

NRICH Maths Challenge – River Crossing Rohan - Wilson's School

If there were 2 adults and 2 children:

1. 2 children →
2. ←1 child
3. 1 adult →
4. ←1 child
5. 2 children →
6. ←1 child
7. 1 adult →
8. ←1 child
9. 2 children →

Therefore with 2 adults and 2 children there were 9 crossings.

If there were 3 adults and 2 children:

1. 2 children →
2. ←1 child
3. 1 adult →
4. ←1 child
5. 2 children →
6. ←1 child
7. 1 adult →
8. ←1 child
9. 2 children →
10. ←1 child
11. 1 adult →
12. ←1 child
13. 2 children →

Therefore with 3 adults and 2 children there were 13 crossings.

By considering both of the above scenarios I was able to identify a common pattern of movements. I noticed that the steps below were frequently repeated in both cases:

- 2 children →
- ←1 child
- 1 adult →
- ←1 child

I also noticed that the number of times this combination was repeated was positively correlated to the number of adults. Also, in both scenarios the final step was always the same (2 children would return in the boat).

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If there were 100 adults and 2 children:

Following on from my previous findings, if there were 100 adults then the combination below would need to be repeated 100 times:

2 children →
←1 child
1 adult →
←1 child

Additionally, the final crossing would also be the return of two children in the boat. Therefore, the total number of crossings would be:

$$(100 \times 4) + 1 = \underline{\underline{401}}$$

If there were n adults and 2 children:

I was now able to create the formula below for the number of crossings where there are two children and n adults:

$$\text{Total crossings} = 4n + 1$$