**SPAB – assignment 02**

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**Task 2.2**

Hilbert’s Hotel: countable number of rooms occupied

1. One more guest:

Move guest from room 1 to room 2, guest from room 2 to room 3, …

(possible because adding a constant on countable infinity is still a countable infinity)

Move new guest to room 1

1. Bus with countable number of guests:

Move all guests in a room with a number twice their current room number.

(multiplying a countable infinity with a constant is still a countable infinity)

All rooms with odd numbers are free (countable infinity) for the guests in the bus.

1. Countable number of busses with countable number of guests:

Move all guests in a room with a number twice their current room number (odd room numbers are free now)

Put guests from bus i in the rooms pi, pi2, pi3,… with pi = i+1 th prime number

(Note: all guests have to move at the same time, otherwise it would take a countable infinite amount of time)