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Solution — how the farmer can get everyone across safely

Start: Left bank = {Farmer, Wolf, Goat, Cabbage} ; Right bank = {}.

Sequence of moves (Farmer always **in** the boat):

1. Farmer takes Goat to the right bank.

Left: {Wolf, Cabbage} — safe (wolf **&** cabbage okay). Right: {Farmer, Goat}.

2. Farmer returns alone to the left bank.

Left: {Farmer, Wolf, Cabbage}. Right: {Goat} — safe.

3. Farmer takes Wolf to the right bank.

Left: {Cabbage}. Right: {Farmer, Wolf, Goat} — but Farmer must **not** leave Wolf **&** Goat together **with** no farmer, so we fix that next.

4. Farmer brings Goat back to the left bank.

Left: {Farmer, Goat, Cabbage}. Right: {Wolf} — safe (goat **and** cabbage together only when farmer **is** present).

5. Farmer takes Cabbage to the right bank.

Left: {Goat}. Right: {Farmer, Wolf, Cabbage} — safe (wolf **&** cabbage fine).

6. Farmer returns alone to the left bank.

Left: {Farmer, Goat}. Right: {Wolf, Cabbage} — safe.

7. Farmer takes Goat to the right bank.

Left: {}. Right: {Farmer, Wolf, Goat, Cabbage} — done.

Why this works: the only risky pairs are (Wolf, Goat) **and** (Goat, Cabbage).

Every time the farmer leaves one of those pairs unattended, the sequence avoids leaving the two together.

The critical trick **is** bringing the goat back after taking the wolf across, so the wolf **is** never left alone **with** the goat, **and** the cabbage **is** transp

In [4]:

In [1]: