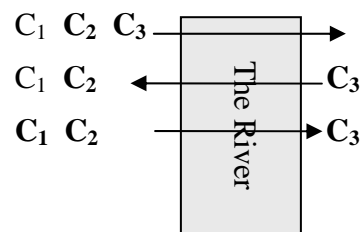
- 2) a) 25 trips (6 adults x 4 trips + 1 more trip) b) 61 trips
 c) 93 trips d) 401 trips

3) Multiply the number of adults by four then add 1 or $4A + 1$.

- 4) a) 3 adults b) 10 adults c) 14 adults

5) Since the problem still specifies that there are only two children, begin by subtracting the one additional trip. Then divide the remaining number of trips by 4 to find the number of adults. For example, for 13 trips, subtract 1 to get 12 trips, then divide by 4 to get 3 adults.

6) If there are 3 children, you need 2 trips to get one child across the river (2 children go over, one remains and one returns with the boat) then 1 more trip to bring the remaining 2 children across. So the rule becomes $4A + 3$.



If there are 5 children, you need 7 trips to get all the children across the river: 2 trips per child until there are only two children left, then one last trip to get the last two children across the river. So the rule becomes $4A + 7$.

If there are 10 children, you need 17 trips to get all the children across the river. For the first 8 children, there are 2 trips each. Then for the last 2 children, there is only 1 trip. So the rule becomes $4A + 17$.

7) The rule is $4A + 2C - 3$ where C = the number of children.

Explanation:

Since only one trip is needed to bring the last two children across, consider the remaining $C - 2$ children. Each of those children needs 2 trips to get across the river – one to ferry them over and one to return the boat to the other side. So call this $2(C - 2)$.

Then one last trip is needed to bring the remaining two children across the river.
 $2(C - 2) + 1$ or $2C - 3$

Added to the expression for adults, you get $4A + 2C - 3$.