**Task 2:**

Two adults and two children are on the left side of the river. Each adult weighs 150 pounds. Each child has half the weight of an adult, so each child weighs 75 pounds. They all want to cross to the right side of the river. However, the only means of transportation they can use is a boat, and the boat can carry a maximum of 150 pounds. Thus, the boat can carry one adult without children, or one child, or two children. Any adult or child can operate the boat, but the boat cannot be operated without having at least one person on the boat. The goal is to come up with a plan for moving everyone from the left side to the right side using multiple boat trips.   
  
Define appropriate actions for this planning problem, in the PDDL language. For each action, provide a name, arguments, preconditions, and effects. Also, describe the initial state and the goal, using PDDL.

**Solution:**

Below description shows the initial and the goal state:

(adult1 Adult)

(adult2 Adult)

(child1 Child)

(child2 Child)

(boat Boat)

(preconds

(left adult1) (left adult2) (left child1) (left child2) (left boat))

(effects

(right adult1) (right adult2) (right child1) (right child1) (right boat))

Below shows for each action - the name, arguments, preconditions, effects.

(operator

travel-adult

(params

(<adult> Adult) (<boat> Boat))

(preconds

(left <adult>) (left <boat>))

(effects

(right <adult>) (right<boat>) (del left <adult>) (del left <boat>)))

(operator

travel-child-right

(params

(<child1> Child) (<child2> Child) (<boat> Boat))

(preconds

(left <child1>) (left <child2>) (left <boat>))

(effects

(right <child1>) (right <child2>) (right <boat>) (del left <child2>) (del left <child2>) (del left <boat>)))

(operator

travel-child-left

(params

(<child1> Child) (boat Boat))

(preconds

(right <child1>) (right <boat>))

(effects

(left <child1>) (left <boat>) (del right <child1>) (del right <boat>)))

We can also specify initial state and goal state as follows:

Initial State:

left(child1) and left(child2) and left(adult1) and left(adult2) and left(boat)

Goal State:

right(child1) and right(child2) and right(adult1) and right(adult2) and right(boat)