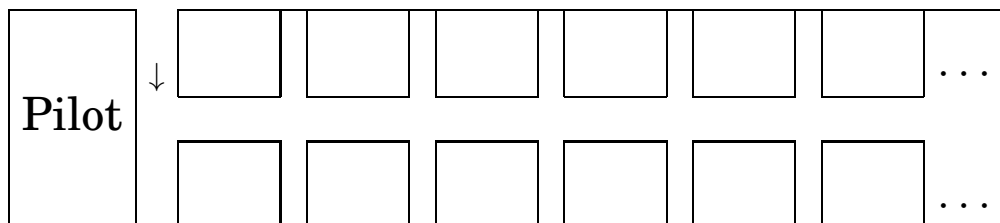


HOTEL INFINITY II

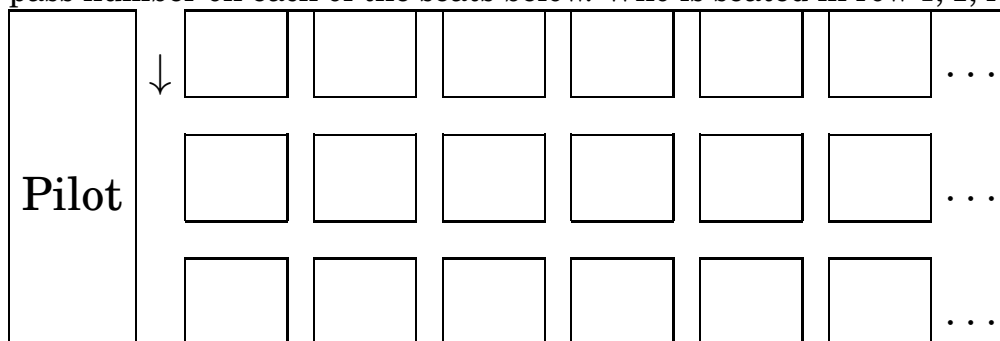
JUNIOR CIRCLE 10/02/2011

- (1) In the galaxy tourists travel on *Infinity Rockets* operated by *Infinite Space*. Each *Infinity Rocket* has an infinite number of seats. In the seating charts below, each square represents a seat for a single passenger. The arrow \downarrow indicates the entry door.
- (a) Passengers have been issued boarding passes numbered 1, 2, 3 and so on. Your task is to assign the seats so that all seats are full. First, write in each of the seats below the boarding pass number.

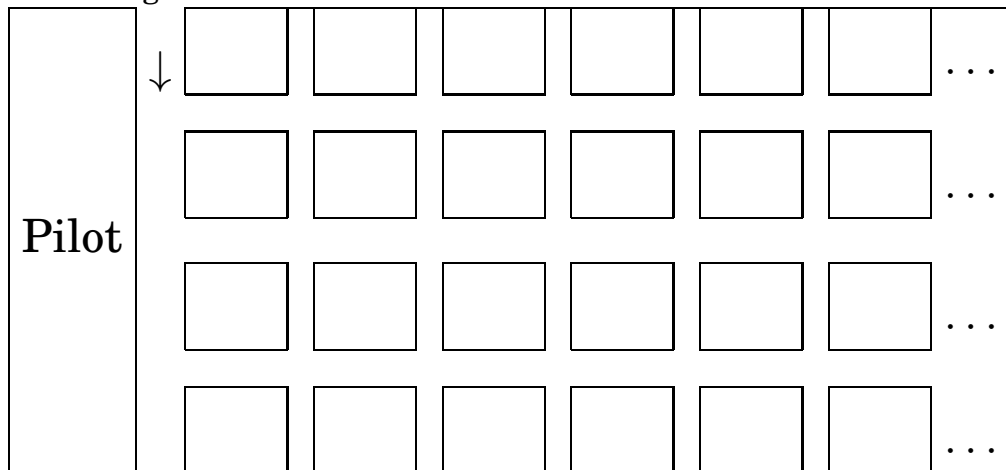


Who is seated in row 1? Row 2? What about row x ?

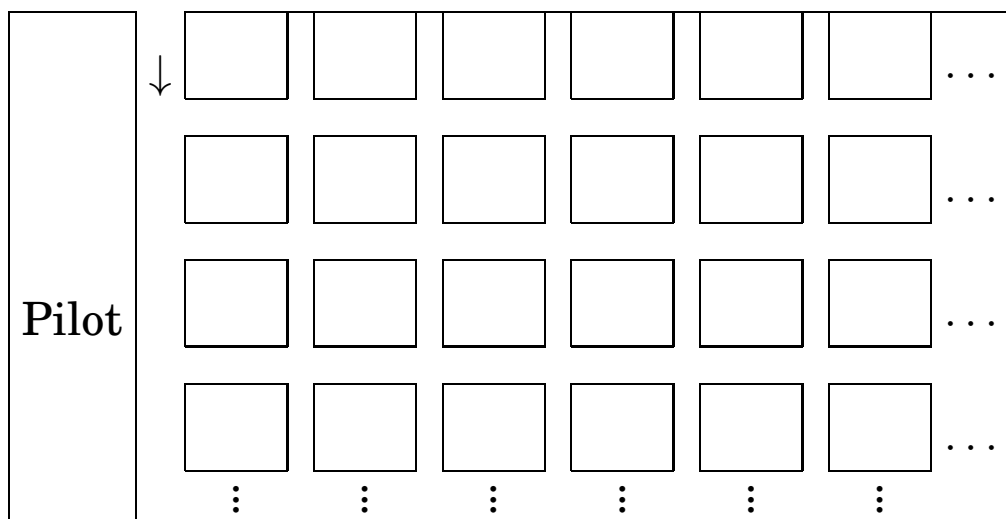
- (b) Another type of a rocket is presented below; it seats 3 passengers per row. Once again, assign seats so that all seats are taken. Write the boarding pass number on each of the seats below. Who is seated in row 1, 2, row x ?



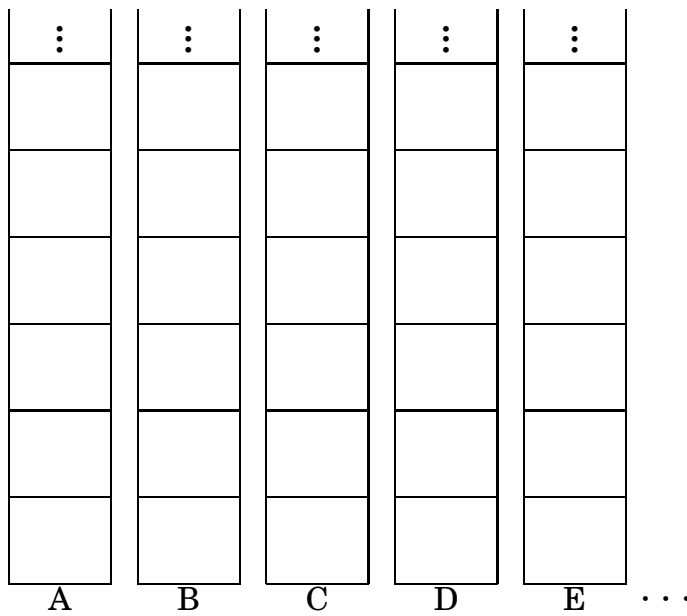
- (c) A wide-body rocket seats 4 passengers. Assign seats to all passengers by writing the boarding pass number on each seat. Come up with a formula describing who sits in row x .



- (d) A super-wide-body rocket has an infinite number of seats in each row. Can you assign seats to an infinite number of passengers so that each seat is taken? Again, you must come up with a way to write the boarding pass number in each seat. *Hint:* There is only one door into the rocket and every tourist has a lot of baggage, meaning they want to walk as little as possible.



- (2) Hotel *Infinity*² consists of an infinite number of towers, each with an infinite number of floors. All towers in the hotel are completely full:



Unfortunately, due to an earthquake the towers are damaged, and all guests are evacuated on a single rocket. To do this, you must give them boarding passes numbered 1, 2, 3 and so on. Can you do this? Write the boarding pass number you will be assigning into each room.

- (3) Each Infinity Rocket looks wonderful at night. Next to each row there is a round window. Some passengers have their lights on, and some off. When you look at the rocket from the outside, you see a pretty pattern of lit and unlit windows, like this:



The Leonardo d'Infinci Studios want to make a picture book with an infinite number of pages numbered 1, 2, 3, They want to put a photo of a rocket on each page, so that different pages show different patterns.

- (a) Can you help them design the picture book? For each page, describe the pattern to be drawn on that page (indicate lit windows with “+” and unlit ones with “-”). Make sure that different pages contain different patterns:

page 1	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ . . .
page 2	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ . . .
page 3	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ . . .
page 4	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ . . .
page 5	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ . . .
page 6	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ . . .
page 7	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ . . .
⋮	

- (b) Do you think you could make a book that lists *all possible such patterns*? Try to come up with a way. Then try to see if you could invent a pattern that is *not* on your list (if you can't, ask your instructor). Try doing more than just one below, if you would like to.

page 1	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ . . .
page 2	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ . . .
page 3	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ . . .
page 4	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ . . .
page 5	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ . . .
page 6	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ . . .
page 7	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ . . .
⋮	

