AIML Week 6 Problem Set:

```
import heapq

GOAL_STATE = [
    [1, 2, 3],
    [4, 5, 6],
    [7, 8, 0]
]
MOVES = [(-1, 0), (1, 0), (0, -1), (0, 1)]

def is_valid_move(x, y):
    return 0 <= x < 3 and 0 <= y < 3

def calculate_heuristic(state):
    misplaced_tiles = 0
    for i in range(3):
        for j in range(3):
            if state[i][j] != GOAL_STATE[i][j]:
                misplaced_tiles += 1
    return misplaced_tiles

def calculate_cost(state, level):
    return level

def create(initial_state, max_level):
    initial_state = [list(row) for row in initial_state]
    priority_queue = [(calculate_cost(initial_state, 0) + calculate_heuristic(initial_state), 0,
initial_state)]

    while priority_queue:
        _, current_level, current_state = heapq.heappop(priority_queue)

        if current_state == GOAL_STATE:
            print("Goal State Reached!")
            return

        if current_level > max_level:
            continue

        print("Level:", current_level)
        for row in current_state:
            print(" ".join(map(str, row)))
```

```
        print("Heuristic Value (Level + Misplaced Tiles):", current_level +
calculate_heuristic(current_state))
        print()

        for i in range(3):
            for j in range(3):
                if current_state[i][j] == 0:
                    empty_x, empty_y = i, j
        for dx, dy in MOVES:
            new_x, new_y = empty_x + dx, empty_y + dy
            if is_valid_move(new_x, new_y):
                new_state = [list(row) for row in current_state]
                new_state[empty_x][empty_y], new_state[new_x][new_y] = new_state[new_x][new_y],
new_state[empty_x][empty_y]
                new_level = current_level + 1
                priority = new_level + calculate_heuristic(new_state)  # f-value
                heapq.heappush(priority_queue, (priority, new_level, new_state))

initial_state = [
    [1, 2, 3],
    [5, 4, 6],
    [8, 0, 7]
]

level_number = int(input("Enter the max level required for the state space tree to be produced:
"))
create(initial_state, level_number)
```