

## Take Home test

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### # Missionaries and cannibals problem solution.

Problem statement : 3 missionaries and 3 cannibals are on one side of a river, along with boat, that can hold  $1/2$  people. The goal is to find a way to transport everyone to the other side of the river without ever leaving a group of missionaries in one place outnumbered by cannibals in that place.

Solution  $\Rightarrow$

#### ① State description

$(M1, C1, B1, M2, C2)$ .

$M1$  : Missionary count on Bank 1.  $(0, 1, 2, 3)$

$C1$  : Cannibals count on Bank 1  $(0, 1, 2, 3)$ .

$B1$  : Bank on which Boat  $(0 \Rightarrow \text{Bank 1} \quad 1 \Rightarrow \text{Bank 2})$

$M2$  : Missionary count on Bank 2  $(0, 1, 2, 3)$

$C2$  : Cannibals count on Bank 2  $(0, 1, 2, 3)$

② Initial state  $\Rightarrow (3, 3, 0, 0, 0)$

Goal state  $\Rightarrow (0, 0, 1, 3, 3)$

③ List of all actions  $\Rightarrow$

$B1 M M B2 \Rightarrow$  Take 2 M from Bank 1 to Bank 2

$B1 C C B2 \Rightarrow$  Take 2 C from Bank 1 to Bank 2.

$B1 M C B2 \Rightarrow$  Take 1 M & 1 C from Bank 1 to Bank 2

$B1 M B2 \Rightarrow$  Take 1 M from Bank 1 to Bank 2

$B1 C B2 \Rightarrow$  Take 1 C from Bank 1 to Bank 2.

Teacher's Signature:.....

$B_2 M M B_1 \Rightarrow$  Take 2M from Bank 2 to Bank 1  
 $B_2 C C B_1 \Rightarrow$  Take 2C from Bank 2 to Bank 1  
 $B_2 M B_1 \Rightarrow$  Take 1M from Bank 2 to Bank 1  
 $B_2 C B_1 \Rightarrow$  Take 1C from Bank 2 to Bank 1  
 $B_2 M C B_1 \Rightarrow$  Take 1M & 1C from Bank 2 to Bank 1

### Solution

Initial state :  $(3, 3, 0, 0, 0)$   
 $\downarrow (B_1 C C B_2)$   
 $(3, 1, 1, 0, 2)$   
 $\downarrow (B_2 C B_1)$   
 $(3, 2, 0, 0, 1)$   
 $\downarrow (B_1 C C B_2)$   
 $(3, 0, 1, 0, 3)$   
 $\downarrow (B_2 C B_1)$   
 $(3, 1, 0, 0, 2)$   
 $\downarrow (B_1 M M B_2)$   
 $(1, 1, 1, 2, 2)$   
 $\downarrow (B_2 M C B_2)$   
 $(2, 2, 0, 1, 1)$   
 $\downarrow (B_1 M M B_1)$   
 $(0, 2, 1, 3, 1)$   
 $\downarrow (B_2 C B_1)$   
 $(0, 3, 0, 3, 0)$   
 $\downarrow (B_1 C C B_2)$   
 $(0, 1, 1, 3, 2)$   
 $\downarrow (B_2 C B_1)$   
 $(0, 2, 0, 3, 1)$   
 $\downarrow (B_1 C C B_2)$   
 Goal state  $\Rightarrow (0, 0, 1, 3, 3)$